SCHRIFTENREIHE DER BUNDESANSTALT FÜR AGRARWIRTSCHAFT
Nr. 66

USE OF AGRICULTURAL LAND FOR NON-FOOD PURPOSES

(Results of the FAO/ECE Symposium, 3-8 June 1991, Graz, Austria)

Nutzung landwirtschaftlichen Bodens für nichtlandwirtschaftliche Zwecke

Herausgegeben von

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Wien 1991

ISBN 3 - 7040 - 1095 - 2

Eigentümer, Herausgeber und Druck: Bundesanstalt für Agrarwirtschaft, 1133 Wien, Schweizertalstraße 36. Verlag: Österreichischer Agrarverlag, 1014 Wien 1, Bankgassse 1-3.

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VORWORT

Die europäische Landwirtschaft ~~- und nicht nur diese -~~ steht zu Ende dieses Jahrhunderts vor zwei großen Herausforderungen: einerseits die Produktion auf die Nachfrage am Nahrungsmittelmarkt abzustimmen unter gleichzeitiger Sicherung eines ausreichenden Einkommens für die Landwirte, und ander~~er~~seits einen Beitrag zur Verbesserung der Umweltsituation zu leisten. Es lag deshalb nahe, sich auf die Funktionen, die die Land- und Forstwirtschaft über die eines Nahrungsmittelproduzenten hinaus Jahrhunderte hindurch hatte, rückzubesinnen, nämlich auf die eines Energie- und Rohstofflieferanten für Gewerbe und Industrie. Erste Ansätze dazu wurden in Österreich schon vor über 10 Jahren, bei einzelnen Sparten sogar schon länger, gesetzt. Im Juni 1991 wurde vom

In dieser Situation hat das Sekretariat der FAO/ECE Agriculture and Timber Division in Genf im Jahre 1988 unter seinen Mitgliedstaaten einen möglichen Veranstalter für ein Symposium zu diesem Problemkreis gesucht und ist angesichts der international anerkannten Arbeiten auf diesem Gebiete mit dem Vorschlag an Österreich herangetreten, baldmöglich ein Symposium zum Thema "Nutzung landwirtschaftlichen Bodens für Nicht-Nahrungszwecke" zu organisier~~en~~. zu diesem

Dieser Vorschlag wurde dem damaligen Herrn Bundesminister für Land- und Forstwirtschaft, Dipl.-Ing. Josef Riegler, unterbreitet, der den Vorschlag sehr positiv aufgenommen, einen Ministerratsvortrag eingebracht und die Bundesanstalt für Agrarwirtschaft mit den fachlichen und organisatorischen Vorbereitungen beauftragt hat. Am 10. Jänner 1989 hat der Ministerrat die Einladung der österreichischen Bundesregierung an die ECE zur Abhaltung dieses Symposiums vom 3. bis 8. Juni 1991 in Graz ausgesprochen und die Übernahme der damit zusammenhängenden Kosten beschlossen.

nahmen

Am Symposium ~~haben~~ 47 Fachleute aus Forschung, Industrie und Gewerbe, Landwirtschaft, Verwaltung und Agrarpolitik von zwei Organisationen und aus 14 Ländern teil~~genommen und~~ konnten in Vorträgen, Diskussionen, Posterausstellungen und Exkursionen ihre Erfahrungen und Perspektiven austauschen. Um dieses äußerst wertvolle Material zu dokumentieren und über den Kreis der Symposiumsteilnehmer hinaus zugänglich zu machen, wurde beschlossen, es in der Schriftenreihe der Bundesanstalt für Agrarwirtschaft zu veröffentlichen. Dabei werden die Vorträge nur in der Fassung der Originalsprache abgedruckt, die jewei- Sie ligen Zusammenfassungen jedoch in allen vier Sprachen - Englisch, Französisch, Russisch und Deutsch. Die Erklärungen zu den Postern und die Unterlagen zu den beiden Fachexkursionen konnten aus Platzgründen nur in der englischen Fassung übernommen werden.

Als Organisator des Symposiums möchte ich aber an dieser Stelle hervorheben, daß die finanzielle Basis dafür das Bundesministerium für Land- und Forstwirtschaft geschaffen hat. Ihm und der Landeskammer für Land- und Forstwirtschaft Steiermark mit Herrn Kammeramtsdirektor Dr. Heinz Kopetz und dessen Mitarbeitern sei für die fachliche und organisatorische Unterstützung ebenso gedankt wie für die Bereitstellung des Bildungshauses "Raiffeisenhof" in Graz als idealer Tagungsort; Herr Direktor Dipl.-Ing. Franz Riebenbauer und seine Mitarbeiter haben zum reibungslosen Ablauf des Symposiums wesentlich beigetragen. Nicht zuletzt möchte ich allen Mitwirkenden an den sehr eindrucksvollen Posterausstellungen und den Betriebsinhabern bzw. Geschäftsführern der Exkursionsziele den Dank aussprechen, denn sie haben das Thema mit Leben versetzt.

Wien, August 1991 *Dipl.-Ing. Hans Alfons*

Dr. Heinz Kopetz, Direktor der Landeskammer für Land- und Forstwirtschaft Steiermark, Graz

EINLEITUNGSWORTE

Die Landeskammer für Land- und Forstwirtschaft Steiermark betrachtet es als Auszeichnung, daß das FAO-Seminar "Use of agricultural land for non-food purposes" im Bildungshaus der Landeskammer in Graz stattfindet.

Namens der Führung der Landeskammer entbiete ich den Teilnehmern an diesem Seminar herzliche Willkommensgrüße.

Das Thema des Seminars ist für die künftige Entwicklung der Landwirtschaft von außerordentlicher Bedeutung. Die europäische Landwirtschaft befindet sich derzeit in einer Überschußkrise. Diese Situation führt zu einem ständigen Druck auf die Agrarpreise und damit auf die bäuerlichen Einkommen. Durch die raschen Fortschritte in den Landbauwissenschaften ist auch in den kommenden Jahren mit einer weiteren Erhöhung des Angebotes zu rechnen. Schon heute gibt es Fachleute, die darauf hinweisen, daß in Europa mehrere Millionen Hektar Ackerland aus der landwirtschaftlichen Produktion genommen werden sollten, um diese Überschüsse zu verringern. Während also auf der einen Seite die agrarische Überschußproduktion in Europa immer drückender wird, haben wir auf der anderen Seite eine Industrie- und eine Energiewirtschaft, die sich überwiegend mit nicht erneuerbaren Rohstoffen versorgt. Besonders der rasche Abbau der fossilen Rohstoffvorräte zur Deckung des Energiebedarfes in Europa führt zu zahlreichen Problemen. Daher ist es naheliegend, daß sich auch Fachleute auf internationaler Ebene mit der Frage auseinandersetzen, wie weit freiwerdende landwirtschaftliche Flächen für die Erzeugung von Rohstoffen für die Industrie- und Energiewirtschaft genutzt werden können.

Von der Lösung dieser Frage erwartet sich die bäuerliche Landwirtschaft eine entscheidende Erweiterung ihrer Aufgabenstellung in den kommenden Jahrzehnten.

Wir halten die Beratungen dieses Seminars für äußerst wichtig und wünschen Ihnen in Graz am Raiffeisenhof einen angenehmen Aufenthalt und viel Erfolg.

Dipl.-Ing. Hermann Schaller, Landesrat der Steiermärkischen Landesregierung, Graz

BEGRÜßUNGSREFERAT

Zum ersten Mal ist der Non-food-Bereich Gegenstand einer Tagung in Österreich. Zum ersten Mal auch ist die Steiermark Veranstaltungsland eines FAO/ECE-Symposiums in diesem Bereich. Die vielen guten Ansätze, die es in der Steiermark gibt, sind bekannt. Mir kommt die ehrenvolle Aufgabe zu, namens der Steiermark anläßlich der Eröffnung dieses Symposiums die Teilnehmer aus dem In- und Ausland herzlich willkommen zu heißen. Ich überbringe Ihnen die Grüße und guten Wünsche des Steirischen LANDESHAUPTMANNES Dr. JOSEF KRAINER ; er hat mich mit seiner Vertretung beauftragt.

Es stellt sich natürlich die Frage: Ist der Weg der Landwirtschaft in die Non-food-Produktion unumgänglich? Dazu einige Anmerkungen:

1) Unsere Bauern haben den wirtschaftlichen und technischen Fortschritt zu nutzen gewußt:
   - Seit den 50iger Jahren haben sich die Durchschnittserträge auf dem Ackerland verdreifacht;
   - die Milchlieferleistung an die Molkereien hat sich mehr als verdoppelt;
   - der Versorgungsgrad bei den wichtigsten Nahrungsmitteln (Milch, Getreide, Fleisch) übersteigt den Inlandsbedarf um 20-60 %.

2) Auf den Weltmärkten herrscht ein brutaler Verdrängungswettbewerb:
   - EG und USA geben Hunderte von Milliarden Schilling für Marktentlastungsmaßnahmen bzw. für die Landwirtschaft aus (die EG-Haushaltsleitlinie erlaubt für das laufende Haushaltsjahr Agrarausgaben von umgerechnet 466 Mrd. S);
   - GATT-Regelungen zielen auf eine Liberalisierung des Welthandels ab, wovon die Großexporteure profitieren werden.

   Für Österreich werden dadurch die Marktverhältnisse immer schwieriger, die Produzentenpreise geraten unter Druck, die Regulierung der wichtigsten Märkte kostet enorm viel.

3) Der ungehemmte fossile Energieeinsatz droht weltweit unsere Lebensgrundlagen Luft, Wasser und Boden zu zerstören. Auch in Österreich leidet das gesamte Ökosystem, vor allem der Wald, trotz deutlicher Reduktion einiger Schadstoffe nach wie vor an einem unzumutbar hohen Maß an Schadstoffeinwirkungen. Daher müssen wir all unsere Kraft und unseren Erfindungsgeist mobilisieren, um uns von den Drogen Öl, Gas, Kohleenergie zu befreien.

Die Agrarpolitik kann, ja sie muß gegensteuern, damit es nicht zu den angekündigten Horrorszenarien kommt. Indem wir bäuerliche Landwirtschaft sichern, werden wir auch einen unverzichtbaren Beitrag für Natur- und Umwelt zu leisten vermögen.

Dazu bestehen zwei Möglichkeiten:

- Wir können unsere Produktion anpassen, indem wir entweder die Erträge reduzieren oder die Fläche, oder auch beides.
- Wir nützen einen Teil unserer landwirtschaftlichen Böden für Nicht-Nahrungsmittelproduktion, indem wir Bioenergie und nachwachsende Rohstoffe produzieren und so die Märkte und die Umwelt entlasten.

Die Chance: Energie aus funktionierenden ökologischen Kreisläufen

Weltweit gesehen hat sich der Mensch im 20. Jahrhundert weitgehend von natürlichen Ökosystemen, betrieben aus der Sonnenenergie, zu künstlichen Systemen mit vorwiegend fossilen Energieträgern hinbewegt. Der gesamte Primärweltenergieverbrauch wird zu 95 % aus den fossilen Energieträgern Öl, Gas und Kohle gedeckt, deren Vorrat in absehbarem Zeitraum zu Ende geht und deren Verbrennung maßgeblich zum sogenannten "Treibhauseffekt" beiträgt.

Wir müssen uns daher mit unserem gesamten Handeln wieder in die natürlichen ökologischen Kreisläufe einfügen; wir müssen der Biomasse als erneuerbarem und umweltfreundlichem Energieträger eine Chance geben (sie ist CO_2-neutral).

Bioenergie in der Steiermark

Was haben wir in der Steiermark getan, und was haben wir bisher erreicht?

- 1984 sind wir daran gegangen, die Biomasse-Nutzung in eine zukunftsorientierte steirische Energiepolitik einzubetten. Der damals beschlossene Steiermärkische Landesenergieplan umfaßt neben dem Energiesparen als bedeutendstem Schwerpunkt: Abkehr von der Verwendung importierter fossiler Rohstoffe und Vorrang für heimische, regenerierbare Ressourcen.

- Zu betonen ist, daß die Steirische Landwirtschaftskammer seit dem Jahre 1980 in Zusammenarbeit mit dem Bundesministerium für Wissenschaft und Forschung und verschiedenen Instituten der Universität für Bodenkultur Versuche mit Energieholzkulturen im Kurzumtrieb durchführt, die vom Land gefördert werden.

- Wir müssen dem Einsatz von Bioenergie Starthilfe geben, d.h., wir müssen die etwas höheren Investitionskosten durch eine Förderung abfedern:
  - In der Steiermark sind derzeit 44 Biomasse-Heizzentralen in Betrieb (ihre Kesselleistung beträgt 71,5 Megawatt), 5 sind in Bau (5,5 Megawatt) und weitere 65 sind in Bearbeitung. Darüber hinaus sind 1.800 kleine bäuerliche und gewerbliche Hackschnitzelheizungen in Betrieb (60 Megawatt).
  - Der Biomasseanteil an der Primärenergie beträgt damit in der Steiermark derzeit 13,7 %. Wir streben eine Erhöhung auf 25 % bis zum Jahre 2000 an.

Das steirische RME-Projekt (Biodiesel)

Die Land- und Forstwirtschaft war im Energiebereich bis in dieses Jahrhundert hinein weitgehend autark. Holz und Holzkohle, tierische Zugkraft und menschliche Arbeitskraft standen ausreichend zur Verfügung.

- Ein Drittel des Ackerlandes wurde für Futter benötigt, der Wirtschaftsdünger aus dem Stall kam wieder zurück auf die Felder, der Nährstoff- und Energiekreislauf funktionierte.
- Mit der Mechanisierung und Rationalisierung in der Wirtschaft ging die Aufgabe der Energieversorgung verloren. Auf den freigesetzten Flächen wurde einerseits für den Markt produziert, anderseits muß der Großteil der Energie importiert werden.

Im südsteirischen Bezirk Mureck haben seit 1985 22 Bauern konsequent die Idee verfolgt, das "Futter" für das "Zugtier" Traktor auf den eigenen Feldern zu erzeugen. Die Idee konnte deshalb Wirklichkeit werden, weil zu gleicher Zeit an der Grazer Technischen Universität Wissenschafter (Univ. Prof. JUNEK und Dozent MITTELBACH) an der Umesterung des Raps arbeiteten und im Rahmen eines Pilotprojektes in Silberberg dieses Verfahren zur Praxisreife entwickelten.

Die Pilotanlage wurde am 28.8.1987 der Öffentlichkeit vorgestellt. Im Vorjahr wurde eine "Öko-Dieselanlage" errichtet; heuer wird erstmals die Rapsernte von 220 Bauern mit insgesamt 230 ha Rapsfläche verarbeitet (Ziel: 400-500 ha).

Versuche mit Energiegras

Seit 1987 laufen in der Steiermark Versuche mit verschiedenen Grasarten, um herauszufinden, welche sich am besten zur Gewinnung von Energie eignen.

Von Interesse sind insbesondere die Versuche mit Elefantengras: Von der Arbeitsgemeinschaft "Erneuerbare Energie" betreute Landwirte haben in den vergangenen 2 Jahren auf 16 Standorten in der Steiermark 1,4 ha mit Elefantengras bebaut. Die Ergebnisse werden laufend ausgewertet und lassen derzeit noch keine abschließende Beurteilung zu.

Flachsanbau im oberen Murtal

Lein ist eine der ältesten Kulturpflanzen der Welt. Seine Kultivierung läßt sich bis in das 4. Jahrtausend v. Chr. zurückverfolgen. In Österreich gehörte der Leinanbau zum festen Bestandteil der landwirtschaftlichen Nutzungsform bis zum Jahre 1960.

Mit der leichten und billigen Verfügbarkeit von Mineralöl für die Herstellung von synthetischen Fasern änderte sich die Situation schlagartig, der Flachs verschwand aus den Fruchtfolgen. In die Überlegungen, wie man die Überschüsse in der Landwirtschaft herabsetzen könnte, wurde auch der Leinanbau einbezogen.

- Der Pionier für den Flachsanbau in Österreich Dipl.-Ing. Günter ALFONS (verstorben 1987) hat 1974 mit Wiedereinführungsversuchen begonnen.
- 1987 wurde daraufhin der Flachsanbau in Österreich wieder eingeführt; im Waldviertel, in Oberösterreich und in Pausendorf in der Steiermark wurden Schwunganlagen errichtet.

- Heuer werden in der Steiermark insgesamt 200 ha Flachs angebaut; großteils im oberen Murtal, aber auch im Bezirk Hartberg.

Was wird damit erreicht?

- Wir ersetzen damit Importe durch heimische Erzeugung und verbessern auch noch unsere Außenhandelsbilanz.
- Wir entlasten die Bauern von der Überschußproduktion bei Getreide, denn die Flachsförderung kommt billiger als die Exportstützungen.
- Derzeit wird die steirische Ernte nach dem Verschwingen in Pausendorf auf dem Weltmarkt verkauft. Ziel ist aber, in die Veredlung zu gehen und insbesondere auch einen wertvollen biologischen Rohstoff für die Baustoffindustrie zu schaffen.

Naturstoffchemie anstatt Petrochemie

Ein Zukunftsziel der Landwirtschaft wird es sein müssen, zunehmend über die Naturstoffchemie den wertvollen Rohstoff Erdöl zu substituieren und umweltbelastende Stoffe, wie sie heute in großer Menge am Markt sind, durch nachwachsende Rohstoffe zu ersetzen. Dazu einige Beispiele:

- Stärke und Stärkeprodukte aus der landwirtschaftlichen Erzeugung könnten als Vorprodukt in vielen Bereichen der Industrie, insbesondere in der chemischen Industrie, eingesetzt werden, wo z.B. Ethanol als Lösungsmittel alle anderen umweltfeindlichen Lösungsmittel ersetzen könnte (Ozonproblematik!).
- Unsere pflanzlichen und tierischen Fette könnten in der gesamten Kosmetik, in der Wasch- und Reinigungsmittelindustrie sowie auch im Baustoffbereich eingesetzt werden.
- Eine Chance ist auch die Erzeugung von Rohstoffen für die Erzeugung von biologisch unbedenklichen, abbaubaren Schmierstoffen und Lösungsmitteln sowie verrottbaren Verpackungsmaterialien.

Das Potential, um das es im Non-food-Bereich geht, besteht aus:
- bis zu 200.000 ha Energiewäldern
- Holz aus 4 Millionen ha Wald: Rückstände, Rinde, Sägespäne
- Energiegras auf einem Teil der Maisböden
- Raps und Sonnenblumen zur Erzeugung von RME und Biosprit in der Größenordnung von 3 % bis 5 % des österreichischen Verbrauches an Diesel und Vergasertreibstoffen.

Forderung an die Bundesregierung

Es wäre viel leichter, in diesen Bereichen vorwärts zu kommen, wenn wir von unserem Wirtschafts- und Steuersystem her bessere Voraussetzungen hätten. Wir setzen uns daher schon seit Jahren dafür ein, eine CO_2-Abgabe zu realisieren. Dabei geht es uns nicht darum, eine neue Steuer einzuführen, sondern um ein ökologisch außerordentlich wirkungsvolles Steuerungssystem. Die Arbeitskraft sollte ebenso eine Chance bekommen wie ökologische Formen der Energieerzeugung (Biomasse, Wasserkraft).

- Die Schweden haben diesen Schritt bereits getan; die Norweger und Dänen stehen knapp davor; Schweiz, Italien und BRD planen ihn.
- In Österreich gibt es Absichtserklärungen im SPÖ/ÖVP-Regierungsübereinkommen, die heimischen erneuerbaren Energieträger verstärkt zu nutzen, aber damit ist ihnen der Weg noch nicht geebnet.

Wollen wir unseren Verpflichtungen gegenüber Mutter Erde gerecht werden, müssen wir wirksame Schritte zur Eindämmung der Belastungen setzen.

Zum Abschluß

Der wichtigste Beitrag unserer bäuerlichen Landwirtschaft im "Non-food-Bereich", d.h. über die Aufgabe, den Tisch des Volkes zu decken, war und ist - und das nicht erst seit heute, sondern seit mehr als 1000 Jahren - das Antlitz unserer Landschaft zu prägen und zu gestalten, sie zu der prachtvollen Kulturlandschaft zu machen, wie wir sie heute kennen.
In dieser Aufgabe ist sie auch heute genauso unverzichtbar und unvertretbar wie je zuvor.
Sie wird diese Aufgabe aber nur erfüllen können, wenn ihr für diese äußerst respektable Leistung von unserer Gesellschaft - und sie ist ja der Nutznießer - die Leistung anerkannt und der gerechte Lohn zuerkannt wird.

Dipl.-Ing. Hans Alfons, Direktor der Bundesanstalt für Agrarwirtschaft, Wien
(in Vertretung des Herrn ***Bundesministers Dr. Franz Fischler***)

ERÖFFNUNG DES SYMPOSIUMS

Der Herr Bundesminister Dr. Franz FISCHLER wurde kurzfristig durch dringende, unaufschiebbare Verhandlungen in Wien gehindert, zur Eröffnung dieses Symposiums zu kommen, was er außerordentlich bedauert, da er an diesem Thema größtes Interesse hat, kann es doch zur Lösung einiger aktueller Probleme langfristig beitragen. Er hat den Auftrag gegeben, die Symposiumsteilnehmer in seinem Namen zu begrüßen und ihn bei der Eröffnung zu vertreten.

Wenn man sich hier zu einem Symposium zusammengefunden hat, das unter dem Thema "Use of agricultural land for non-food purposes" steht, noch dazu mitveranstaltet von der FAO, so zeigt dies sehr deutlich die Situation, in der sich viele Industriestaaten der Welt und fast alle Staaten Europas befinden: Es werden Überschüsse produziert, die auf den Weltmärkten kaum mehr unterzubringen sind und gleichzeitig die Staatshaushalte finanziell schwer belasten. Eine Umlenkung der Produktion ist hier unerläßlich; nationale und internationale Maßnahmen sind dazu erforderlich.

Auf der anderen Seite steht die Umweltproblematik. Wie aus der Umweltstudie "Global 2000" zu entnehmen ist, hat der Raubbau an den irdischen Ressourcen zu einer krassen Gefährdung der Grundlagen des menschlichen Lebens geführt.

Das Produktions- und Lebensniveau der hochentwickelten Industrieländer hat kaum Aussicht auf längerfristigen Fortbestand. Die endlichen Ressourcen der Erde erschöpfen sich allmählich, wichtige Ökosysteme der Meere und Kontinente sind gestört. Dies erkennen immer breitere Schichten der Bevölkerung und beeinflussen die Politik in Richtung umweltschonender Maßnahmen.

Es gilt, wirtschaftliche Rahmenbedingungen um ökologische Gesichtpunkte zu erweitern, um unsere Lebensgrundlagen - Umweltqualität und Wohlstand - zu erhalten und auszubauen. Denn Sozialleistungen werden nur durch eine prosperierende Wirtschaft ermöglicht, Umweltsanierung und effizienter Umweltschutz kann ebenfalls nur von einer gesunden Wirtschaft finanziert werden.

An dieser Stelle soll deshalb ausdrücklich festgehalten werden:

Die Nahrungsmittelproduktion wird auch künftig die zentrale Aufgabe und Haupteinnahmequelle für unsere Bauern bleiben. Betriebe, die dauerhaft die internationale Arbeitsteilung und den Wettbewerb bestehen sollen, müssen daher ihre Produktionsmöglichkeiten ausschöpfen. Optimierung der Produktion, Kostensenkung und überbetriebliche Zusammenarbeit bleiben deshalb wichtige Leitsätze.

Neben dieser Nahrungsmittelproduktion wird mittel- bis längerfristig die Erzeugung nachwachsender Rohstoffe an Bedeutung gewinnen. Dabei ist insbesondere an den Anbau von Industriepflanzen zur Herstellung von Stärke, Zuckerstoffen, Ölen und Fetten sowie an den Anbau von Energiepflanzen gedacht. Züchtung und Forschung sind gefordert, Österreich hat hier frühzeitig wichtige Aktivitäten gesetzt.

Unabhängig vom Anbau nachwachsender Rohstoffe und der Produktion qualitativ hochwertiger Nahrungsmittel erwartet sich die Gesellschaft von den Bauern ökologische Signale für die Reinhaltung der Gewässer und eine bodenschonende Agrarproduktion, aber auch für den Art- und Biotopschutz und zur Erhaltung des Landschaftsbildes.

Bewährte Instrumente der Agrarpolitik sind deshalb durch verstärkte Direktzahlungen für Kulturlandschaftsleistungen auf der Grundlage politisch konsensfähiger Modelle zu ergänzen.

Die seit 1987 praktizierte ökosoziale Agrarpolitik bekennt sich

- zu einem Miteinander der verschiedenen Betriebs- und Erwerbsformen;
- tritt für umweltschonende Produktionsmethoden ein;
- strebt eine vielfältige, bäuerlich strukturierte und flächendeckende Landwirtschaft an;
- fördert Kreativität und Leistungsfähigkeit;
- sichert Absatzmärkte im In- und Ausland und
- versteht sich als umfassende Politik für den ländlichen Raum.

Diese Neugestaltung der Agrarförderung mit einer Rekorddotierung des Grünen Planes von 3,6 Mrd. Schilling für das Jahr

1991 ermöglicht den Ausbau der Direktzahlungen für die Betriebe in benachteiligten Regionen sowie die Intensivierung der tierischen und pflanzlichen Produktionsalternativen.

Die derzeit laufenden Beratungen über das Getreideprotokoll streben den weiteren Ausbau der pflanzlichen Produktionsalternativen auf 15 % der Ackerfläche durch Einführung einer Prämie an, um einen weiteren Schritt zur Marktentlastung bei Getreide zu tun.

Österreichs Land- und Forstwirtschaft ist von Klein- und Mittelbetrieben geprägt: Fast 80 % der etwa 300.000 land- und forstwirtschaftlichen Betriebe bewirtschaften weniger als 20 Hektar, 115.000 Höfe entfallen auf das Berggebiet. Aus dieser Situation und den aufgezeigten Grundzügen unserer Agrarpolitik ist es aber auch verständlich, daß Österreich in internationalen Verhandlungen sehr dezidiert eine klare Position zugunsten einer bäuerlich strukturierten, flächendeckenden Landwirtschaft bezogen hat und bezieht, gemeinsam mit einigen anderen Staaten in ähnlicher struktureller und topographischer Lage.

Welche konkreten Möglichkeiten bestehen derzeit für den verstärkten Einstieg der österreichischen Land- und Forstwirtschaft in die Rohstoffproduktion für industrielle Zwecke und zur Gewinnung von Energie?

1. Die Rahmenbedingungen für den verstärkten Einstieg der österreichischen Land- und Forstwirtschaft in die Rohstoffproduktion für industrielle Zwecke und zur Gewinnung von Energie sind zur Zeit nicht optimal; die Preise fossiler Energieträger sind zu niedrig.

2. Das Bundesministerium für Land- und Forstwirtschaft hat in Teilbereichen (Biogene Brennstoffe, Ersatztreibstoffe) in den letzten Jahren große Anstrengungen auf dem Gebiet der Forschung, Untersuchung und Prüfung unternommen, um den verstärkten Einstieg der Land- und Forstwirtschaft in diesen Bereichen zu ermöglichen.
   Auf dem Sektor "Energetische Nutzung der Biomasse" in Form der Biomasse-Heizanlagen und Biomasse-Nahwärmeversorgungsanlagen ist dieser Einstieg voll im Gange. So wurden in den letzten 10 Jahren über 8.000 moderne Hackschnitzelheizanlagen bis 100 kW, 1.400 Anlagen zwischen 100 und 1.000 kW und 180 Anlagen mit über 1.000 kW installiert.

3. Die Errichtung von Biodieselanlagen ist zum Teil abgeschlossen bzw. im Gange (2 industrielle Anlagen in Aschach und in Bruck/Leitha mit Verarbeitungskapazitäten von je 10.000 bis 15.000 t/Jahr = 10.000 bis 15.000 ha Ölfruchtfläche; 3 bäuerliche Anlagen in Asperhofen, Güssing und Mureck mit Verarbeitungskapazitäten zwischen 500 und 1.500 t/Jahr = 500 bis 1.500 ha).

4. Das Äthanolprojekt (Austroprot) sieht die Erzeugung von 100.000 t Alkohol/Jahr aus landwirtschaftlichen Grundstoffen wie Weizen, Mais, Zuckerrübe, Erbse vor und den Einsatz des Alkohols zur Benzinbeimischung (Bleiersatz; ab 1.1.1993 ist Bleizusatz verboten). Mit dem Bau der Anlage in Krems soll 1992 begonnen werden.

5. Auf anderen Sektoren (Anlage von Energieholzflächen, die Nutzung von C_4-Pflanzen) sind wir derzeit noch im Forschungs- und Versuchsstadium.

Das Bundesministerium für Land- und Forstwirtschaft hat deshalb die von der FAO/ECE schon vor 3 Jahren herangetragene Anregung, ein Symposium zu diesem speziellen Thema zu veranstalten, gerne aufgegriffen und die Bundesanstalt für Agrarwirtschaft mit der Organisation und der Durchführung des Symposiums beauftragt. Nach der durch den Ministerrat im Jänner 1989 ausgesprochenen Einladung der Republik Österreich wurde als Tagungsort Graz gewählt, weil man in der Steiermark dieses Thema nicht nur in der Theorie diskutieren, sondern auch dank der besonderen klimatischen Verhältnisse und der gesetzten Initiativen in der vollen Breite vom Biodiesel bis zum Golfplatz in Exkursionen in der Praxis sehen kann.

Für uns ist es eine Auszeichnung, das FAO/ECE-Symposium "Use of agricultural land for non-food purposes" durchführen zu können. Wir sehen darin auch eine internationale Anerkennung der frühzeitigen Initiativen Österreichs auf diesem Gebiet. Von diesem Symposium erhoffen wir weitere, europaweite Impulse für die Erzeugung biogener Rohstoffe und Energieträger durch neue Kontakte zwischen Forschung, Industrie und Gewerbe, Landwirtschaft sowie Administration einerseits und den Ländern untereinander andrerseits.

Mit dem Wunsch auf einen guten Erfolg ist das Symposium eröffnet.

Dr. Ernst-Ludwig Littmann, Chief of Agriculture Section, FAO/ECE Agriculture and Timber Division, Geneva

OPENING ADRESS

I have the honour and the pleasure to open this symposium on the use of agricultural land for non-food purposes on behalf of the two international organizations under whose auspices it has been organized - the Food and Agriculture Organization of the United Nations (FAO) and the UN Economic Commission for Europe (ECE). More specifically the symposium is connected with the work of the joint FAO/ECE Working Party on Agrarian Structure and Farm Rationalization with its secretariat in the joint FAO/ECE Agriculture Section in Geneva. The latter is a small international secretariat - of which I am the head - which has been co-ordinating all-European co-operation in the field of agriculture ever since its foundation in 1949. As such it has been analysing and commenting the enormous changes which have been taking place in European agriculture throughout more than four decades. Initially the work was mostly concerned with the spreading of technical progress and with rapidly rising productivity and incomes in European agriculture.

More recently there have been important changes, notably in the course of the 1980's, in the general orientation of agricultural development. The economic and social situation of the agricultural population is increasingly an integral part of the problems affecting the national economy as a whole and therefore has to take into account regional development trends, environmental aspects as well as markets and trade both at national and international levels in an ever more integrating European continent.

The work on these kinds of problems is concentrated in the joint FAO/ECE Working Party mentioned before. It was already mentioned today that part-time farming is an important feature of Austrian agriculture. The Working Party has noted for more than ten years now that the income situation of the European farmers requires the widest possible range of non-agricultural sources. It has also identified the organization of symposia as the most efficient means for an in-depth discussion of selected specific developments or concepts in order to offer practice-oriented policy concepts to the member governments.

Therefore, two symposia were organized so far in the course of the 1980's, i.e. one on agriculture and tourism in Poland. Here I may add a reference to the last session of the Working Party which was held in the Netherlands in 1990 and which dealt in particular with the impact of new environmental legislation on agrarian structures and farm management. Those meetings proved highly interesting and productive, also because they were organized in member states which could show many practical examples and facets of the theme discussed.

We are therefore extremely grateful to the Austrian hosts, and more particularly to our hosts here in Styria, for offering to us the valuable possibility to deal with another specific field of growing importance, i.e. the use of agricultural land for non-food purposes. Here I should like to add a personal observation. Two years ago I participated in the city of Graz in the annual meeting of the European Confederation for Agriculture (CEA), the professional international organization of the farmers' unions of most European countries. This meeting devoted also special discussions to the possibilities of using surplus food as industrial raw materials and sources of energy. In these discussions, the farmer representatives were insisting that this be the case at the high price levels prevailing for food in Europe and I tried to warn against such an illusion. I think it is absolutely necessary that these new developments are as far as possible market oriented in order to ensure competitive prices to the European industry which has to compete for its final products on the world market. May I therefore express the wish that the discussions at this symposium also deal with the economic aspects of the various technical solutions and alternatives which will be presented.

Concluding my introductory remarks, I should also like to stress the great importance of limiting the time of presentation of each paper in order to leave enough time for questions and discussion as an essential element for the success of a symposium. I should also like to express my thanks to the Austrian organizers for their declared intention to publish the proceedings of this meeting for a general access to this interesting material. I wish you a fruitful meeting.

I. REPORT OF THE SYMPOSIUM

INTRODUCTION

1. At the invitation of the Austrian authorities, the Symposium was held from 3 to 8 June 1991 in Graz, Styria, and was attended by about 50 experts representing governments, universities, research institutes, enterprises and producers' organizations of the following countries: Austria, Czechoslovakia, Denmark, Finland, Germany, Hungary, Italy, Netherlands, Poland, Portugal, Sweden, Switzerland and the Union of Soviet Socialist Republics. Israel attended under Article 11 of the ECE's Terms of Reference. A representative of the following intergovernmental organization was also in attendance: Council of Europe.

2. The Symposium was opened by Dr. H. Kopetz, Director of the Chamber for Agriculture and Forestry in Styria, Mr. H. Schaller, member of the Government of Styria and by Mr. H Alfons, Director of the Federal Institute of Agricultural Economics representing Dr. F. Fischler, Federal Minister for Agriculture and Forestry of Austria.

ADOPTION OF THE AGENDA

3. The provisional programme, together with a detailed timetable prepared by the Austrian hosts for the final programme, was adopted (AGRI/SEM.29/1).

ELECTION OF OFFICERS

4. Mr. Hans Alfons (Austria) was elected Chairman and Mr. Ilkka Vainio-Mattila (Finland) ewas elected Vice-Chairman of the Symposium.

THE PROGRAMME

5. The papers of the following authors were presented at the Symposium, each presentation being followed by a discussion:

   Mr. P. MARTYKAN, Czech Institute of Agrarian Economics, Prague/Czechoslovakia; Ms. B. FRANDSEN, Danish agricultural Council, Copenhagen and Mr. Ch. KJØLLER, Bioraf - Danmark, Gudhjem/Denmark; Mr. R.M. NIEMI, National Board of Agriculture, Helsinki/Finland; Mr. I. VAINIO-MATTILA, Ministry of

Agriculture and Forestry, Helsinki/Finland; Mr. M. KÖNIG, Federal Ministry of Food, Agriculture and Forestry, Bonn/Germany; Mr. H. MEYER zu DREWER, Federal Ministry of Food, Agriculture and Forestry, Bonn/Germany; Mr. S. LANNER, Council of Europe, Strasbourg/France; Mrs. H. PIRRINGER, Federal Institute of Agricultural Economics, Vienna/Austria; Mr. G. PELZMANN, Styrian State Board of Agriculture and Forestry, Graz/Austria; Mr. E. UNTEREGGER, Styrian State Board of Agriculture and Forestry, Graz/Austria; Mr. K.-F. THÖNE, Federal Ministry of Food, Agriculture and Forestry, Bonn/Germany; Messrs. L. CSETE and L. DORGAI, Research Institute of Agricultural Economics, Budapest/Hungary; Mr. M. COHEN, Ministry of Agriculture, Tel Aviv/Israel; Mr. G. BARBERO, University "La Sapienza" and INEA, Rome/Italy; Messrs. J.Th.C. de JONG, G.G. van LEUWEN, H.R. OOSTERVELD and J. de VOS, Ministry of Agriculture, Nature Management and Fisheries, The Hague/Netherlands; Messrs. E. OTOLINSKI and W. MUSIAŁ, Agricultural University, Cracow/Poland; Mr. E. BRASCH, National Board of Agriculture, Jönköping/Sweden; Mr. H.W. POPP, Federal Ministry of Agriculture, Bern/Switzerland; Mr. E. MEISTER, Swiss Federal Research Station for Agronomy, Zürich/Switzerland; Mr. A.B. SOSKIEV, V.I. Lenin All-Union Agricultural Academy, Moscow/USSR.

6. Mr. C. COSTA (Portugal) presented the specific problems of Portuguese agriculture. The reports prepared by Messrs. J. F. BOUDY (France), M. SVATOŠ (Czechoslovakia) and S. SOMOGYI, (Yugoslavia) were also available but not discussed due to the absence of the rapporteurs. The exchange of experience among national experts was facilitated by a poster exhibition organized on the premises of the meeting place. Representatives of companies and organizations from Austria and abroad active in research, development and application of renewable raw material and energy resources made introductions to their poster presentations. The poster session covered a wide range of relevant issues and practical applications related to the topic of the Symposium.

STUDY TOURS

7. The Symposium was supplemented by two full-day excursions to different regions in Styria. During these technical visits, the participants of the Symposium had an excellent opportunity to acquaint themselves with the development and

some of the special characteristics of renewable energy production and utilization in Austria. Also units active in other alternative sectors of non-food use of land (fibre plant growing, specialized horse breeding and leisure activities) were visited. In addition to the valuable technical information, some of the visits offered also special impressions of the rural landscape for the visitors. The participants of the Symposium expressed their high appreciation to the Austrian hosts for their considerable efforts and hospitality to make the Symposium a fruitful meeting.

USE OF AGRICULTURAL LAND FOR NON-FOOD PURPOSES

BACKGROUND

8. As a result of the overall economic and social development, in general, and the considerable achievements in agricultural and food production, in particular, the European region seemed to arrive at a stage where fundamental changes are expected to occur to rural and agricultural policies. Ever increasing agricultural productivity, saturated markets at a considerable level of food consumption even in several central and eastern European countries as well as declining demographic trends are expected to prevail also in the future. Several hundred thousand hectares of arable land are becoming surplus agricultural land even in relatively small countries of Europe. Hence, the FAO/ECE Working Party on Agrarian Structure and Farm Rationalization has been making efforts to include in its programme of work those activities which seem to offer promising possibilities for alternative uses of agricultural resources and for additional incomes for the rural population. Thus, after the symposia on <u>farm tourism</u> (Finland, 1982) and on <u>fish farming</u> (Poland, 1988), this time the trends and prospects of the <u>non-food use</u> of agricultural land were the subject of an in-depth discussion. The reports presented at the symposium were based on the rather different socio-economic conditions and experiences of the participating countries. One part of the reports covered all relevant areas of non-food use of agricultural land while others concentrated on one or a few specific aspects of the issue.

RENEWABLE RAW MATERIALS AND SOURCES OF ENERGY

9. Industry has traditionally been relying on agriculture for a large number of raw materials such as e.g. starch, su-

gar, natural fibres, cellulose, natural oils and fats and protein for the manufacture of a very wide range of end products. In addition, agriculture has also been an important source of energy supply, not least for the sector itself. However, this reliance seemed to weaken with the appearance of at first cheap fossil raw materials and fuels. Their rising costs, the uncertainties of their supply, environmental damages connected with their use, and changing consumer attitudes on the one hand, as well as the appearance of surplus arable land, the growing need for natural raw materials and the advance of processing technologies re-oriented the interest towards renewable raw materials and energy sources. In the utilization of renewable raw materials, the current main trends included the development of new processes and products from the existing material base and also the breeding of new plants with a higher usable raw materials content for direct application by industries.

10. Regarding renewable energy sources, the considerable energy potential of biomass production, and the low emission potential of its use (soot, HC, SO_2 and CO_2 fixation) were emphasized. Biodegradable plastics, bio-ethanol and biomass for energy as well as the multiple utilization of rape oil both as raw material and energy source were reportedly at the centre of research and development efforts. In addition to feasibility studies and plans under way (e.g. in Italy and Switzerland) in these areas, there were already several small and large-scale (pilot) plants in operation in a few countries (e.g. Austria, Denmark, Finland, Germany, Sweden). Starch and various fibre plants, medicinal herbs and aromatic plants were also listed under agricultural products with promising prospects for non-food utilization by the paper, building material, chemical and pharmaceutical industries. The papers from Denmark reported on an international project to set up a pilot plant for a so-called whole-crop biorefinery. It would offer the possibility for an integrated technological and economic evaluation of a total utilization of raw materials.

11. It was underlined that at the present stage, many applications of renewable raw materials and energy sources are unprofitable as compared to competing products and processes by economic standards currently in use which are not taking into account external effects and costs. In a few

countries with large-scale farms, poor profitability had been improved by adopting a wide range of non-agricultural activities, which dampened the interest in such renewable resources. It was pointed out, however, that an overall cost-benefit analysis ougth to be applied which would take into account new trends and perspectives. In this context the following elements were mentioned as being of importance in the long run: rising total demand for new materials, increasing awareness of environmental effects and higher prices for fossil energy. Currently high prices for agricultural land were identified as an important obstacle to the development of non-food uses of agricultural land. However, the investments needed in basic and applied research, in process technology and marketing infrastructure for a large-scale utilization of renewable sources of energy were regarded as being substantial. In several cases, best middle-term economic and marketing chances were given to plant oils, starch, some plant fibres and medicinal herbs in non-food utilization.

12. Several reports emphasized that goverment policies should aim at improving the general conditions for the cultivation and use of renewable raw materials and energy sources. Such products should receive the same treatment in agricultural policies as food products do. However, the cost of such a policy should be lower than that of other surplus-reducing measures. The long-term objective was identified by one report as achieving the economic feasibility of non-food use of such resources without the need for aid from public funds. Government support should go in the first place to the relevant research activities, demonstration projects, market research, the initial phase of first application, its ecologic soundness and to technical information. Since the use of bio-based products is also important for working conditions, addressing labour unions and companies would be an important means for the development of non-food products. It was noted with interest that Italy banned the use of non-biodegradable plastics as from 1991; carbon dioxide in fossil fuels was taxed in Sweden as from January 1991; Austria prohibited the use of mineral based lubricants in chain saws in favour of rape oil as from May 1992; and in Germany, forests belonging to communities, Länder and the state, the exclusive use of biodegradable lubricants have been stipulated since 1990.

SET-ASIDE OF AGRICULTURAL LAND

13. Growing agricultural surplus induced national measures aiming at taking out arable land from production since the late 60's (e.g. in Finland the land reserve programme between 1969 and 1989, and green fallowing programmes in Finland since 1977 and in Austria since 1987). The European Community has had a set-aside scheme since 1988. In discussing the application of the scheme in Germany and Italy it was stressed that its overall effects could not offset the annual increment of production. At the given level of producer prices, the premia paid for set-aside did not seem too attractive to producers on high quality soils (except in the new Bundesländer of Germany). Moreover, it was noted that permanent fallowing might run against farm efficiency by taking out land and leaving the other production factors (capital and labour) in surplus.

14. Hence, the recent trend in policies was directed towards combining set-aside with non-agricultural or non-food production in several countries (e.g. in the EC cultivation of cereals for non-food purposes or afforestation). Under this arrangement, producers were entitled to a reduced (e.g. 70 per cent) set-aside grant per hectare. The need to include also energy plants into such a regulation was emphasized by one report. Another report gave clear preference to non-food production and afforestation on surplus arable land against fallowing schemes. During the discussion it was pointed out that large-scale fallowing programmes (induced e.g. by a supposed fall in producer prices) might lead to heavy claims on the agricultural budgets and to ecologic problems. A report from Finland informed on a new regulation under which fallowing 15 per cent of arable land was quasi-compulsory in 1991, however, fallow land could be used for grazing sheep and for growing industrial plants.

CONSERVATION AND PROTECTION OF NATURE

15. Several reports and the discussions revealed that environmental considerations became more and more relevant in agricultural policies. This seemed to confirm the conclusions of the 10th session of the FAO/ECE Working Party on Agrarian Structure and Farm Rationalization (Wageningen, Netherlands, 1990) according to which environmental considerations would have an economic price and also structural

consequences in agriculture. Reclamations of land from natural areas were negligible in the Netherlands after 1950 or made unprofitable in Finland since 1987. The total area of natural reserves was increasing in many countries. This also indicated the trend that with a diminishing need for land for food production purposes, possibilities were widening to allocate land for other uses such as physical planning (e.g. in Austria, Germany) integrated rural development and specific village development in order to achieve regional economic multiplier and higher quality of life for the farmers themselves (e.g. in Israel).

16. More recently, specific targeted measures were appearing to reinforce the conservation policy. In several countries, direct legislation was introduced to control the use of insecticides, pesticides, fertilizers and the manure problem (e.g. in Austria, Denmark, Finland, Italy, Netherlands, Sweden, Switzerland). The report from the Netherlands and Sweden informed on the system of nature management contracts allowing farmers to adapt their farming methods to the values of nature and landscape against a compensation of lost income. Such an agreement could also serve as a transitional measure to a complete withdrawal of an area from agricultural use in order to convert it into a nature reserve. Specific maintenance agreements were aiming at preserving and restoring characteristic elements (hedges, copses, pounds, etc.) of the natural landscape. In several countries, the area under such arrangements was expected to grow in the future and similar concepts were under consideration in Switzerland.

<u>RECREATION AND LEISURE ACTIVITIES</u>

17. The reports and the discussions revealed the current marginal impact of such activities on the non-food use of agricultural land. It was pointed out, however, that the sector had a certain growth potential for the future, particularly along coastal and wooded areas, rivers and around towns. Providing camping sites on the farm and the direct sale of some basic farm products to tourists (e.g. eggs, fruits, cheese) did not require high investments and ensured additional incomes. The establishment of riding facilities and particularly of golf courses was regarded as costly investments for family farms. The reports from France and Hungary attributed excellent economic prospects to game husbandry for hunting provided that the activities

were carried out at a high professional level. In fact, in the latter country, this activity relying on large-scale farms of game husbandry had been a net currency earner for many years.

AFFORESTATION

18. In several European countries, afforestation was seen as one of the most important ways to an alternative use of excess arable land (e.g. in Czechoslovakia, Finland and Hungary) and the activity was supported by government subsidies. In some countries, the rate of afforestation had been quite high (e.g. Austria, Hungary). In certain countries afforestation was preferred for domestic timber production offering also additional employment in primary and secondary processing (e.g. in Finland). Besides some further advantages of new afforestation (e.g. ecologic, distribution of labour), some negative effects on the surrounding fields (e.g. shade, yield decrease) were also noted. A report from Austria pointed out that forestry profit contribution per hectare was lower, however, profit contribution per man-hour was higher than in other branches. It was underlined that on high quality soil, afforestation could not offer a viable economic alternative to producers.

19. The issue of energy costs had repeatedly directed the interest towards energy forestry on former arable land in some countries, with Austria pursuing such a programme since 1980. Energy production from wood relied on short rotation forests using rapidly growing species (e.g. willow and poplar) to obtain a high yield of biomass to be burnt in chipped form in special stoves. The reports from Austria mentioned 1071 heating projects up to 1990 and successful growing tests were carried out in Denmark by utilizing sludge and sewage for higher dry matter yields. Investigations were concentrating on important factors influencing economic efficiency like the cycle of cultivation, cultivation length and biomass yield. It was pointed out that under current Austrian conditions (price for chips and subsidies paid) energy forestry was not profitable for farmers. Hence, this alternative activity could be recommended only to units farming under special conditions and otherwise achieving low to medium yields in other branches. High labour intensity of planting and harvesting, drying of chipped wood as well as improved burning

systems were identified as the main problems to be solved for getting better economic results. The report from Hungary informed on good economic results obtained in a forestry energy project based on acacia.

20. With respect to policy, afforestation of surplus arable land (particularly of marginal quality) was expected to be stepped up and supported by state subsidies in many countries. The targets included and annual afforestation rate of e.g. 2,000 to 20,000 hectares (Austria and Finland, respectively) or even 800,000 hectares as the long-term aim in the case of Hungary.

CONCLUSIONS

21. As an overall conclusion, it was noted during the discussions that:

- At the present state of European agricultural production and food markets, the various directions of non-food use should be paid more attention at all levels of management in order to help the farming community carry out the necessary structural changes, maintain productive activities and social values of rural areas and preserve the natural environment;

- Such a transformation should be carried out on an economically sound basis. Production based on renewable resources has many advantages. It reduces the dependence on nuclear and fossil energy sources, supplies industries and consumers with biodegradable raw materials and lowers emissions. Production is not competitive economically as long as the external effect and costs are not taken into account;

- Hence, agricultural policies were attributed a decisive importance in furthering non-food use of agricultural land. While such policies should be less expensive than the disposal of agricultural surpluses, environmentally sound non-food options should be offered a clear economic incentive. The cultivation of renewable raw materials and energy crops and afforestation of former arable land should receive a similar treatment in agricultural policies as food and feed production. Competitiveness in the utilization of these resources could only be achieved on the basis of stable contractual relations between agricultural producers, traders, processors and manufacturers;

- Set-aside schemes alone were generally considered as transitionary measures and should preferably be connected to some productive, ecologically sound, non-food activities which correspond well to local conditions and opportunities as well as to new market trends. This should help to maintain optimum relations among the existing production factors and to prevent new ecologic problems. In the future, the use of agricultural land should better meet the more general needs of the whole society for a better quality of life.

- Government policies were expected to support more technical research in the primary, processing and marketing stages of the agricultural non-food sector. Similarly, a decisive role was expected from the state in information, training and extension service with respect to non-food utilization of agricultural land.

- It was also pointed out that the increasing diversification in the use of agricultural land away from food production would, at the same time, make a useful contribution to reducing the pressures of subsidized surplus food products on the international markets.

22. The participants of the Symposium considered the material presented and the discussions to be of high topical interest. It was noted with satisfaction that the Austrian hosts would publish the complete proceedings of the Symposium for wider distribution.

<u>OTHER BUSINESS</u>

23. The delegation of the USSR announced the opening of an international competition called "AGROMODEL - 2000" and organized under the auspices of the State Committee of the USSR on Science and Technology and of the All-Union Academy of Agricultural Sciences. The purpose of the competition was to attract international co-operation on a contractual basis in order to solve the actual development tasks of the Soviet agricultural-food sector at the national, regional and farm unit levels in its process towards a market based economy. Project proposals to a

wide range of development problems were invited to be sent before 1 October 1991 to The State Committee for Science and Technolgy, Tverskaya Street 11, 103905 Moscow, USSR. Telex: 41354 DMNTS SU or the All-Union Academy of Agricultural Sciences, B. Kharitonyevskij per., 21, 1014 Moscow, USSR.

ADOPTION OF THE REPORT

24. The Symposium adopted the present report.

II. REPORTS RAPPORTS Доклады BERICHTE

EUROPEAN AGRICULTURE AS A SUPPLIER OF RAW MATERIALS AND ENERGY TO INDUSTRY

S. Lanner, Strasbourg

I. INTRODUCTION

In September 1988 the Parliamentary Assembly of the Council of Europe organised a Conference in Munich on the theme "European Agriculture as an Industrial Supplier - A Way Out of the Crisis?". About 200 representatives of political life, industry, agriculture and research in Europe and beyond essentielly debated, during two intensive days, whether the question mark in the title of the Conference was justified or, if not, what type of punctuation should replace it. In other words, could the theme of the Conference be realised in the medium-term?

It is fair to say that the verdict of this impressive jury came out overwhelmingly in favour of deleting the question mark and replacing it with a highly affirmative exclamation mark. European agriculture has a considerable, as yet untapped potential in supplying dependable, price-competitive, high-quality raw materials to a whole set of industries. It can also produce energy, both for itself and for other sectors of the economy. But, it concluded by saying: time is short. Everyone has to act together, now, and with courage if we want this to happen, if we do not want irreparable harm to be done to our farming community, to our rural areas, to our environment and to the European edifice that we are trying jointly to construct.

II. AGRICULTURE: MORE THAN "FOOD CULTURE"

Why is it that we politicians so stubbornly tend to regard agriculture as being there only to produce food? Is it because of the food scarcity throughout much of our history, or the admittedly dramatic experience of the years during and immediately after the Second world war when food was scarce and even starvation reigned? Or is it because we are caught in systems, be it the Common Agricultural Policy of the European Community or similar once in other Council of Europe member states, which have become too gigantic, too bureaucratic for us even to contemplate altering them?

The agricultural policies we adopted in the post-war years, and which have remained essentielly unchanged up until the present day, have stimulated food production at all cost, even as markets, be they at home or abroad, did not want them. Who could reproach our farmers for using every last acre of their land, even that which under normal circumstances would never have been considered, since they received linear price guarantees, that is, the same remuneration, for every unit produced, even for unsaleable surpluses. Can we hold it against them that they allied themselves with producers of artificial fertilisers and pesticides, with research laboratories, in the development of more and more productive strains of plant and animals, and as they tapped the entire potential of their land in order to cover constantly rising costs?

I certainly do not wish to criticise the policies of those crucial post-war years, nor those who put them into practice. They helped eradicate hunger and the age-old European insufficiency in food production. However, systems must adapt to changing circumstances if they are to continue to be useful, and our agricultural policies must wrestle themselves free from the suffocating grip of their own success. For we are, and have been for a considerable time, producing too much food, with too much money wasted as we try to store and market it. We have large amounts of food that we cannot consume, and cannot sell to others except through ruinous export subsidies, which in themselves distort trade among nations and make nil the efforts of developing countries to promote their own agriculture.

In fact, the Munich Conference concluded that agricultural policies in Europe will not - to the extent that they are oriented exclusively towards food production and characterised by overproduction and inflexible price policies - be capable of sustaining a sufficient income for farmers. The social life of villages and the countryside in general thereby risks undergoing further deterioration, not to speak of the environment, as we shall see later.

Nor are things likely to improve in the future either, if present policies are pursued, considering 1. yearly productivity increases in the agricultural sector of about 2 %, 2. a week increase in demand in Europe, only about 0.5 % per year, and 3. likely future decreases in the population of Council of Europe member states.

It seems convenient at this stage to recall that agriculture did not always concentrate so exclusively on food producition. Before the mechanisation of European agriculture started on a large-scale in the 1950s, about 20 % of the arable land was used to produce the energy needed by the sector itself, for instance to feed horses and oxen. Since mechanisation rendered draught animals largely unnecessary, this area has been used for food production instead.

Furthermore, until the advent of fossil fuels, a large part of the raw materials used by the chemical, dying and packaging industries came from renewable raw materials. A whole science and economic activity that could have helped us immeasurably today was abandoned and forgotten in the process.

Who, today, remembers that the French Parliament in 1923, half a century ahead of its time, obliged oil importers to mix 10 % to 20 % agriculturally produced alcohol to petroleum? In 1937, 2.5 million hectolitres of agricultural bio-ethanol were used in this way. The law was only abrogated in 1974, paradoxically enough at the height of the first oil crisis.

The last point illustrates a dilemma for those who want to bring about change in the direction indicated. They have a host of established interests to contend with, not least in the oil industry and in oil-producing countries, who are afraid of losing even the slightest share of their markets. This should not deter us, however, for we are fighting for the good of society as a whole, and in particular for the survival of rural areas.

Let me add to these points a comment on the set-aside programmes introduced to decrease surplus production of food. Our Assembly in a recent report specifically asked member governments and the Commission of the European Community for favour non-food production on this land, afforestation and the use of environmentally-friendly and less intensive techniques. We do not believe that it is a solution for rural regions in Europe that some of their farmers receive direct payment for letting their land lay idle.

III. SUPPLYING THE CHEMICAL, COLOURING, PACKAGING, TEXTILE AND OTHER INDUSTRIES

In spite of the neglect of renewable raw materials referred to above the list of agricultural products already used by industry as raw materials is impressive. It serves both as a refutal to those who say agriculture cannot perform such a role, and as an illustration as to what can be done in the future if the right encouragement is provided. The raw material in question include starch, sugar, cellulose, oils, fats and proteins, and the industries those of chemistry, pharmaceutics, cosmetics, textiles, packaging, paper and cardboard.

In fact, nine per cent of the molasses, eight per cent of the harvests of wheat and maize and thirty per cent of the fats produced by European agriculture are taken care of by industry. In the year 2000 Europe's chemical industry is expected to utilise 550 thousand tons of sugar, 2.6 million tons of starch and 3.5 million tons of fats. In 2020 about thirty per cent of the raw materials for the chemical industry in the United States are expected to come from farming.

The wide variety of products in which agricultural raw materials can be used is equally impressive. Starch, for instance, is imployed as a raw material in over 500 products, including plastics, where it is particularly appreciated because of its bio-degradability.

Apart from this form of starch (amylopectin), another type of starch molecule, amylose, was highlighted at the Conference. It can be used in plastics, colouring materials, acrylic chemistry and as biodegradable packaging material, for instance in plastic bags. It is heartening to note that Italy has banned all non-biodegradable plastic packaging materials.

Of natural oils and fats in Western Europe, about 60 % (6.8 million tons) come from plants. Of this about 15 % is used in industry (the rest going mainly to food and animal feed). The industrial applications are approximately as follows:

- washing, cleaning and cosmetic products (40 %);
- plastics, softening agents (22 %);
- colours (13 %);

- food (11 %);
- metal processing, flotation, lubricants (11 %);
- other (2 %).

It should be noted, however, that European agriculture supplies only an insignificant portion of the oils and fats needed by industry. The overwhelming part comes from tropical countries. We fully realise that a great many developing countries depend to an important degree on their exports of commodities like natural oils and fats to European industry. To the extend that if they were to suffer economically because of rising competition from a European agriculture increasingly geared to non-food production, alternative solutions will, and can, surely be found. One area in which European experiences could be valuable is the genetic development of plants which could provide an easilly accessible, decentralised source of energy or raw materials for nascent industries in the Third World, thus easing their often pronounced dependency on imports of petroleum and other products. Furthermore, if the industries concerned can be persuaded to use more renewable materials, than there will be place both for Third World and European agriculture as suppliers.

The use and potential of various fibre plants were also discussed at the Conference. Whereas in the last few decades materials such as flax, and hemp lost out to chemical fibres, they now have a possibility of a revival. In France, Belgium, the Netherlands, Sweden and other countries, a certain flax production was always maintained, whereas in, for instance, the Federal Republic of Germany it was left virtually to disappear.

Still, because of a recent increase in demand by the textile as well as other industries, the need for natural fibres will grow. As a result, large areas could be used for flax production. Flax is used not only in the textile industry. Other industries use various parts of the plant for: car interiors, substitutes for asbestos, cement fibre boards, other construction materials, filters and insulation products. Natural instance, be considered a priority for us to substitute flax for asbestos as urgently as possible. Environmental considerations, which were so emphasised at the Conferece, do not stop at what damages nature, but includes what harms man. If the suffering caused to those thousands of workers in our countries who suffer from asbestosis can be avoided, then no effort or cost should be spared to achieve it. Whether hemp, which can no longer be grown in many countries because of the abuse of cannabis, can serve as a widely used raw material is a question which has to be examined without prejudice. Needless to say drug abuse must in that case be prevented.

The above account is not meant to be exhaustive, but merely points to the considerable potential of agriculturally reproduced raw materials in a large variety of industrial branches. The Conference repeatedly stressed the advantages of such products over carbon sources. They are renewable. The supply can adapt itself - through crop rotation and plant development - to changing requirements by industry as regards quality and composition. Finally, industry is in a position to widen its range of supply sources and thus become less vulnerable to cut-offs or price increases in traditional supply lines.

Yet the Conference did not gloss over the indubitable problems that exist. Some are of an environmental nature, such as when undesired waste products result from treatment processes. Others are economic, in that traditional raw materials are often cheaper than those produced by agriculture, especially if the latter are not given sufficient financial support in the beginning. Others again are of a logistic kind, requiring new systems of collection and transport.

However the participants remained confident that all the existing problems can be solved given the right kind of cooperation among industry, farmers and research institutions. The political authorities in this regard have the important role of providing the necessary framework for this to happen, that is, to supply financial, legislative and infrastructure support. More particularly, the representatives of industry stated their positive attitude and their very specific requirements. The Conference in this context saw the new arrangements within the European Community for agriculturally produced starch and sugar as encouraging, in that they allow for steadily growing outlet possibilities to industries for that product.

One concern of the industrial representatives was that agriculture should demand less that industry buy existing commodities - which are essentially grown for nutritional purposes - and that it should instead reflect more on ways to develop industrial crops tailored to chemical demand. By way of example, chemistry is not looking and paying for rape seed oil per se, but for erucic acid. If by-products of lower value are too much present they wreck the economic side of the equation and may cause environmental problems.

On the one hand, industry will not engage in charity vis-à-vis agriculture. Just like any sector it will look for the most economic supply sources. On the other hand it will want to co-operate with agriculture to develop industrial crops - even in times of low crude oil prices (even though the interest will of course grow as oil prices rise).

There was even a sort of threat implied by the representatives of industry, to the effect that, unless European agriculture ceases its excessive concentration on food crops and starts offering interesting non-food renewable raw materials, then industry may well have to leave Europe for more southern latitudes where such materials are more readily available. In other word, Europe's agriculture had better wake up, or it may find no industrial partner - and no market at the receiving end.

Research must thus be oriented so as to create improved plant varieties of a kind satisfying often stringent industrial demands (a long-haul effort in itself) - varieties that can be directly used by industry (that is, without first having to be broken down into basic chemicals and transformed). In the case of starch, to mention just one example, the goal is to develop plants high in amylose, such as 'high-amylose maize' or special pea varieties; or plant oil through the cultivation of the spurge plant (Euphorbia Lathyris).

Furthermore, the proportion of raw material actually used (in proportion to the total biomass supplied) must be high. For example, oleic acid, which can be obtained from the previously mentioned spurge plant (Euphorbia Lathyris) can be used directly - that is, without chemical transformation - to over 80 % by the industry concerned.

Industry for its part must ensure that its present and future requirements of renewable raw materials are properly assessed, and should maintain close links with farmers so that the latter can be persuaded to grow the crops in question - and be certain to find long-term outlets for them. Environmental concerns must also be given high priority. Thus, biomass should be produced using as little fertilisers and pesticides as possible, and varieties should be chosen which do not add to soil erosion or water pollution.

IV. ENERGY

The Gulf crisis prompted the Committee on Agriculture to organise a Hearing on the contribution of agriculture to enhancing energy security. The findings of this Hearing, which will take place on 7 May 1991, will be reported to participants at the Symposium.

The potential of biomass production is considerable. In the European Community alone it is calculated that 20 million hectares of agricultural land and 10-20 million hectares of marginal land are likely to become available for biomass production in ten years time. When adding the biomass from agricultural residues and biomass from refuse, the potential production would be about 950 million tons dry matter per year which corresponds to roughly 400 million tons oil equivalent per year. This can be compared to the crude oil consumption in the European Community in 1989 which was 462 million tons oil equivalent per year. With a net energy conversion efficiency of 75 % the biomass production would correspond to an energy production of 6 million barrels per day. The production quota for Iraq and Koweit for 1989 was 4.6 million barrels per day and the total production in the North Sea was 3.6 million barrels per day in 1989.

The Commission of the European Community has calculated the cost of different types of energy products. Without going into any detail, it might be of interest to cite the cost of one barrel bio-crude oil which would be 13 US $ when the cost of desulphurisation and other costs linked to fossil fuel use have been substracted. Production costs for electricity have been calculated to be in the area of 0.04 to 0.06 ECU/kWh depending on the system. The production cost of bio-methanol and bio-ethanol has been calculated to be respectively 0.27 and 0.30 ECU/litre.

There are several algae, tree and plant species well suited for such biomass production in Europe. Eucalyptus, poplar, sweet sorghum and Jerusalem artichoke are all well known but other new species should be studied. Bio-engineering techniques offer interesting possibilities for the improvement of biomass productivity at reduced costs.

The present main biomass conversion processes - bio-chemical conversion, thermo-chemical conversion and digestion - can certainly also be improved.

A well-known example of the use of biomass for energy purposes has been the brazilian experience of using bio-ethanol in vehicles. At the time of the Munich Conference the production amounted to over 200,000 barrels per day, corresponding to more than 25 % of the petrol consumption. It gave employment to over 800,000 people, of which close to 700,000 in agriculture. Eighty per cent of all new cars in Brazil run exclusively on "agro-alcohol". The problems encountered in the early phases of the "pro-alcohol" programme seem now to have been largely mastered.

It is clear from this example that the exploitation of Europe's biomass potential will create new employment opportunities, particularly in rural areas which will be a major social benefit. The effects will also be felt in the primary, secondary and tertiary sectors of the agricultural, industrial and energy industries.

Utilisation of biomass for energy and industry allows a significant quantity of hydrocarbons to be consumed without increasing CO_2 of the atmosphere, and thus makes a positive contribution to the greenhouse effect and to problems of "global change" as occurs in both industrialised and developing countries. Further advantages from utilisation of biomass include:

- liquid fuels produced from biomass contain no sulphur, thus avoiding SO_2 emissions, and also reducing the emission of NO_x;
- the production of compost as a soil conditioner avoids deterioration of soil and reduces pollution of waterways and ground water;
- improved agronomic practices and well managed biomass plantations will also provide bases for environmental improvement by helping to stabilise certain soils, avoiding desertification which is already occuring in the south of Europe, and reducing forest and bush wood fires that occur in the Mediterranean regions;
- modern bio-energy technologies and bio-fuels are relatively benign from an environmental viewpoint and produce very little pollution if burned correctly and completely. They

have negligible dileterious effects on air, land or water when using state of the art environmental control technology.

A further example from Austria illustrates potential benefits of biomass production. In the province of Steiermark, 22 farmers have grouped together in a project to produce rape to run tractors, feed cattle and heat buildings. One hectare's rape production gives enough energy to farm six hectares of land. The compressed rape cakes from that hectare replace 1,700 kilogrammes of imported soya bean fodder, while the remaining biomass makes 1,500 kilogrammes of heating oil superfluous. Assuming that rape could be grown on the 250 thousand hectares of land now used to produce Austria's surplus cereal production, this would make a considerable contribution toward reducing the country's overproduction in cereals, covering its oil bill. It would also replace 425 thousand tons of imported animal fodder (soya protein).

A new initiative for the production of organic fertiliser should also be mentioned. It is of primary importance for the fertility conversation of soils to allow the introduction of high yield crops. As far as nitrogen inputs are concerned (needs are around 60-300 kgs/ha), 2-3 years crop rotation will help to solve the problem by the adoption of high productivity N_2 fixing crops such as lucerne (alfa alfa), clover, soya etc. (able to fix nitrogen at a rate of 55-300 kgs/ha per year). Other contributions could derive through the recycling (after composting) of a portion (15 %) of biomass production and by the utilisation of specifically produced rhizobium (ie treefollee, leguminu sarum, lumini etc.).

Charcoal pellets and activated charcoal should also be mentioned in this context. Charcoal pellets for industrial use (metallurgy) are an interesting business because the price is double in comparison with energy; but very large amounts are needed. Activated charcoal has a small market, but a very high added value. This market is expanding very fast for pollution-control requirements.

V. THE NEED FOR POLITICAL COURAGE: SAVING FARMING, RURAL SOCIETY AND THE ENVIRONMENT

Rarely did the call for determined, courageous political action come out clearer than in Munich. Speaker after speaker

- were they from agriculture, industry or research - urged us politicians finally to take action arguing that otherwise nothing might happen at all.

All the above will cost money. However, these costs should be compared with those that Europe defrays with present agricultural policies, where in addition only a minor amount of the money spent actually benefits the farmers. We should not look at the expenditure on "renewables" as having to come on top of that of present agricultural budgets, but rather as a temporary investment necessary to achieve much more efficient, "leaner" agricultural policies. The net savings will be considerable, and, above all, they will benefit farmers rather than store-house architects and export middle-men. Society for its part must show solidarity with farmers during the period of change, seeing that the reforms will ultimately benefit all citizens through continued life in rural areas and a cleaner environment.

One term used at the Conference time and again was "lack of research". Political courage also applies here. We have to dare make investments - commensurate to agriculture's economic importance to society - in both basic and applied research, whether the latter concerns new plant varieties, new processes, or the economic viability of projects. The same holds for the major infrastructure improvements (including marketing organisations) and training programmes inside and outside agriculture, that will become necessary.

Environmental considerations were dominant at the Conference. Present agricultural policies may cause considerable damage to parts of our environment: excessive use of fertilisers choke up rivers and lakes by fanning vegetation, and saturate the ground with nitrates; natural manure has much the same effect and is becoming a source of genuine concern in several countries in northern Europe in particular. A reform of the Common Agricultural Policy toward a better balance between food and non-food production would reduce the above-mentioned environmental problems. At the same time it must of course be made sure that non-food production does not cause new problems to appear, for instance in the form of excessive waste products left over during processing. Efforts to develop crops that can be used directly and totally by industry should therefore be stepped up.

Renewable raw materials can bring considerable environmental improvements in the field of plastics. Our continent is virtually littered with non-biodegradable plastic bags and other packaging materials. However, these could long ago have been replaced by bio-degradable ones of agricultural origin. Italy's previously mentioned ban, as from 1991, of non-biodegradable plastics spell a new era of environmental consciousness in Europe. Indeed, if the same legislation were applied in all Council of Europe member states, say within a "grace period" of three to five years, then this would help our agriculture enormously in the reorientation we have been discussing. Within the European Community, the ECLAIR research programme should study this area as a matter of priority.

Renewable energy means infinite, clean energy in comparison with highly finite, polluting fossil fuel. We do not know when the world's oil will become extinct, whether in fifty, one hundred or two hundred years. But it is not fair to future generations to use it up as we please while leaving them nothing. At the same time we do them an injustice by burning it up on the present massive scale, causing harm to our environment.

Political courage will also mean standing up against sterile, ossified thinking, and against established economic interests. An ancient self-sarcastic German and Austrian bureaucratic maxim went as follows: "We've never done it! We won't do it! If we do it, everybody could get into it!". Always when new ideas appear, there is resistance from the comfortable, from those privileged by the status quo. It is the role of us politicians to point the way into the future at the turning points in our societies, to overcome the obstacles of bad will, inertia and ignorance. Europe's agriculture has reached the point where it can face the future with confidence, capable of producing both the food we need, and essential raw materials and energy.

Present laws and regulations, which serve to hamper the development of renewable energy and raw materials, should be replaced by flexible, non-discriminatory ones - or even, sometimes, laws that discriminate in their favour, for instance for the sake of saving the environment!

Our farmers, our industry, our researchers are eagerly waiting for a chance to channel their ideas and energy in true partnership. Our rural areas are ready for the challenge, for they know that their future is otherwise cast in the gravest jeopardy. Finally, our overburdened environment is in desperate need of the respite that a determined, ecologically sound effort to use renewable raw materials can provide. Now it is up to us politicians to seize the opportunity and change things for the better.

The Parliamentary Assembly of the Council of Europe has therefore recommended to the Committee of Ministers to invite the governments of member states:

I. to provide a general framework, at national as well as European level, within which agriculture is able to become an important supplier of renewable raw materials and energy, and where it can form a long-term, dependable partnership with industry and research;

II. to develop an overall plan for the furthering of renewable raw materials, in consultation with all the parties concerned (representatives of political life, agriculture, industry and research), and to put it into practice as soon as possible;

III. to ensure, for this purpose, sufficient long-term economic incentives to all the parties concerned - on the understanding that any initial financial assistance will soon become unnecessary as crops and processes are continously improving, and seeing that such assistance would at any rate be far less costly than, and far preferable to, present agricultural expenditure on, for instance, set-aside programmes, storage of surpluses and export subsidies;

IV. to provide the same financial support for arable land uses in "non-food" production as that given in set-aside programmes;

V. to promote infrastructure investments needed for the collection, transport and processing of agriculturally produced raw materials and energy;

VI. to commit industry, which has an important role in this regard, to provide as soon as possible appropriate technical solutions allowing the use of plant oil as a diesel substitute, for instance in the form of mass-produced engines and plant oil-processing plants;

VII. to encourage, financially where necessary, both basic and applied research into new, better adapted energy and industrial plant varieties, and to develop new products and processes;

VIII. to take every measure to ensure that the farming sector learns about the new plant varieties (professional training, actions at farm and branch level), and that corresponding marketing organisations are established which guarantee fair and appropriate prices to all the parties concerned;

IX. to start a host of widely spread pilot projects in every region, with the goal of speedily developing practical solutions which, although imperfect at first, can be continuously improved;

X. to make obligatory, as a matter of urgency and as an initial step, the use of biodegradable, agriculturally produced plastics for making bags and other packaging materials;

XI. to introduce, on a general scale, petrol containing between 3 % and 5 % bio-ethanol, as such a measure would reduce dependence on fossil fuel, protect the environment and provide a new production outlet for European agriculture;

XII. to use low-quality firewood and biomass more extensively as a source of energy and heating;

XIII. to replace the many laws and regulations which at present serve to hamper development of renewable energy and raw materials by flexible, non-discriminatory ones, or even, where necessary, to enact laws that discriminate in their favour, for the purpose of saving agriculture and the environment;

XIV. to examine whether the knowledge gained as regards renewable raw materials can also be used for the benefit of developing countries.

GERMAN POLICY ON RENEWABLE RAW MATERIALS MONITORING OF RECENT DEVELOPMENTS

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1. INTRODUCTION

The production and use of agricultural and forest products for and in the non-food sector - briefly called renewable raw materials - has a long tradition. It is still of some importance today, in the energy sector especially in less developed countries. Some examples may illustrate that:

- clothing of hides, wool and plant fibres
- fishing nets and sails of flax fibres
- plant or animal fats as lamp oils or lubricants
- paper of pulp and starch
- fuelwood
- biogas, especially of wastes
- alcohol of agricultural raw materials as fuel in Brazil or in the USA.

In many sectors agricultural raw materials were replaced by products from coal- and petro-chemistry. Two reasons were decisive for it:

1. Agriculture concentrated on feeding the fast-growing populations;
2. Coal and mineral oil seemed to be cheap and inexhaustible resources which can be used for many purposes.

Today, the raw material situation has changed:

- Agricultural products are - in Europe and in other developed countries - in plentiful supply.
- Fossil raw materials are going up in price and are not inexhaustible.
- The excessive use of fossil raw materials and the products derived of them entails many risks for the environment.

2. GENERAL CONDITIONS OF RENEWABLE RAW MATERIALS

2.1 The Common Agricultural Policy of The EC

The regulations of the Common Agricultural Policy refer to the production of agricultural raw materials for the non-food sector as well as to that for the food and feed sectors. Due to the higher domestic prices conditioned by that policy special regulations were developed for the use of sugar and starch in the non-food sector. The most important regulations in the EC are the following:

1. Market regime for fats

It regulates imports and exports, intervention and the granting of aids for olive oil and oilseeds. Oilseeds include rape and rapeseed, sunflower seeds and soybeans. Special market regime regulations exist for linseed and cotton seed. A consequence of these regulations is that all oilseeds are available to the user at world market prices. To enable farmers in the EC to produce and to market oilseeds against the competition of the world market, oilmills receive an aid from the EC budget for the processing of oilseeds produced in the EC. The aid is fixed as the difference between the target price fixed by the EC and the world market price. It amounted for example in November 1990 for rapeseed to 56 DM/dt. From the farmers's point of view it makes no difference where his rapeseed is used. The price is the same whether it is burned in engines or it is used as a food product. For oils which were not produced in the EC the user must pay a low customs duty (6 %). This applies for example to imported coconut palm oil.

2. EC sugar and starch regulation

Under EC Regulation 1009/86 in connection with Regulation 2169/86 sugar and starch are available for the use in the non-food sector at world market prices. To compensate for the cereal and/or sugar price difference between EC and world market the user of starch and/or sugar in the chemical-technical sector receives a production restitution. A production restitution is granted for sugar as well as for starches of maize, wheat, potatoes and rice. A list of the products favoured was drawn up which can be extended - for example when new products are developed in the non-food sector. This regulation was mainly set up to satisfy the needs of the industry which otherwise would have changed its locations of production.

3. Market regime for flax

It determines the aid for the cultivation of flax which consists of two components acreage aid and linseed aid. The cultivation of hemp also falls under this aid. Sales take place at market prices.

Compared to these annual plant products timber and timber products are not covered by any EC market regime regulations. Markets are practically liberalized. However, different measures exist, above all for the promotion of afforestation.

The description of the EC market regime regulations shows that the use in the chemical-technical sector can take place at world market prices. While the use in the energy sector - exept for the use of vegetable oil as diesel fuel substitute - is only possible at the high domestic agricultural prices.

With a new EC-Regulation to amend the set-aside regulation under which the cultivation of cereals only is so far possible for non-food purposes under specific conditions on half of the land set-aside at 70 % of the normal premium, the prduction for the energy sector is becoming more promising. As so far only ethanol production from cereals and the burning of whole cereal plants as well as the production for products not falling under the starch regulation or alternatively to it, are liable to promotion, the federal government strongly advocates that the cultivation of other plant species, above all those not falling under market regime regulations (example: C_4 plants like miscanthus) will also be included in the regulation.

2.2. Macroeconomic aspects

With a few exceptions renewable raw materials are competing with fossil resources like coal, mineral oil or natural gas. This also applies to the technical-chemical sector, even though agricultural raw materials could maintain their access to some important markets. The raw materials in question are starch, oils and fats as well as plant fibres (cotton). The reasons are the special characteristics of agricultural raw materials and partly also the higher acceptance by consumers of more favourable environmental effects. In view of the multiple interdependences and dependences of the different production patterns of chemistry it is not only a question of price, but above all a question of technical feasibility whether renewable raw materials can be used for individual processes or products. It seems rather necessary to set up or to intensify as in the case of oleochemistry a chemical industry oriented to natural materials with a view to increasing the sale of renewable raw materials to a considerable extent.

The situation is different in the energy sector, where renewable raw materials are competing directly with fossil energy sources. Renewable raw materials can be used as liquid and solid energy sources. Fig. 1 shows how world market prices developed for vegetable oils and mineral oil. The use of vegetable oil as diesel fuel substitute is unreasonable under economic aspects, as it requires additional public support. Other possibilities of supporting farmers' income have to be judged in a more favourable way under budgetary aspects.

3. USE AND CHANCES OF RENEWABLE RAW MATERIALS IN THE FEDERAL REPUBLIC OF GERMANY

Renewable raw materials account for about 10 % of the raw materials used by the German chemical industry. The two most important agricultural products are starch and vegetable oils; sugar, by comparison, is used to a very small extent only. The figures below only refer to the former Federal Republic of Germany. The data from the five new federal states are not sufficiently reliable. In detail, the following statements can be made:

- Sugar was chiefly used in 1988/89 at 28,000 t (federal territory) and 189,000 t (EC) for biotechnological purposes (production of antibiotics, vitamins and organic acids). There should be increases in use for the production of surfactants, vitamins, amino acids and biodegradable materials.

- Starch was chiefly used in 1988/89 at 506,000 t (federal territory) and 2,2 million t (EC) in the paper industry, in the textile sector and for biotechnological purposes. There should be increases in use above all in the paper industry because of its growth and because of ecological advantages as well as in the plastics industry for the production of biodegradable materials.

- While starch and sugar are almost entirely derived from domestic production, about two thirds of the almost 0.94 million t of vegetable oils and fats which were sold in the EC in 1989 in the non-food sector (federal territory 0.44 million t) were imported mostly from third countries. There is a wide range of uses as in the case of starch (inter alia, detergant auxiliaries, inks, synthetics, softening agents, lubricants, floor coverings). Sectors of growth are especially surfactants and lubricants. From domestic production are derived about 50,000 tons of rapeseed and small quantities of linseed.

- The cultivation of flax in 1990 covered an area of about 1,500 ha after its re-introduction a few years ago. Flax has been produced so far only in the traditional way pulling - retting - scutching. The development of new delignification techniques and methods for fibre separation aims at greatly reducing the high expenditure associated with the traditional method so that flax fibres can also be used in the non-textile sectors (e.g. to replace asbestos fibres) in an economical way. At time the three existing scutching factories have all economic difficulties.

- Compared to agricultural products timber assumes a special position, as the markets are practically liberalized for timber and timber products. Consumption in the federal territory in 1989 amounted to about 70.87 million m^3 (rawwood equivalent). The most significant increase in wood consumption is forecast for pulp. The large-scale technical application of newly developed pulp production methods is necessary to allow the increased use of domestic timber for pulp production.

More informative is the conversion of tonnages into area units (Tab. 1).

Estimates of the potential are connected with substantial uncertainties. The future possible cultivated area for flax is estimated to be very high which can, however, be attained only under specially favourable conditions. The potential for rapeseed oil in the lubricant sector might possibly be markedly higher.

Renewable raw materials are thus used in industry. There are good chances that their use will be expanded.

As regards the second big sector of renewable raw materials, the energy sector, three important sub-sectors are to be distinguished:

TABLE 1: Actual and potential uses of renewable raw materials in the chemical-technical sector (in ha)
Acreage 7.3 million ha

Product line	Present use	Potential[1)] (medium-term)
Starch	112,000	200,000
Sugar	5,000	10,000
Rape-seed oil	42,000	100,000
- of which as lubricants		
= Saw chain oil	6,000	8,000
= Lubricating grease/oil	4,000	15,000
= Hydraulic oil	3,000	12,000
- of which containing erucic acid	1,000	12,000
Linseed oil	700	40,000
Plan fibres (flax)	1,500	65,000
Medical plants	2,200	6,000
Total ha	166,400	424,000
% of acreage	2.3	5.8

1) According to data from different authors

1. the fermentation of carbohydrate-rich basic material to bioethanol; a large-scaled pilot plant in Ahausen-Eversen with a capacity of 100.000 t ethanol per year is not able to work economically;
2. the use of rapeseed oil as diesel fuel substitute; recently some demonstration projects have started which are also supported by the EC, mainly methylic ester of rapeseed-oil is used in busses for public transport, lorries and tractors;
3. the direct burning of biomass, e.g. whole cereal plants or C_4 grasses (miscanthus) for the production of heat or electric current; at time there arn't any large projects (more than 1 MW capacity) although many proposals are discussed.

For all three energetic uses of biomass applies that

- the energy balance is positive;
- the use is not interesting economically in view of the presently low prices of fossil energy sources;
- not all technical preconditions have been solved in an optimum way.

The latter applies to the production and use of bioethanol to a very limited extent only.

As a whole, biomass is only used for energetic purposes in demonstration projects if one ignores wood, wood residues etc. As only the energetic use of biomass, however, shows a sufficiently great area potential, a very broad public discussion on that sector is under way.

4. NATIONAL MEASURES TO PROMOTE RENEWABLE RAW MATERIALS

A coherent overall concept for the promotion of renewable raw materials has not yet been drawn up at the political level. A prerequisite for the promotion of renewable raw materials is that it may not burden the budget to a greater extent than other measures to reduce surplus production. Therefore, possible measures are measured by the expenditure on land set-aside which is between 700 and 1,416 DM/ha (average about 1,100 DM/ha; since July 1991 only 940 DM/ha for new areas set-aside). Under budgetary aspects, as Table 2 shows, all energetic uses are out of the question for direct promotion.

TABLE 2: Requirement for support of biogenic energy sources

	Bioethanol Sugar beet	Bioethanol Wheat	Vegetable oil (rape)	Burning of whole cereal plants
DM/l ethanol	0.93	0.99		
DM/l vegetable oil			1.87	
DM/l oil equivalent				0.35
DM/ha	4519	2483	2525	1680

Efforts are, however, being made to improve the general conditions for renewable raw materials. The following important initiatives were taken at the national level and within the EC - upon the urgent request of the federal government:

- A new EC regulation facilitates the cultivation of cereals for non-food purposes under certain conditions after adoption of the implementing regulation on retired land. The federal government presses for the cultivation of energy plants in particular to be included in the regulation.

- The German parliament passed an electricity supply bill which regulates in a satisfactory way the feeding of electric current of renewable energy sources, among which, of course biomass, into the network of public utilities.

- The federal government will make substantially more funds available for R & D as well as demonstration projects in the field of renewable resources. The present annual expenditure to the amount of about DM 50 million will increase in 1991 to about DM 69 million.

- The EC will also take part in demonstration projects to an increased extent. For the next four years 45 million ECU (about DM 90 million) will be made available for the launching of projects.

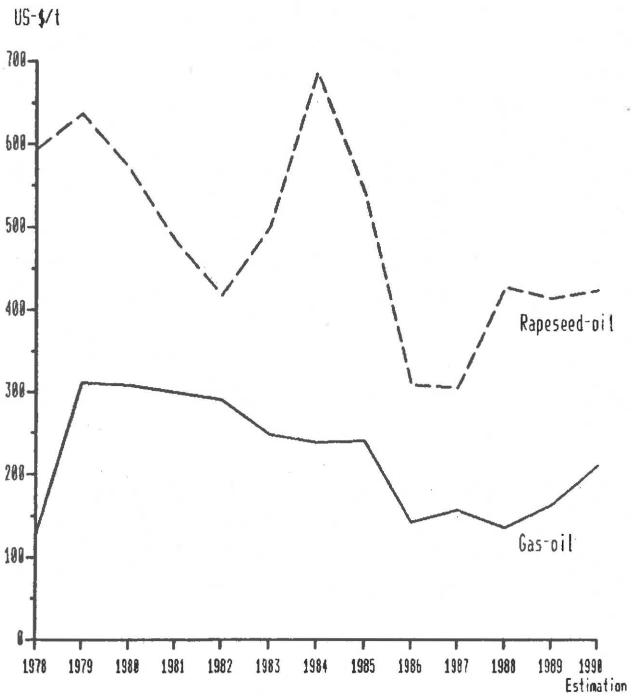
- The Market Structure Act which defines the establishment, recognition and promotion of agricultural producer groups and their associations was extended in the autumn of 1990. In the list of products for which producer groups can be established and recognized were included: kitchen herbs, soybeans, linseed and sunflower seed as well as plants, parts of plants, seed and fruit of species mainly used for the production of olfactory substances or medical purposes. Plant products for technical uses of energy production were also taken into account.

- In its targets for the waste sector the federal government has stated that "to facilitate or to improve the disposal of materials, also plastic materials have to be developed which can be composted in an environmentally compatible way owing to their biodegradability". Also the Packaging Ordinance adopted in November 1990 by the federal cabinet states that composting represents a disposal of materials. Consequently, degradable packing materials continue to have good chances of being introduced on the market to an increased extent.

- The federal government, in the framework of a cabinet decision for a national CO_2 reduction programme on climate protection, has initiated the examination whether a 5 % addition of ethanol to Otto fuels and a 10 % addition of rapeseed oil to Diesel fuels is possible.

The measures outlined show clearly that increased attention is being paid to renewable raw materials not least for ecological reasons. This means on the part of industry some innovative developments, for example degradable lubricants and plastic materials which offer favourable market chances. It will be necessary for the future that the cultivation of renewable raw materials should get the same support by the EC as the cultivation of food and fodder plants. If prices of fossil energy sources increase - due to shortages or because of imposing environmental levies - the price gap could be closed.

FIGURE 1: Longterm development of world market prices for rapeseed-oil and gas-oil in US-$ per t



SELECTION OF AGRICULTURAL LAND TO BE USED FOR NON-AGRICULTURAL PURPOSES : A POSSIBLE METHODOLOGY BASED ON ECONOMIC CRITERIA

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1. INTRODUCTION

One of the harmful if not even dangerous irrationalities of man's behaviour is that concerning his relation and attitude towards his environment. In economy, it is usually the short-term changes causing easily recognisable manifestations that attract professional attention most. At the same time the slow, almost unnoticeable changes are neglected though having some very dangerous and quite often irreversable effects. Such are the changes of the quality of soil, subterranean water, air, etc. This statement is also proved by the fact that while there are various taxes for the use of artificial objects, anybody can use (according to his own criteria, paying no special tax) land, water and air as economic resources. These resources are available without payment, the costs of their maintenance most often are not casually related to their use and to profiting from them.

To put it figuratively, we behave like a man who carefully cures his unpleasant cough, but continues smoking and gives no attention to the slow, long-term changes in his body, that can easily have cancerogenous consequences. This compares to the way we treat land resources.

This paper is aimed at pointing to some of the consequences of the non-rational use of agricultural land. Several methodological problems are also discussed concerning the selection of agricultural land, the use of which is economically unjustifiable in conditions of agricultural commodities self-sufficiency.

2. LAND EXPLOITATION AND FOOD PRODUCTIONS : SOME GENERAL PROBLEMS

BOROJEVIĆ was undoubtedly right arguing that "Our major natural resource is land and we are still not conscious of the fact that there isn't much agricultural land and that each year we easily lose hundreds of hectares"(3).

In the history of mankind there were various examples of the destruction of fertile soil and the related disappearance of human civilizations. It would be enough to mention an alarming process in contemporary Africa where during the last 50 years some 650.000 square kilometers of potentially arable land in the south of the Sahara has turned into desert (5). Until recently, gigantic dams were considered a sort of sacred symbol of African progress. However, scientific research and measurements have contributed to the conclusion that these "super dams" cause more damage than benefits. The Egyptian Asuan has forever taken away 400.000 ha of arable land. The Ascombo dam in Ghana caused the inundation of an area almost as large as the Lebanon, with actually the most fertile fields in valleys by the Volta. The change of this river's course has affected the Atlantic Ocean streams which consequently resulted in the destruction of some 100 km of seashore. Besides, huge dams have also caused various social and economic problems, like the disappearance of many villages, the ruining of small producers, etc.(1).

Agricultural land has also been continually lost due to other needs of mankind. According to MADAS (8), "World population is, at the present tempo of increase, doubled every 35 years. This increases the requirements for residential acreages, which are now 0.08 ha per inhabitant (including apartment, roads, long-distance power lines, water supply, etc.). The 3.2 billion hectares which, speaking theoretically, can be used will be reduced to a mere one billion by the year 2070 - which probably won't be enough to meet the needs for food".

On the other hand, the nutrition problem has always generated an immense pressure on global political relations. Even in 1965 FAO began to monitor the international situation concerning agriculture and nourishment. Under the influence of FAO's findings, in the early 1970's the prognostic activities increased and quite a number of scenarios were launched concerning the provision of enough food for mankind. These scenarios were mostly of the Malthusian type, as in the case with the papers of MEADOWS and his group, on the limits of growth (9), of MESAROVIČ, HEILBRONER, ERLICH, FORRESTER (11). Even the authors who did not approve of their concepts, like Hermann KAHN, several Soviet authors, the Bariloche group (11) did admit the existence of a final limit to growth on the Earth.

This explosion of dark visions has probably contributed a lot to a (psychological) pressure toward appropriate measures on the global level. After the 1974 UN conference on food, some major changes occurred resulting in a controversial situation on the global level. Famines are still common in many (mostly rural) areas, and the impression is still strong that LOWDERMILK (7) was right arguing that "For 7000 years man has been looking for ways towards a better life on this planet, which in fact has been a race against famine, in which the winner is still unknown". On the other side, there is an abundance of food and a real war on the international markets.

According to the New Farm's data, financially supported agriculture of 25 highly developed countries received around $ 160 billion through various subventions. In these countries, as stated by DEMMLER (4), the share of agriculture in total national investments is higher than it is in gross national income, in percentages. Hence, from the viewpoint of the Portfolio philosophy (cash investments) it can be presumed that in many countries agriculture is viewed as a profit-centre with a promising future. It seems that such an attitude is recognisable even in some of the countries traditionally faced with famine.

In general, the EEC countries have met their food demands and have even produced certain amounts of surpluses. According to NEMETY (10), in 1981 their demands for plant and animal products were already met by 114% and 105%, respectively.

All this suggests the conclusion that global interests of mankind, in respect of agricultural land maintenance and the long-term food supply have been seriously affected. On the other hand, however, the developed countries are facing the problems of food overproduction, the necessity of reducing the arable land acreages, and soil conservation.

3. PROBLEMS CONCERNING LAND EXPLOITATION AND FOOD PRODUCTION IN YUGOSLAVIA

Yugoslavia is rightfully considered a country of meagre land resources potential. The movements in acreage per farmer and per active inhabitant are given in Table 1. Though the land/agricultural population ratio might be considered satisfactory, the intensive processes of "deagrarization" have resulted in the fact that a lot of parcels are owned by non-farm population.

As shown in Table 2, only 16% of nearly 10 million ha of arable land is the state (social) property; the additional 20% are owned by full-time farmers, while all the rest belongs to the aged households, non-farmers and the mixed households. A lot of owners from the latter group moved from villages during the urbanization process, were employed in the secondary or tertiary sectors and are now getting their income on the basis of both farm and non farm work.

Duality of the ownership structure has extremely negatively affected the food supply and the fertile soil preservation. Having been enormously enlarged, state farms with their basically extensive production structure couldn't have maintained the soil fertility even by means of intensive use of agro-chemicals. On the other side, on private farms land hasn't been properly treated either - mostly due to their unoptimal acreages and general political and economic ignorance at the social level.

Human environment protection and problems concerning agriculture, land particularly, have only recently been given proper significance. This is also the case with areal planning and agricultural land preservation. The problems to be solved in the forthcoming period are as follows:

- Most pastures, with the low productivity, require cultivation, land reclamation, anti-erosion protective measures and, in some cases, afforesting or other changes in their use.
- Barren mountain and hill soils should also be afforested.
- Around 5 million ha of excessively acid arable land need limer (calcification).
- Some parts of the Province of Vojvodina should be salt-protected.
- In many parts of Yugoslavia there is a need for erosion-protective measures of soil conservation.
- The small individual farms (called salas) that used to be widely scattered in the lowlands have almost disappeared nowadays; instead of them, afforesting should provide an adequate protective barrier to wind erosion.
- Due to its concentration on state farms, the animal production has become a dirty-technology production, while the use of pastures remained an open question. On the other hand, how to make up for lack of organic matter in fields is a question of increasing importance.

The data on major agricultural commodities' consumption given in Table 3, indicate the (potential) nutrition quality problems. The problems concerning foreign trade are also significant ones. As the analyses have shown, Yugoslav import/export balance has been negative for the last 15 years, imports exceeding exports by $66 to 694 million. Over the same period the share of agricultural exports continued to decrease from 13.3% in 1978 to 9.4% in 1987 (13). Such a situation indicates that in the forthcoming period the dominant need of production growth will remain. However, one more important problem is to be solved in that respective in Yugoslavia.

The agricultural input industries (agro-chemicals, fodder, agricultural machinery) are still insufficiently developed, with low productivity and inadequate competitiveness in the international market. Monopolistic and privileged positions in these industries have resulted in slow growth of labour productivity and in highly increased prices. Intensifying agriculture by high input use has caused the increase in employed and fixed capital and decrease in income realised. The impact of the production growth on income has been significantly reduced due to the growth of specific consumption of means of production, i.e. the expenditures overcharge agricultural incomes. Especially in the late 1960's and early 1970's there was a significant growth of capital intensity. Introduction of some new technical technological systems developed on the base of cheap energy concept, incrased the industrial input use as well as the agricultural expenditures. Abrupt increase of expenditures and decrease of accumulation were only partially compensated by credits and prices increased (14).

Though the production was improved, agricultural income stagnated or even decreased. This was a rule and not an exception. From 1974 to 1980 there was a decrease of real income in agricultural sectors of nine CEM countries, by 9.8% (2), as a consequence of industrialization processes.

If we also consider that the share of agricultural population in Yugoslavia is still of a high percentage, like the share of agricultural sector in gross national product, there are clearly no sufficient financial resources for agricultural subsidies.

Therefore, the problem is a very complex one. For the purpose of food self-sufficiency, production has to grow. At the same time, the pricing policy "scissors" are opening at the expense of the agricultural sector, i.e. the ratio of input/output prices is unfavourable. The question of production intensification is a very delicate one and requires serious efforts in solving the problem of how to intensify the efficiency of both fixed and variable production factors.

4. PREVIOUS RESEARCH

Previous research focused mostly on the problems of objective functions of production. By using different types of objective functions the optimal combination of fixed and variable plant production factors were searched for, i.e. the research was aimed at defining the optimal intensity level. Analyses of production results by method of objective functions have also shown a great variability of conditions, production results, production elasticity levels, justifiable or unjustifiable use of variable factors. By methods of linear programming, the problems of optimal production structures for various conditions were analysed. Gradual introduction of market economy and more direct impact of market will soon impose the problem of agricultural land use - in the first place for the purposes of regional development planning and urbanization.

Thus the question is what agricultural land can be and on a rational basis should be definitely excluded from production, to be used for other, non agricultural purposes?

5. A POSSIBLE SOLUTION

The problem of transformation of agricultural land for non-agricultural purposes is not only the question of ecological and economic significance. In the first place it is a strategic question since each national economy shows the tendency towards food self-sufficiency. In the case food surpluses are not the tradeable ones, or the trade is not rationally justifiable, the question is: what agricultural land capacities should be used for non-agricultural purposes, according to the criteria of economic justification? It should clearly be the worse quality soils; however, what areas precisely and what acreages - that is not so easy to decide on grounds of free estimations. The fact that various crops react differently on different types of soils make this problem even more complex.

The starting point in a model to be used for defining the potential "surpluses" of agricultural land is demand for particular quantities of particular agricultural products. The term "demand" includes self-sufficiency and the possibility of exports. In the long run, the annual quantities of particular agricultural products can be approximately defined which provide for self-sufficiency and offer good prospects of export.

Since food production is the function of two parameters - acreage and average yield - the question is imposed of defining the economically optimal level of production intensity, and hence the economically optimal yield to aim to. However, the economically optimal yield is not a fixed category but depends on input/output prices' parity which is strongly influenced by market interdependences and is therefore a changeable factor.

On the base of these presumptions, a general strategic model is formulated by which the potential "surpluses" of agricultural land capacities can be defined:

$$1.\ \max \sum_{i=1}^{m} \sum_{j=1}^{n} d_{ij}\, z_{iJ}$$

$$2.\ \sum_{j=1}^{n} y_{ij}\, z_{ij} = Q_i$$

$$3.\ \sum_{i=1}^{m} z_{ij} = z_j \qquad \text{where:}$$

Yij = optimal yield of "i" crop on soil type "j" (in t/ha)
i = 1(1)m ; m = number of crops
j = 1(1)n ; n = number of topes of soil
dij = maximum profit at the economically optimum yield of "i" crop on the "j" type of soil (in dinars/ha)
Qi = required quantities of "i" product (in tons)
Zj = available acreage of "j" soil.

By this formulation of the general problem of linear programming, benefits for agriculture are maximized and the food demand met. By solving the problem posed in relations of the inequation under 3), the reserves of particular soil type resources are received which are not included in optimal production structure. These reserves indicate that agricultural land acreages can potentially be used for non-agricultural purposes.

In this case, we deal with a methodological, general-theoretic model the operationalization of which requires a number of parameters such as yield fluctuations, deviations of optimal yields from the average ones, dynamics of changes in particular product demand, population growth, technological progress in agriculture, crop, turnover, etc.

In spite of its generality and insufficient precision, the presented model offers the potential framework and points out (at least in general terms) the structure and acreage of agricultural land which is sooner or later supposed to be used for a changed purpose.

This kind of application of an optimization model doesn't require the local optimum of a particular producer, but a global optimum of region. That is why an adequate strategic selection of parameters and aspects of logistic chains of production and distribution is automatically required. Ignoring global envirionment parameters and an overestimation of the significance of those concerning local environment can easily lead to suboptimizations.

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TABLE 1: Acreage per inhabitant in Yugoslavia

Region	Agricultural land per farmer	Agricultural land per active inhab.	Average per inhab.
Yugoslavia	2.35	3.99	0.49
Bosnia and Herzegovina	2.41	3.73	0.46
Montenegro	2.45	6.41	0.34
Croatia	3.10	4.90	0.49
Macedonia	1.64	2.93	0.39
Slovenia	3.76	5.56	0.37
Serbia-total	2.08	3.46	0.56
Serbia-cent.	1.79	2.52	0.52
Kosovo	1.05	4.87	0.31
Vojvodina	4.17	7.65	0.80

TABLE 2: Arable land property structure

	ha	%
Arable land	9 938 000	100
State farms	1 590 000	16
Private farms	8 347 920	84
of which owned by		
- full-time farmers	2 006 120	20
- aged households	1 391 000	14
- non-farmers	993 800	10
- mixed households	3 957 000	40

TABLE 3: Consumption of major food items in Yugoslavia per inhabitant

Commodity	1960	1987
Wheat	148.2 kg	144.4 kg
Corn	32.6	20.8
Potato	69.7	48.6
Vegetable	65.9	82.7
Meat	29.7	57.9
Milk	79.0 1	99.3 1
Eggs	66.0	186
Sugar	14.9 kg	39.6 kg

NON-FOOD UTILIZATION OF AGRICULTURAL LAND IN FINLAND

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1. INTRODUCTION

In Finland, agricultural conditions deteriorate noticeably towards the north, and farming characteristics vary greatly from one part of the country to another (NIEMI & HÄKKILÄ 1988: 1-8). Finland lies completely north of the 60th parallel, in contrast to Sweden, for instance, where over 80 % of the arable land lies farther south than southernmost Finland (Fig. 1). Because of this country's northerly location, the intensiveness of agriculture in Finland has traditionally been lower than that of central and southern Europe. Nonetheless, intensive farming has caused local environmental problems, such as eutrophication and ground consolidation.

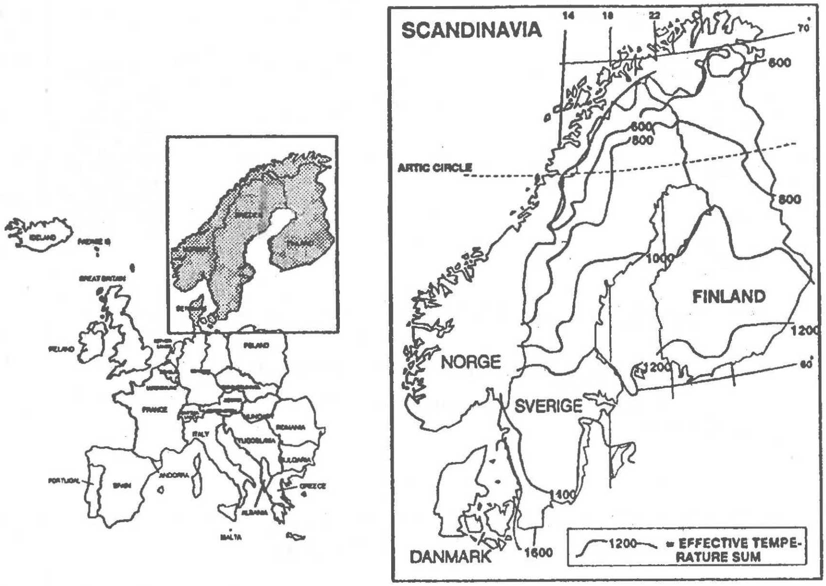
Finland's agriculture is based on privately owned family farms. Farmers receive their income from farming, but also from forestry, ancillary occupations and off-farm jobs. Most fields produce feed, which is why animal husbandry is of prime importance in Finnish agriculture. In terms of field area or livestock numbers, farms are rather small.

The small size of holdings has made it difficult to secure the income of the farming population. Expenses have risen. Due to surplus production and exportcosts, agricultural production will have to be limited through various production restriction measures. This will further curtail the sustainability of farms. European integration and the GATT talks will also effect on the future of Finnish agriculture and the Finnish countryside.

The Government made attempts to increase arable area before and particularly after the Second World War through various support measures. These included notably the pioneer and pasture clearance bonuses, and the settlement Acts. Because of these measures, the arable area continued to grow until the 1960s, by which time the opposite trend was already under way in the other Scandinavian countries. The focus of the pioneering work was in eastern and northern Finland (PÖLKKI & IKÄHEIMO 1982:8).

In order to balance domestic production and consumption, the measures to encourage pioneering were soon replaced by a tendency to reduce field area, which manifested itself particularly in a reduction in the actively cultivated field area. In 1990, the total arable area was 2.43 million hectares, of which 2.05 hectares were cultivated (Fig. 2).

FIGURE 1: The geographical location of Finland and effective temperature sum



1.1 The need to reduce field area

The food shortage of the post-war period was shortlived and by the 1960s self-sufficiency was achieved. Since then surplus production became an increasingly serious problem, especially in fodder and livestock products (Fig. 3). Various measures were planned to reduce surplus production. The first were implemented in the late 1960s, at which point the attitude towards arable land under cultivation changed. Since then, many different methods have been used to try and limit agricultural production in Finland (HÄKKILÄ et al. 1989:9).

Previously, it had been possible to increase production through price policies, but because of the increasing surplus production and the deteriorating world market situation, it was not possible to use this method to reduce production without reducing farmer's income level. Thus, an extensive special system for agriculture was evolved, aiming at curbing and reducing production, either voluntarily or through economic sanctions (GRANBERG 1985: 178).

FIGURE 2: The total, cultivated and needed arable area 1970-90 and the prognosis 1991-95, assuming no measures are taken to reduce the arable area

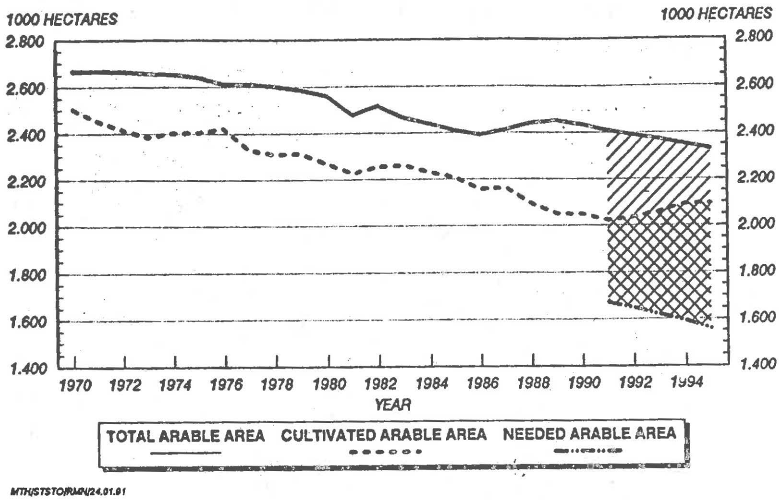
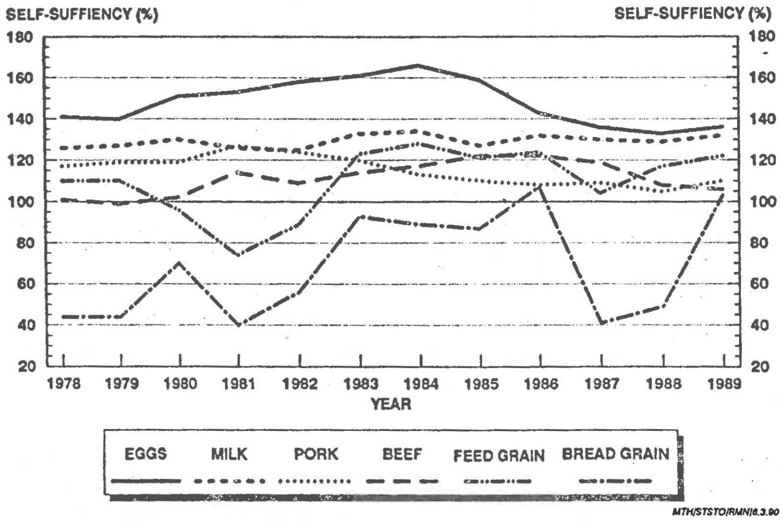


FIGURE 3: Self-sufficiency level in eggs, milk, pork, beef, feed and bread grain 1979-1989



Despite many efforts for reducing field area, it is estimated that there are still hundreds of thousands hectares of surplus arable land (Fig. 2). In the current world market and production situation, the productivity of agriculture should be raised not by increasing the output volume but by reducing production costs. It is of prime importance to find alternative uses for the surplus arable land.

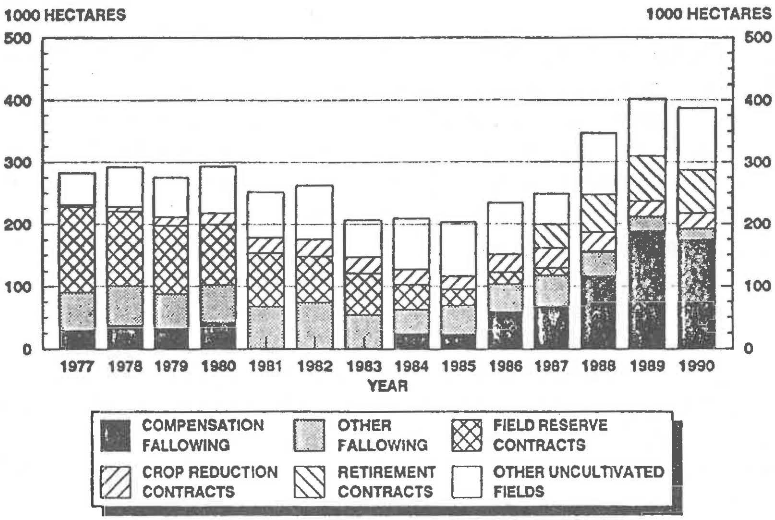
2. MEASURES FOR REDUCING ARABLE LAND

The volume of agricultural production has been regulated by restricting the arable area since 1969 through voluntary agreements on the one hand and through compulsory regulatory measures on the other. Some of these measures are aimed at the field area itself, others at specific products. The most important of these measures are the land reserve programme also called Soil Bank (1969-1989), the fallowing land bonus system (1977-), and agreements to curb agricultural products (1977-). The fallowing system and afforestation are currently the main methods used for reducing field area. Together with the field clearance change, they have ensured that in practice no new fields are now cleared (Fig. 4).

2.1 The land reserve programme

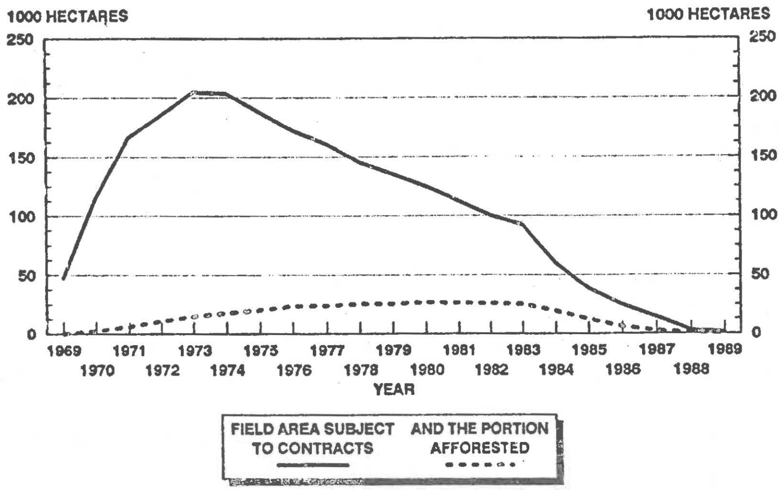
The Field Reservation Act was passed in 1969. Under this act, farmers could receive compensation for leaving fields uncultivated. Initially, compensation was paid for a maximum of fourteen hectares, but later also for larger areas. However, the

FIGURE 4: The extent of arable area reduction measures implemented between 1977 and 1990



compensation grew progressively smaller for areas exceeding 14 ha. Under the Act, a field placed in reserve could not be used for agricultural production apart from some exceptional cases. Fields could also be afforested, for which a separate afforestation compensation was paid. The field was then required to be such that withdrawing it from production would significantly reduce the output of the farm in question (see JAATINEN & KÄRKKÄINEN 1971: 3, JAATINEN & ALALAMMI 1978: 14, HÄKKILÄ et al 1989: 10).

FIGURE 5: The field reserve programme 1969-1989. Field area subject to contracts, and the portion afforested



In all, 36,000 farms signed a field reserve contract. The aim was to reduce the total arable area in the country by 450,000 ha. However, altogether the contracts only covered about 240,000 ha. The greatest arable area affected at a particular time (1973) was 205,000 ha. Since then, the area subject to the contracts has been reduced due to the termination of contracts, afforestation, etc. The system was discontinued in 1989, at which time all remaining contracts were terminated (Fig. 5).

At its most extensive the field area under contract amounted to about 10 % of the total Finnish arable area. Since 1982, the amount of arable land left uncultivated for other reasons has exceeded the arable area covered by the field reservation contracts (see Appendix Table 1).

Afforested fields have been permanently removed from the arable area. Some of the field area under contract was left uncultivated for other reasons, and usually became overgrown or afforested naturally. About 90,000 ha of fields were afforested with the aid of afforestation compensations (Fig. 5).

2.2 Agreements to curb agricultural production

These agreements were made between 1972 and 1983. Like the field reservation contracts, they aimed to terminate the entire field cultivation or animal husbandry operations of a farm. The contract system was superseded in 1983 by the Act on the Control and Balancing of Agricultural Production. Under this Act, contracts to reduce the total agricultural output of individual farms were made.

The field area under contract was about 25,000 to 30,000 ha in the 1980s (Fig. 4). In recent years, the system has been mostly directed at farmers under 55 years of age who are considered able to take up forestry or some other small-scale rural occupation. The contract period is ten years, and the farmer commits himself not to practise agriculture during that period. A farmer taking up forestry is required to have a farm producing at least 150 cu.m of timber a year, and to have a sustained outturn of at least 120 cu.m. In addition, the farmer must be informed about forestry and be able to practise it.

Those taking up other rural occupations are required to show that their farms are suitable for such purposes. Acceptable occupations are fishing and other production drawing on renewable natural resources, excluding agriculture and forestry proper, the production of horticultural or fuel peat, biofuel, wood chips or other domestic fuel, farm holidays, horse breeding or other business activity connected with or complementing the basic production of the farm.

In 1990, a total of 25,000 ha of fields was withdrawn from production under the above contracts. A further 70,000 ha of fields was covered by the retirement scheme in 1990 (Fig. 4).

2.3 The field clearance fee

An Act limiting the right to clear new fields was passed in 1987 to reduce the costs incurred to the State by the export of agricultural products. This Act makes the clearing of new fields effectively unprofitable, since it levies a fee of FIM 30,000 per hectare of new field. In the 1980s, about 3,000 to 4,000 ha of new fields were cleared every year. However, immediately before the Act became effective there was a massive increase in field clearing, due to which the total field area was nearly 50,000 ha greater in 1988 than it had been in 1986.

2.4 Fallowing and fallowing agreements

Apart from afforestation, fallowing is the most important measure for reducing field area. The drawing up of fallowing contracts began in earnest in 1989 and has since been intensified. Fallowing is a fairly efficient and economic means of balancing surplus production. It withdraws fields from crop production, gives the land a rest and a chance to renew itself, and compensates the farmer for loss of income by means of the fallowing compensation. The fallowing system is also proving beneficial to the environment. Fallowed land bordering waterways forms a protective zone preventing leaching between the fields and the water.

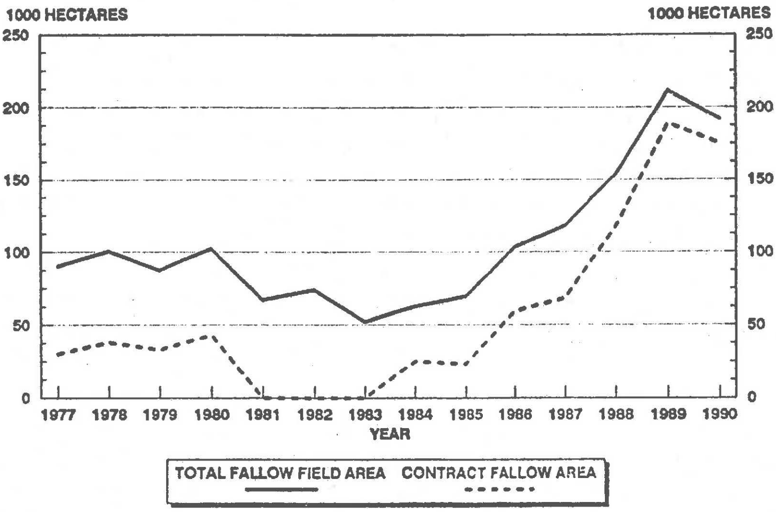
The fallowing contract system has had a clear impact on the total area of fallowed land and the total area of cultivated fields. Introduction of the system halted the decline in the amount of fallow land area in the late 1970s (see Appendix Table 1 and Fig. 6). The fallow area was falling to an annual level of 40,000 to 50,000 ha, and would probably have continued to go down had the contract system not been introduced.

About 20,000 to 30,000 ha of normally fallowed fields are covered by the contract; thus, it is only field area in excess of this which forms any real increase in the fallow land area. The greater the area covered by contracts, the greater the effect of the system.

In 1990, 26,000 farms and 175,000 ha of fields were covered by fallowing contracts. The average area was slightly less than seven hectares per farm. Together with the 17,000 ha of other fallow land, a total of 192,000 ha of fields were withdrawn from production - eight per cent of the total arable land area. Normally, the fallowing area is only a few per cent of the total arable land area of the country.

Green fallow is best for both the field and the surrounding waterways. It prevents nutrients from being leached into the waterways by rainwater. Vegetation is an efficient preventive measure against erosion. Green fallow is also the preferred type of fallowing for environmental reasons. Of the most recently made contracts, 60,000 ha consisted of three-year green fallow. Such farms are significantly smaller than other contract farms, whose size distribution corresponds to that of farms in general. Thus, green fallow farms are slightly less effective at curbing production than other contract farms.

FIGURE 6: The total fallow area and the contract fallow area (1000 hectares) from 1977 to 1990



The fallow land target for 1991 is 350,000 to 450,000 ha. Every farmer must lay 15 % of his arable land fallow, and is entitled to compensation for this. If a farmer does not lay his land fallow, he is charged an export fee of FIM 1000 per hectare for his entire field area. Farms under three hectares in size are exempt from fallowing, as are those whose field area consists of more than 90 % grassland. In practice, therefore, fallowing is compulsory this year.

Fallow land can be used for grazing sheep and for growing flax, sunflowers, herbs and other aromatic plants. A drawback to the fallowing contract system is that the level of compensation is reflected in the cost of renting a field. The use of the remaining field area may also be boosted and fertilization increased.

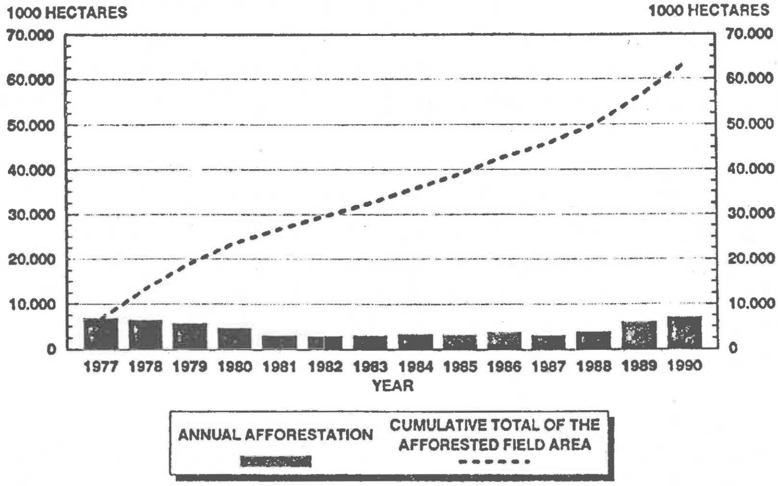
2.5 Afforestation of fields and specializing in forestry

The surplus production problem led to the subsidized afforestation of excess arable land in the early 1970s. From a modest beginning, afforestation rose to about 13,000 ha per annum by 1972. This level dropped in the late 1970s and early 1980s. Field afforestation has clearly increased in recent years along with the growth in forestry bonuses. About 6,000 ha of field was afforested in 1989 and 7,000 ha in 1990; in the 1980s, the annual rate was about 3,000 to 4,000 ha (Fig. 7). In all, about 133,000 ha of field has been withdrawn from production since 1970. The average afforestation area per farm is two hectares.

A farmer can carry out afforestation in three ways: afforest at his own expense, apply for a forest improvement loan to finance afforestation, or apply for compensation for withdrawing a field from production. In the last mentioned case, the farmer is paid a bonus per hectare for afforestation. The bonus afforestation practice is based on the Act on Balancing Agricultural Production, under which a farmer converting fields to forest is entitled to a bonus which was FIM 6,400 to FIM 9,600 per hectare in 1990. The bonus is highest where field productivity is highest, i.e. in southern and southwestern Finland.

Because there is a surplus of dairy products and feed grain in Finland, afforestation and specializing in forestry provide farmers with a viable alternative to farming. The need for fibrewood in the paper industry is growing. Finland imports round timber as there is a shortage of hard wood. Plywood birch is also in short supply. Afforestation of fields also boosts the national economy, since the cost of marketing agricultural surplus is reduced. The farmers' share of the marketing costs is also decreased. Funds invested in afforestation will provide employment in the future in tree growing, felling, timber transport and the pulp and paper industries. In terms of the economy, Afforestation would seem to be the best way of withdrawing arable land from agricultural production.

FIGURE 7: Annual afforestation (1000 hectares) 1977-1990, and the cumulative total of the afforested field area



If no special measures are taken, it is estimated that the annual afforestation rate will be about 4,000 ha. The target is to raise the afforestation level to about 20,000 ha per annum by 1994. The afforestation aim is 10,000 ha for 1991 and 13,000 ha for 1992. Achieving this target, together with other measures for reducing field area, would decrease the total arable area by 25,000 to 35,000 ha per annum.

To achieve the afforestation aim, afforestation terms should be even further alleviated to entitle anyone who afforests his fields to an afforestation bonus. The competitiveness of afforestation in comparison with other uses for fields should be enhanced by distributing information, for instance. Factors hindering deforestation include sentimental reasons, economic circumstances and, possibly, bureaucracy.

3. NON-FOOD USE OF FIELD AREA

3.1 Energy production, ethanol and starch

Recently, increasing interest has been shown in finding new applications for agricultural products traditionally used for foodstuffs or feed. The focus is on the non-food production of agricultural products, mostly for the manufacture of chemicals. Advances in biotechnology will provide technically improved ways of using agricultural products.

The most extensive non-food use is made of the ethanol and starch obtainable from agricultural products. These substances are the basis for other, more refined chemicals. The main applications of ethanol are in industry and motor fuel. The paper industry is using an increasing amount of modified starches as binding substances as the value added increases.

Interest in ethanol as a gasoline additive has increased. Barley has proved to be the best raw material for ethanol. This trend is due partly to attempts to balance grain production, partly to environmental policy. Ethanol is the most environmentally sound of all the gasoline additives. The gasoline sold in the USA, for instance, now contains about ten per cent ethanol for environmental reasons.

It is possible to produce ethanol competitively in Finland with the present production technology if the manufacturers (ALKO and NESTE) can obtain their raw material, barley, at world market prices. This is problematic in practice. The current world market price of barley is FIM 0.25 to 0.30 per kg. A Finnish farmer is paid FIM 1.85 per kg.

If the manufacturers were to obtain their barley at the world market price, the Finnish Government would have to pay the difference between the world market price and the domestic market price. This is the equivalent of the export subsidy, and any increase in agricultural subsidies is frowned upon in Finland as it is elsewhere in the world.

Experiences of barley spirit factories have also been somewhat ambiguous. Alko's first barley spirit plant was set up to produce starch and spirit at world market prices from grain purchased at domestic market prices. However, the high price of barley rendered the operation unprofitable. The Government guaranteed a supply of grain at world market prices for Alko's second barley spirit factory, incurring expenditure equivalent to the export subsidy.

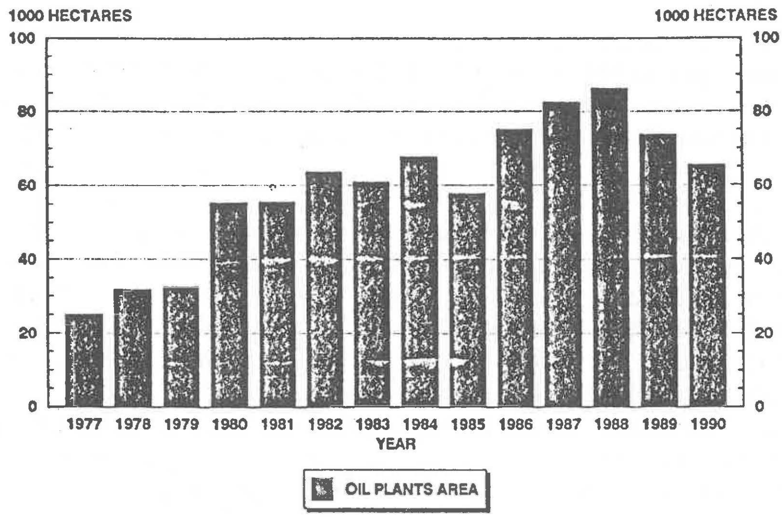
Another problem in ethanol production is the large amount of feed left over in the production process. It is not certain whether it would be possible to market such amounts of protein feed to a diminishing livestock industry. Of the present 45,000 suppliers of milk, it is estimated that only 30,000 will be in production in 1995. If the aim is to satisfy the whole demand for ethanol in Finland, the feed by-product would amount to about twenty per cent of the present requirement for protein feed. No less than 150,000 ha of field would be needed to produce the required output of ethanol.

In international agricultural negotiations, subsidies for reducing environmental hazards are viewed favourably. The aims for developing ethanol concern agricultural policy and largely also environmental policy. Thus, any subsidies should not perhaps be considered as agricultural subsidies at all. Support for environment-friendly energy production should be approved.

3.2 Energy production and rapeseed oils

Domestic rapeseed oil and the tallow produced by slaughterhouses are used as raw materials for industrial fat chemicals. Rapeseed oil is also suitable as a lubricant and motor fuel. Compared with mineral oils, rapeseed oil is a renewable, environmentally sound energy source and lubricant; hence, its use as a raw material for technical oils will probably increase. The field area for oil plants and demand for the domestic crop have grown continually.

FIGURE 8: Arable land under oil plants (rapeseed) in thousands of hectares from 1977 to 1990



Large-scale cultivation of oil plants did not begin in Finland until the 1960s. However, the field area grew quickly from 10,000 ha in the 1960s to 25,000 ha in the 1970s. At present, the field area is more than 60,000 ha (Fig. 8). Spring rape is Finland's fourth largest grain crop in terms of field area after barley, oats and wheat. It is predicted that rape will surpass wheat by the next millenium. The use of rapeseed oil as a lubricant is expected to increase to about 5,000 tonnes per annum, corresponding to 8,500 ha of field area.

This year, a new domestic variety of rapeseed with a ten per cent greater yield has been released. Previously, the most common species cultivated in Finland had all been developed in Sweden. The new variety will thus significantly increase the contribution of domestic rapeseed.

3.3 Other non-food use for fields

Since the 1970s, here have been several policies in Finland for broadening the potential of rural areas and their economy. The Act on Promoting Small Businesses was passed in 1987. The Act was intended to create jobs as alternatives for traditional agricultural production and thus promote the use of surplus fields for other than food crops.

The Act has been in force for four years now, and it has produced positive results. Alternative jobs have been created in trades not related to traditional agriculture and field cultivation. Some facets of this development will be outlined below.

Forestry can be an enormously varied business. At its simplest, the entrepreneur's income is based on the sale of timber from his own land. A more varied operation might involve the entrepreneur sawing his own lumber and selling processed products such as sawed goods, utility wood, etc. A forestry entrepreneur is one whose income is mainly or wholly based on forestry on his own farm. A reasonable income requires the ownership of 150 to 200 ha of productive forest on southern Finland and over 500 ha in northern Finland.

Organic farming is another way of balancing surplus production. Since 1990, organic farming has been promoted through a system of contracts. A farm can cange over to organic cultivation in stages over three years, during which time the farmer receives compensation of FIM 2,800 per hectare. The contract applies to the whole field area of a farm, but unsuitable tracts can be excluded. Only fields cultivated or laid fallow in the previous year are considered suitable. The farmer commits himself to organic cultivation for at least three years after the last subsidized year. In 1990, new contracts were made with 640 farmers, covering 8,300 ha.

The expansion of organic farming is partly linked to Government measures to guide production and organize marketing. Research is needed to bring production costs down. Much more investment is needed in developing consultation services.

In ornamental plant production, cut flowers are grown in greenhouses with a total area of 100 ha, and demand is growing slightly. Small amounts of summer flowers are also grown outdoors for the cut flower trade. Cut flowers are only imported in winter, when flowers cannot be grown outdoors in Finland. Ornamental plant production requires greenhouses which can be used all year round. These are very costly both to build and operate under Finnish conditions.

Nursery production and landscaping are practised by about 300 farmers, with a combined production area of about 500 ha. Nursery production is mainly concentrated on cultivating perennial, trees, shrubs and fruit and berry plants for landscaping. The use of ornamental trees and shrubs has increased considerably in urban areas, but also in the countryside. At the same time, large nurseries have experienced problems with diseases and quality level fluctuations in the production of forest tree saplings. There is a clear deficit in forest tree sapling production. Landscaping is often connected with horticultural peat and turf production. There are already large companies in the sector, but it is easy for a farm to convert to such a business, as they already have the basic equipment.

Flax cultivation has become significantly more popular in the 1980s. At the moment, however, the crop is produced by amateurs only. Research into flax cultivation has begun, and suitable machinery has been developed for the purpose. It is possible in Finland to achieve a yield similar in relative volume to that of the rest of Europe. There is a need for development, especially in harvesting and crop handling techniques. The area under flax is estimated to be only 70 ha at the moment. If the cultivation techniques can be improved and if flax imports are to be made unnecessary, a field area of 3,000 ha will be required for flax and 7,000 ha for linseed flax.

The cultivation of aromatic and other herbs has only been studied in earnest for a few years. Less than 200 ha of field area is used for aromatic herb cultivation. It would require 400 ha more to replace imports with domestic products. The food and alcohol industries and the central wholesalers import spices worth over FIM 30 million per annum. Only the cultivation of fresh spices is likely to be economically feasible. To create significantly more jobs in the cultivation of dried herbs, the production technology should be developed so that the products are competitive with imports and of exportable quality as well.

The structural change in horse breeding has moved horses away from farms proper. The training and breeding of racing and riding horses for leisure is an eminently suitable sideline for farmers. Horse management provides full-time employment for some 2,000 people.

The new rural industries typically operate on a small scale. They are often sidelines on a normal farm, and the business is begun tentatively and carefully. However, these means of livelihood offer an income to the rural population and thus help keep the countryside populated. As a whole, the effect of small rural businesses on agricultural production is not significant, since farms strongly dedicated to traditional agriculture are not usually involved in ancillary business ventures (KAIPAINEN et. al 1990: 84-85).

4. CONCLUSION AND DISCUSSION

This paper deals with alternative ways of using fields and with non-food production in Finland in view of the developments which took place in the 1980s. The focus is on the measures the Government has undertaken to reduce field area and on evaluating the new uses for fields.

Apart from measures to reduce the arable area, the finding of alternative uses for surplus fields is of prime importance to the future of agriculture. This decade will be a period of adaption for agriculture. The reduction of agricultural production and the pressure from GATT to reduce the import protection on agricultural products will face the rural community with increasingly difficult changes. Traditional agriculture, especially milk, eggs and grain, will account for a smaller proportion of farmers' income in the next few years. There is room for growth in forestry, organic farming, special production processes and other small rural businesses.

The most important field area reduction measures were the field reservation programme (1969-1989), the crop reduction contracts (1977-1982, 1983-1989), the fallowing contract system (1977-1980, 1984-), and the subsidies granted for organic farming (1990-), afforestation and small rural businesses (1987-). In the next few years, the total field area will be reduced primarily by fallowing and afforestation. The fallowing target for 1991 is about 350,000 to 400,000 ha and the afforestation target 10,000 ha.

New plants and plant varieties are continuously under development, and results and changes can be expected in the near future. Flax, protein plants, aromatic and other herbs and organic farming will probably prove to be new sources of income. However, their significance in reducing the amount of surplus field area is slight. Instead, the use of industrial and motor fuel ethanol presents interesting opportunities for putting fields to new use. It is estimated that as much as 150,000 ha of field is needed to produce the proposed volume of ethanol. There are problems with the price level, the concomitant export subsidies, and the marketing of the protein fodder produced as a by-product of ethanol production.

In forestry, there are opportunities for expansion in delivery cutting. The orientation towards forestry and afforestation should be developed to increase farmers' interest in deriving their main income from forestry.

The liberation of trade may slow down growth in horticulture. The traditional greenhouse and other forms of horticulture may be curtailed. There are new possibilities in landscaping not subject to international competition.

The use of fields for landscaping is an alternative to be considered in the future. As environmental protection and management in rural areas develop, agriculture could serve other sectors by maintaining important landscape and environment features, such as farms, uncultivated fields and other cultural entities. This is important for tourism; the maintenance could also bring some extra income.

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APPENDIX

TABLE 1: Use of uncultivated field area; field area reduction measures from 1970 to 1990 (in thousands of hectares)

YEAR	FIELDRE-SERVA-TIONS CONTRACTS	CROP REDUCTION CONTRACTS	COMPEN-SATION FALLOW-ING	OTHER FALLOW-ING	RETI-REMENT	OTHER UN-CULTIVA-TED FIELD AREA	TOTAL TEENS
1970	114,0			47,8		0,0	161,8
1971	160,2			52,9		0,0	213,1
1972	173,8			48,2		27,5	249,5
1973	190,2			50,3		33,6	274,1
1974	185,8			43,4		21,0	250,2
1975	167,7			48,6		19,8	236,1
1976	149,0			43,0		0,0	192,0
1977	136,8	3,3	30,3	60,2		51,2	281,8
1978	120,0	7,2	38,2	62,6		63,6	291,6
1979	110,1	13,4	33,2	54,7		64,0	275,4
1980	98,0	17,7	43,0	59,3		75,0	293,0
1981	85,8	25,0	0,0	67,5		73,4	251,7
1982	74,1	27,2	0,0	74,2		87,6	263,1
1983	66,8	26,1	0,0	52,4		59,3	204,6
1984	40,0	24,6	25,0	37,9		81,8	209,3
1985	26,0	20,7	23,5	46,2		86,9	203,3
1986	19,1	28,5	59,7	44,0		82,9	234,2
1987	11,6	31,4	68,6	49,5	38,0	49,3	248,4
1988	2,3	30,2	117,4	36,5	61,0	99,3	346,7
1989	0,0	25,0	189,1	22,2	73,0	92,3	401,6
1990	0,0	25,0	175,0	16,9	70,0	99,7	386,6

Source: Annual reports of the National Board of Agriculture, farm statistics by month.

THE PROSPECTS OF THE NEW TYPES OF NON-FOOD USES OF AGRICULTURAL LAND

I. Vainio-Mattila, Helsinki

There are several reasons why the need of cultivated area in Finland has decreased. Declining consumption per capita, reduced number of cattle, increasing production per production unit, etc. just to mention a few. The same developments have taken place all over the industrialized world. In Finland this is likely to cause severe economic problems due to the fact that the production costs are quite high as compared to the world prices. For this reason it is not worth while to maintain agricultural overproduction in Finland in order to produce food for export. There are, of course, exceptions to this rule as far as certain special products are concerned. In general the statement, however, holds true. The balance of agricultural production and the domestic use of these products can mainly be obtained by reducing the land area available for agriculture.

The means to reduce the land area for food production consist among others of afforestation, set aside land programmes (fallowing scheems and soil bank), non-food production and the introduction of extensive farming. The latest interest in Finland and also in several other countries has been to investigate the possible uses of plant fiber as a raw material in the processing of high quality paper. This paper tries to describe some of the pros and cons of alternative solutions to extensify agriculture or to increase the uses of agricultural land for non-food purposes. There is no intention to present a statistical review of the prevailing situation, but rather to make an evaluative approach to the topic.

EXTENSIVE FARMING

There seems to be more and more emphasis to introduce less mechanized, less intensive, so called biological methods of farming whereby less or no fertilizers, pesticides or other chemicals are applied in order to increase production. Opinion research shows clearly that consumers prefer non-contaminated food stuffs and are even prepared to spend more money if the quality or "pureness" can be guaranteed. The aim of extensive farming can also be considered as a solution to reduce overproduction in agriculture. The reduction in the use of fertilizers by means of higher taxes has, however, so far been encouraged mainly in order to protect the environment, not to reduce agricultural production.

Although we do not consider the safeguarding of the conventional methods of agriculture as the only reasonable backbone of future development, we have to be realistic. In Finland, for instance only a few thousand hectares are under the so called biological production as compared to over two million hectares under conventional farming. Secondly, although consumers claim to be willing to accept higher food prices for "bio products", they are, in general, strongly against the high prices of food. Perhaps the best way we can proceed is to finance research and advisory work, which aims to develop and extend the use of biological methods of weed and pest control. It is not advisable to increase the amount of manual labor among the farmers.

SET ASIDE LAND

There are several alternative ways to carry out set aside programms. The idea of this approach is very simple: the smaller the area under cultivation, the less agricultural production. It is not even profitable to keep all existing farm land in production. There are, at least in nordic countries, rather large and remote areas with isolated farm land and areas where the soil is not good enough to pursue profitable agriculture.

Various soil bank systems have the disadvantage of beeing rather expensive for the governments, and as these areas usually are not taken care of, they make parts of rural communities look like abandoned waist land. Fallowing programmes are certainly more appealing also from the farmers' point of view. We know the favourable impact of fallowing after long lasting monoculture. We are, however, afraid that farmers make use of the government subsidies by fallowing lands, which have not been actively cultivated. There is also a strong evidence of nutrient and mineral dilution from the open fallow. Green fallowing is, therefore, strongly recommended, but in case of overproduction harvesting or grazing of these areas cannot be allowed.

As far as nature conservation and especially water pollution are considered it is recommended, that green fallowing is carried out for instance on 5 to 15 meters narrow stripes next to the water. Difficulties arise in exact measuring of the followed areas which should be compensated to the farmer. Farm practices are also complicated especially on fields with open ditches.

On voluntary bases, there will hardly be enough land set aside from active cultivation. If the fallowing compensation by government funds is meant to be high enough to compeat with land renting costs, the total expenses will be unacceptable high. The Finnish way of solving this problem is that farmers have access to subsidies called direct payments only after they have fallowed the minimum of fifteen percentage of their actively cultivated area. Extra allowance is payed to those who fallow more. Green fallowing is also favoured. One severe problem is, that in a long run it is hardly acceptable to have a major part of natural resources unused in the world where food care seems to be a growing problem.

Reducing the area of cultivation by means of fallowing is strongly in contrast with the aim to enlarge farm size. This aim is based on the need to create more rational units of farming in order to reduce the food production costs. If farm area is reduced for instance by 15 percentage, it means, in most cases, that there are resources like machinery, buildings and labour force in excess.

In Finland, the aged farmers are recommended to quit farming especially on small farms in connection of various retirement scheems. This is possible, because on many farms there are no children who are willing to continue farming. In our circumstances the distance between the neighbouring farms is quite often so long that it is not worth while to join those into one farm unit. About one hundred thousand hectares of arable land is set aside within this arrangement.

NON-FOOD PRODUCTION

Non-food production is a means of keeping the farm land in active cultivation. Its acceptability is, however, dependent upon the reduced need of outside financing as compared to farm subsidies. There is a strong emphases to develop such alternatives of land use, which are likely to create economically vital enterprises and whereby the need of governmental interventions are in minimum.

Afforestation is usually recommended to be the best solution in isolated areas and other areas, where agriculture cannot be recommended on bases of economical reasons or poor soil quality. The major difficulties are the very slow growth of trees in the conifer belt and technical difficulties to grow trees on former agricultural land. Although there is a substancial government intervention in these programmes, only a few thousand hectares are annually planted with trees. Our intention is to encourage farmers to add the annual afforestation area up to 20.000 hectares by the year 1995. The areas once afforested cannot easily be taken back into cultivation, if the need arises.

Many of the farm products can at least partly be processed into non-food products like starch, ethanol, oil or converted into energy. Especially willow bushes have been experimented as a source of energy. Also straw can be used for these purposes. One problem in the situation of overproduction is that there is quite often a major fraction in the process, which is likely to add to feed production. This is, of course contradictory to our goal of reducing agricultural production.

When concidering the hundreds of thousands of hectares in excess, one is rather pessimistic as to whether agricultural land could be used for these purposes in a substancial degree.

The most recent developments have brought up one possible solution to the over all problem discussed in this paper. There is namely a growing interest to investigate the suitability of plant production as a new source of raw materials for high quality paper industries. It is evident, that a medium size paperplant could make use of 20-40.000 hectars of cultivation. The simultaneous bio gas production would cover the energy needs of the plant, unless used at farm or village level. The areas under fiberplant production are planted with perennials, which produce as long as ten years, and remain therefore green. It might, therefore, be possible to spread sewege on these areas unless they are located near waters.

The first feasibility study in Finland on this subject will be published in good time before the Graz-symposium. Information about the results of this study can be made available to the participants of the working party in the connection of presenting this paper.

OTHER LAND USES

The growing number of horses for riding and troting compensates somewhat the rapid decrease of cattle. For the time beeing the need of land to feed the horses exceeds 40.000 hectares in Finland. Some area is also needed to feed the fur animals or to recreational purposes like constructing golf courses and using land for road construction and building purposes.

CONCLUSIONS

The main solutions to reduce area in active cultivation have been temporary in nature. Only afforestation, giving up cultivation in the connection of certain retirement scheems and using land for housing or road construction are more or less permanent alternatives. It is certainly advisible to seek solutions, whereby no land is left idle and can easily be returned to agriculture. Active land use to non-food production should reduce the necessity of government intervention. If this requirement is fulfilled, it is possible to keep more farms alive and rural villages vital.

SHORT ROTATION FORESTRY IN AUSTRIA AS A FORM OF NON-FOOD USE OF AGRICULTURAL LAND

G. Pelzmann, Graz

In our agrarian policy, the agreement exists that the increasing overproduction of cereals, meat and dairy products has to be stopped and cut back.

On the other hand our consumption of energy uses up reserves and causes irreversible ecological problems.

Short rotation forestry gives a possibility of an alternative non-food utilization of agricultural land and reduces both problems.

Furthermore, it should provide some other effects:

- an increasing independence of imported energy,
- a renewable, domestic energy source,
- a stimulation of the regional economy,
- a new possibility of income for farmer's agriculture,
- a self-sufficient supply of heat and warm water for farms and villages,
- less ecological impacts on soil and water,
- a reduction of the air pollution and the CO_2 emission,
- an operation safety in contrast to atom-energy and oil-transports.

This paper presents the state of the initial situation, the relative importance, production techniques, the profitability, the market situation and ecological aspects of energy forestry in Austria.

Short rotation forests are cultivated on former arable land with rapid growing tree species to produce high yield of biomass. This wood is chipped and burned in special stoves for room heating and warm water.

Biomass production in short rotation forests is not a new thing in Austria. So-called coppice-forests characterized our countryside over centuries and supplied farmers with firewood, animal feed and litter. In the middle of the nineteenth century, after the appearance of hard coal and oil, they lost their economical importance and disappeared almost totally.

Short rotation forestry differs a lot from traditional forest management. The variety of benefits such as the social, the welfare and protection function, the long time periods of planning and effects and quality aspects of the tree shape are pushed into the background.

Tree species for energy forestry have to perform the following requirements:

- high biomass yield in only a few years,
- resprouting ability from the stump even after several harvests,
- few sprouts per stem,
- high resistance against shadow,
- resistance against abiotic and biotic diseases,
- low nutrient extraction at the harvests.

Under Austrian climate and soil conditions especially willow (Salix sp.) and poplar (Populus sp.) are suitable, on poorer sites locust (Alnus sp.) and birch (Betula sp.) and on dryer areas robinia (Robinia sp.). Other available tree species but less rapid growing are hornbeam (Carpinus betulus), ash (Fraxinus excelsior) and oak (Quercus sp.).

THE INITIAL SITUATION

Austria is an energy importer. (Energiebericht, 1990). In 1988 Austria's total primary energy consumption was about 1,017.9 petajoule.

In the last 15 years, the percentage of oil use on the total primary energy consumption decreased from 50 % to 42 %, the gas consumption almost stagnated at 18 %, the coal requirement decreased from 20 % to 15 %, water power and electricity increased from 10 % to 15 % and the energy use from renewable sources increased from 3 % to 9 %. The energy from renewable sources includes firewood, lye from the paper industry, burning waste, bark, chipwood from the sawmills, geothermal heat, solar collectors and heat pumps.

A high dependency on imported energy products is evident because oil is imported by 90 %, gas and coal by 80 %. Only hydropower and biomass come from domestic production.

In 15-20 years the fossil energy sources will be exhausted in our country (KOPETZ, 1984) and in future all over the world.

Austria is an exporter of agricultural products. (Grüner Bericht, 1989).

In 1988 on 3.5 million hectares of agricultural land Austria's farmers produced 78 % more wheat, 15 % more rye, 16 % more maize, 42 % more beef and 50 % more cheese than necessary in our country. To commercialize this overproduction we needed a State support of S 8.8 billion which means a subsidy of S 2,500 per hectare. But only 30 % of the subsidies reach the farmer directly, the main part goes to the agribusiness, to the chemical industry, banks, the food industry and to the import and export companies (WAIGER, 1988).

In the last 10 years up to 1988, these costs exploded by about 120 %.

POTENTIAL

Estimations of areas which should be eliminated from conventional agricultural production reach from 170,000 to 200,000 hectares (GRILL, 1986; MYLIUS, 1990) up to 550,000 hectares in 2030 (HAAS, 1984).

At an estimated mean of current increment in a period of 30 years of 8 tons dry matter per hectare and year (odT/ha/y) on 200,000 hectares surplus area, 2.7 % of the current Austrian primary energy consumption could be substituted, which is as much as the firewood consumption at the moment. Besides this, more energy forests could be planted near rivers and streams, on embarkments of streets and highways and as wind screens.

ENERGY FORESTRY IN AUSTRIA

From 1980, the year in which the Austrian energy forestry programme started, to 1990, 650 hectares of energy forests were established in the regions of Oberösterreich, Burgenland, Steiermark, Niederösterreich, Kärnten and Salzburg (see figure 1).

The mean size of the stands is about 0.6 hectare.

In the first five years, the main purpose was to find out suitable tree species and fast growing clones available to short rotation forestry.

Since 1986 farmers established energy forests mainly using willows and poplars. But from 1988 onwards this choice of tree species changed to alder. A survey of the current distribution of the tree species is shown in figure 2.

PRODUCTION TECHNIQUES

Since 1980 in Styria, the State Board of Agriculture and Forestry deals with a research programme to find the optimal production methods for high yields. Table 1 shows a list of the mean current biomass production odT/ha/y (oven dry tons per hectare and year) of some tree species and clones.

TABLE 1

Tree species	Mean current increment odT/ha/y	At the age of	Location in Styria (Austria)	Description of the variant
Willow	10.5	8 years	Krottendorf	minirotation (sprout concept); rotation length four years; clone 4/68T; spacing 0.8 x 0.5 m dry matter weighted
Poplar	10.5	8 years	Krottendorf	midirotation (single stem concept); rotation length eight years; clone Oxford; spacing 1 x 1 m dry matter weighted
Black alder	4.9	7 years	Krottendorf	midirotation (single stem concept); rotation length ?; provenance unknown; spacing 1.5 x 1.5 m dry matter calculated
Birch	5.4	7 years	St. Martin/W.	midirotation (single stem concept); rotation length ?; provenance unknown; spacing 1 x 1 m dry matter calculated
Robinia	2.9	5 years	Kellach	midirotation (single stem concept); rotation length ?; six different unknown provenances; spacing 2 x 2 m dry matter calculated

This example of a willow experiment demonstrates the influence of different cultivation variants (table 2):

TABLE 2

Variant		Mean current increment at the age of 8 years dZ8 odT/ha/y	Number of plots	Relative to the lowest value %
Clone	351T	3.5	24	100
	4/68T	6.1	24	172
Spacing	2 x 1.5 m	3.5	16	100
	1 x 1 m	3.7	16	105
	0.8 x 0.5 m	7.2	16	204
Rotation period	2 years	3.4	24	100
	4 years	5.7	24	142

Longer rotation periods, the right clone selection and a dense spacing in relation to its shade tolerance provide high yield. These results show that trees, contrary to grass and C4 plants, are not suitable to be harvested every year, every second or third. A harvest weakens the stumps and the proportion between piece and volume deteriorates on account of more shoots. Longer rotation periods mean that the biomass is more mature and that there are less nutrients in the stems. Larger spacing and the possibility to use machines in the stands are further advantages of longer periods. Costs of cultivation, weed control and harvesting can be reduced. Even so every tree species needs its own management concept:

Willow: Depending on the site, the rotation period should be between four and six years. This "minirotation" can produce about 13 odT/ha/y. The stand area of one stump is about 0.7 m2. Because of many shoots per stem only here full mechanized harvesting is useful.

Poplar: On fertile soils, 10 odT/ha/y can be produced with a rotation length of five years. Otherwise, this period should be stretched up to 10 years. Single or few stems ("midirotation") can be harvested by chain saw and a winch assembled on a tractor. Each stump needs a stand area of about 5 m2.

Alder and robinia: They can be managed the same way as the poplars, but need longer rotation periods ("midirotation") of 10 to 20 years. Biomass of about 6 to 8 odT/ha/y can be reached.

Birch and other species: Due to the bad resprouting abilities or to the slower juvenile growth, a rotation length of 20 to 30 years ("maxirotation") is useful.

At the latest after 30 years, every energy forest stand of mini- and midirotation should be harvested and replanted.

THE PROFITABILITY

Under today's conditions, the energy forestry production is not profitable for farmers.

There exist no exact costs and proceeds about the whole growing period of 30 years. Therefore, and because of incalculabilities of this long time period, a comparison between contribution to coverage of other agricultural productions can give only some hints.

Such calculations done by KREISL (1987) and MYLIUS (1990) demonstrate that the low price for chipwood and the low subsidy are the decisive factors of the non-profitability. In 1989 the price of 1 odT chipwood was about S 1,000 and the one-time State subsidy amounted to S40,000 per hectare.

With this single subsidy of S 40,000 per hectare, proceeds of S 1,400-S 1,600 per odT are necessary to reach the contribution to coverage of cereal on average soil.

Comparing the one-time subsidy to the yearly export costs of barley and maize of S 10,400 and S 18,400 or the export relief of 3,000 kg milk of S 20,100 (Mylius, 1990, modified) the subsidy of energy forestry is too low.

On the other hand, the result per working hour is up to six times lower than in other agricultural branches showing the working intensity of short rotation forestry mainly at the harvest. But this work has to be done in late winter, a period without working peaks for farmers.

Another disadvantage is that the periods between the rotations bring no money.

As a result of these poor economic results, today's short rotation forestry is only advised to farmers under special conditions:

- farm is situated in deciduous region,
- farmer owns only a small forest area and has no thinning backlogs,
- farmer uses the chipped wood by his own,
- farmer has free working capacity,
- farmer owns suitable machines.

THE MARKET SITUATION

The low price of wood chips, where the energy content is underrated, is the result of the competition of cheap oil and saw mill by-products.

Therefore, it is necessary to increase the demand of energy wood by promoting, planning and building biomass heating systems. In 1990 in Austria 9,626 biomass stoves and local heating stations, representing a capacity of 1,108 megawatt, were installed and need about 1 million odT wood and bark each year (1.1 million cubic metres).

From 1980 to 1990, the development of the capacity of the heating stations is shown in figure 3 (Jonas, 1990).

ECOLOGICAL ASPECTS

In general, energy forestry means an extensivation of agricultural land and has favourable influences on the soil (DIMITRI, 1984). Compact soil will be broken up by the roots of the trees, the physical and chemical conditions will be improved by leaf litter. The upper strata will be better in humus and the number of micro-organisms increased (MAKESCHIN et al., 1989).

Energy forest stands protect the soil against erosion and evaporation and provide a biotop to birds and other vertebrates.

From the environmental aspect, no surplus carbon dioxide will be produced.

CONCLUSIONS

National and international research programmes give enough results on production techniques of short rotation forestry.

The next aim of our research is to broaden the genetic base of poplars and willows by testing clones coming from regions of similar climatic conditions.

Problems exist until now on harvest machines and on the drying of fresh chipped wood. At the moment an interesting study about drying under anaerobic conditions is done. Being successful this will be a big step to reduce harvesting costs and work.

In the last few years, the development of heating systems and stoves towards higher efficiency and lower emission rates makes good progress.

National economics and ecology also point to short rotation forestry.

But the key to solving the stagnation problem of energy forestry is the agrarian policy.

Energy production from biomass has to get more priority against fossil energy sources.

We need a tax on oil, gas and coal and no longer a substitution of external cost of these "fossil" energy forms, regulations of using electricity for heating and subsidies to build more biomass heating stations. This will guarantee a fair price of chipwood and the profitability of energy forestry for farmers.

The easier, quicker but worse way to reach profitability is to increase the subsidies of short rotation forestry.

Afterwards, the motto will become true: The farmer serves the dish and warms the house.

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FIGURE 1: Short Rotation Forestry in Austria
total area - 650 hectares

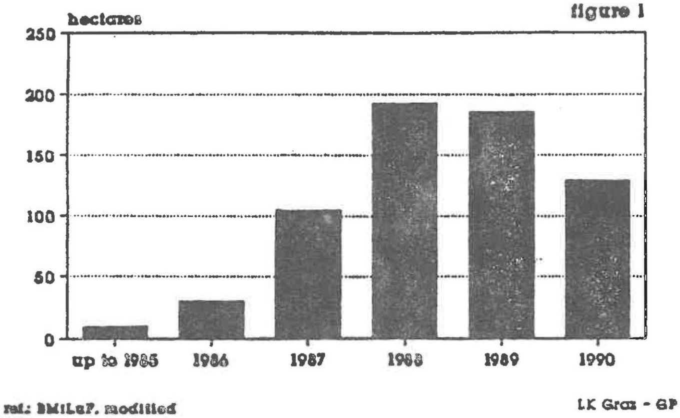


FIGURE 2: Short Rotation Forestry in Austria
distribution of tree species up to 1990

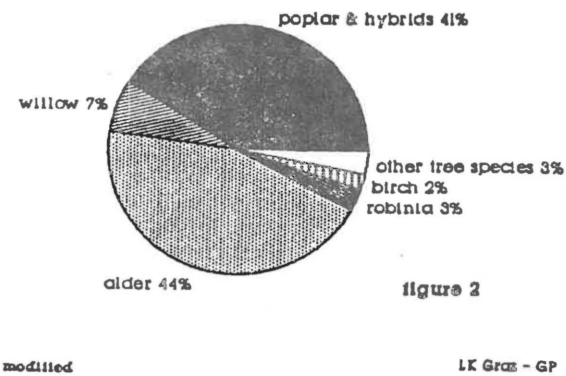
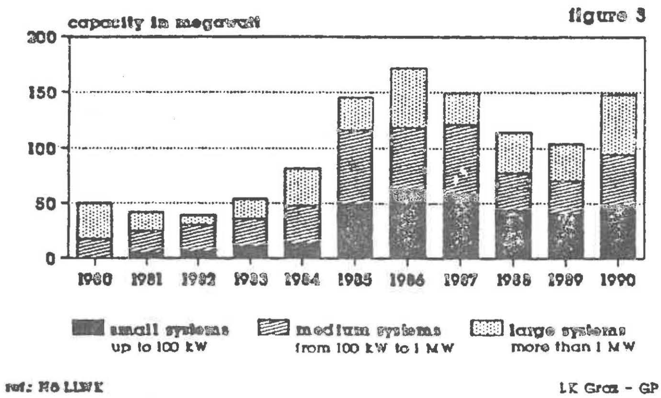


FIGURE 3: Biomass Heating Systems in Austria
total capacity - 1.100 megawatt, 1980-1990



ИСПОЛЬЗОВАНИЕ СЕЛЬСКОХОЗЯЙСТВЕННЫХ ЗЕМЕЛЬ В ЦЕЛЯХ, НЕ СВЯЗАННЫХ С ПРОИЗВОДСТВОМ ПРОДОВОЛЬСТВИЯ

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1. Структурные изменения в экономике, урбанизация, развитие научно-технического прогресса вносят коррективы в землепользование. Значительные площади сельскохозяйственных угодий отводятся под объекты производственного и непроизводственного строительства, подтапливаются, засоляются вследствие водохозяйственного строительства. Это наносит не только экономический, но и экологический ущерб. Уменьшение земельных угодий на душу населения происходит не только в результате роста численности населения страны, но и отвода земель в несельскохозяйственные цели. Если в 1970 году на душу населения приходилось 0,93 га пашни, то в 1989 году - 0,79 га.

По данным на 1 ноября 1988 года, площади сельскохозяйственных угодий, используемых на несельскохозяйственные цели, составили: населенных пунктов 2 031,5 тыс. га; предприятий промышленности, транспорта, курортов, заповедников и иного несельскохозяйственного назначения - 15 989,5 тыс. га. Это составляет более 3% всех сельскохозяйственных угодий страны.

Вместе с тем привлекает внимание масштабность отвода земель в несельскохозяйственных целях в отдельных регионах страны. Подавляющая часть земель, отведенных в несельскохозяйственные цели, падает на Казахскую ССР - 15,0 млн. га, или 83% общей их площади в СССР. Доля же таких крупных республик, как РСФСР, Украинская ССР, составляет 12,0-1,5%.

В Казахской ССР более высок и удельный вес сельскохозяйственных угодий, отведенных в несельскохозяйственных целях, в общей их площади в республике. Если в целом по стране доля земель, отведенных под населенные пункты, промышленные предприятия, нужды транспорта, курорты и иные объекты, составляет 3,0% сельскохозяйственных угодий всех землепользователей, то в Казахской ССР - 6,8%. Наименьший удельный вес в общей площади сельскохозяйственных угодий, используемых в несельскохозяйственных целях, отмечается в Туркменской ССР, Молдавской ССР, Узбекской ССР - 0,3-0,6%.

Участки земель и водные пространства, в пределах которых отводится весь природный комплекс, изымаются полностью из хозяйственного пользования. В них запрещается любая хозяйственная деятельность, вызывающая нарушение природного комплекса. В биосферных заповедниках (национальный парк и др.) защита природных комплексов сочетается с научными исследованиями, долговременным мониторингом среды.

2. Общая площадь земель, находящихся в пользовании сельскохозяйственных предприятий и хозяйств, а также Госземзапаса, лесных организаций и прочих землепользователей составляет 2 227,6 млн. га. По данным на 1989 год, площадь земель, находящихся в пользовании предприятий и хозяйств, равнялась 1 055,0 млн. га. Из них на долю сельскохозяйственных угодий (пашня, залежь, сады, виноградники, сенокосы и пастбища, кроме оленьих пастбищ) приходится 557,9 млн. га, или 53% их общей площади.

Площадь земель, находящихся в Госземзапасе и в ведении лесных организаций (без земель долгосрочного пользования колхозов и совхозов) составляет 1 098,5 млн. га, в том числе 27,4 млн. га сельскохозяйственных угодий.

В пользовании прочих организаций находится 74,1 млн. га общей земельной площади, в том числе 17,5 млн. га сельскохозяйственных угодий, из них на долю пастбищ падает 16,3 млн. га.

Что же касается динамики землепользования, то происходит сокращение площадей сельскохозяйственных угодий, числящихся в Госземзапасе и в пользовании лесных организаций. Если в 1971 году площади сельскохозяйственных угодий указанных организаций составляли 41,1 млн. га, то в 1989 году - 27,4 млн. га. Площадь сельскохозяйственных угодий прочих землепользователей за этот период уменьшилась с 20,3 млн. га до 17,5 млн. га.

3. Происходит трансформация сельскохозяйственных угодий. За 1970-1989 годы площадь пашни возросла на 1,7 млн. га. В то же время площади сенокосов сократились на 9,3 млн. га, а площадь пастбищ, наборот, возросла на 21,5 млн. га.

Посевные площади сельскохозяйственных культур за указанный период увеличились на 3,1 млн. га.

4. Площадь распаханных земель практически стабилизировалась. Вместе с тем продолжается процесс выделения земель под промышленные предприятия, жилищное строительство, инженерные коммуникации. При этом под эти объекты нередко отводятся плодородные земли, что уже отмечалось.

Однако трудновыполнимой задачей является достаточно точное определение размеров площадей сельскохозяйственных угодий, используемых в целях, не связанных с производством продовольствия. Можно только предположить, что часть земель, находящихся, например, в Госземзапасе и в ведении прочих землепользователей, используются не для производства продовольствия.

5. Из 557,9 млн. га сельскохозяйственных угодий, находящихся в пользовании предприятий и хозяйств, на долю пашни приходится 225,4 млн. га, или 40,4%, сенокосов - 30,5 млн. га, или 5,5%, пастбищ - 296,5 млн. га, или 53,1%.

Однако по регионам страны в структуре сельскохозяйственных угодий имеют место более существенные различия. Так, если в Украинской ССР доля пашни в сельскохозяйственных угодьях составляет 81%, то в Туркменской ССР - лишь 3,5%.

В целом по стране структура посевов выглядит иначе. На долю зерновых культур приходится более 53%, кормовых культур - 35,2%, масличных культур - 3,0%, картофеля и овощей - более 2%.

На долю культур непродовольственного назначения в посевных площадях приходится 4,8 млн. га, или 2,3%.

В силу этого наблюдаются существенные различия в уровне жизни населения отдельных регионов страны, если учитывать не столько денежные поступления в семейный бюджет, сколько наличие продуктов питания. Взять, например, республики Средней Азии, где в условиях малоземелья монопольное положение занимает хлопчатник. В качестве примера можно взять Узбекскую ССР, где площадь пашни составляет 4,5 млн. га, а посевная площадь - 4,16 млн. га. Посевная площадь хлопчатника составляет 1,97 млн. га, или 44% площади пашни республики. В посевной площади колхозов на долю хлопчатника приходится 64%.

Такая структура посевных площадей обусловливает низкое потребление продуктов питания, особенно животного происхождения. Так, колхозники Средней Азии в год потребляют: мясо - 8-30 кг, молоко - 86-219 кг, яиц - 40-200 штук. Это несколько раз меньше, чем требуется для нормальной жизнедеятельности человека.

6. В решении продовольственной проблемы важное место отводится адаптивному земледелю, в основе которого лежит нахождение путей максимального соответствия растений среде их возделывания, продуктивного развития.

С учетом этого возможны различные варианты, связанные, например, с улучшением почвы для возделывания культур или с подбором растений для соответствующей почвы. Это значит, что размещение культур следует осуществлять в регионах, где для них имеются оптимальные общие и экологические условия.

В соответствии с этим осуществляется рациональное районирование культур с учетом их потребностей в питании, реализуя генетический потенциал растений. Однако антропогенное воздействие на почву, растительность и атмосферу не должно выходить за пределы, когда уже происходит падение эффективности агроэкосистемы. Вместе с тем требованием к агроэкосистемам является обеспечение устойчивости развития аграрного производства.

При этом экологические аспекты земледелия требуют пересмотра сложившихся представлений как о системе земледелия в целом, так и о ее составляющих.

Для перевода земледелия на экологические принципы исследования проводить, исходя из общих законов трансформации вещества и энергии, с учетом особенностей их действия в агроэкосистеме 1/.

7. Существенные изменения в структуре сельского хозяйства СССР будут происходить в связи с ориентацией в аграрной политике на развитие многообразия форм хозяйствования, особенно фермерства, арендного землепользования и т.д. Уже сейчас в стране функционирует более 40 000 крестьянских хозяйств. Такая ориентация ведения сельского хозяйства существенно скажется на аграрные структуры с учетом спроса и предложения. Изменится также специализация производства в регионах страны, исходя из интересов населения.

С учетом этого предполагается существенно изменить направления научных исследований. Речь идет, в частности, о функционировании крестьянских хозяйств и сельскохозяйственных кооперативов, их оптимальных размерах в различных природно-климатических условиях страны, создании социологического мониторинга применительно к крестьянскому укладу жизни, механизме их взаимодействия с другими формами производства.

8. Значительные площади земель сельскохозяйственного пользования выпадают в результате их загрязнения радиоактивными веществами. Это связано прежде всего с аварией на Чернобыльской атомной электростанции (АЭС), в результате которой произошло радиоактивное загрязнение местностей в Европейской части СССР. Радиоактивному загрязнению подверглись отдельные области Украинской ССР, Белоруссокй ССР, РСФСР.

1/ Журнал "Вестник сельскохозяйственной науки". М., 1991 год, № 1, стр. 47-49.

Наиболее опасное радиоактивное загрязнение, прежде всего, цезием 137 (выше 15 кюри/кв. км) произошло в Киевской и Житомирской областях Украины, Могилевской и Гомельской областях Белоруссии, Брянской области РСФСР 1/.

Повышенные уровни загрязнения имели место в Тульской, Орловской, Калужской областях Российской Федерации, Черкасской, Ровенской, Винницкой и Ивано-Франковской областях Украины.

Оценки Государственного Комитета СССР по гидрометрологии площади загрязненных территорий приводятся в таблице 2/.

Плотность загрязнений (кюри/$км^2$)	5-15	15-40	Более 40
Республики	Площади загрязненных территорий		
Белорусская ССР	10 160	4 210	2 150
Украинская ССР	1 960	820	640
Российская советская Федеративная социалистическая республика	5 760	2 060	310
Всего	17 880	7 090	3 100

Однако с учетом так называемых локальных "пятен" повышенного загрязнения, образовавшихся вследствие накопления радиоактивности или занесения ее извне на мелкие участки в несколько квадратных метров, общая площадь загрязненных территорий будет больше. Эти участки сосредоточены, как правило, вблизи домов, в пониженных местностях, где радиоактивность образуется в результате смыва с дождями и водостоком. Надо сказать, что на этих участках сельскохозяйственная продукция не производится.

К этому следует добавить то, что выпадения радиоактивных продуктов в апреле-мае 1986 года в результате аварии на Чернобыльской АЭС были зарегистрированы (в период прохождения загрязненных воздушных масс) на других территориях страны.

Однако выпадения радиоактивных продуктов носили кратковременный характер и сколько-нибудь существенно не повлияли на уровень загрязнения местностей за пределами Европейской части СССР.

1/ Журнал "Наука и жизнь", № 9. 1990 год, стр. 29.

2/ Журнал "Наука и жизнь", № 9, 1990 год, стр. 29.

Тем не менее продолжается слежение за радиационной обстановкой на всей территории Украинской ССР, Белорусской ССР и РСФСР. Например, детальное обследование радиационной обстановки проведено на 100 000 личных подсобных хозяйствах населения 1/.

9. Стоимость освоения новых земель и размеры компенсации по регионам страны различны. Это зависит от качества почвы, окультуренности, наличия на них оросительных систем.

Вместе с тем советскими специалистами предлагаются и другие методы определения наносимого сельскому хозяйству ущерба в результате изъятия сельскохозяйственных угодий. Предлагается, например, исходить из комплексной оценки изымаемых земель, из оценки не компенсации нанесенного ущерба, а из оценки его предотвращения. При этом имеется в виду, что общий ущерб должен определяться из многих слагаемых: уменьшение производства продукции сельского хозяйства, уменьшение производства другой продукции (леса), затраты на рекультивацию земель, убытки от ликвидации или неиспользуемых средств из изъятой из хозяйства земли, ухудшение условий воспроизводства, ухудшение социальных условий жизни, прочие убытки 2/.

Косвенные потери колхозов и совхозов при изъятии их земель возникают в связи с нарушением экологического равновесия, в частности, в результате изменения рельефа, загрязнения почвы. Существенный ущерб наносится сельскому хозяйству - процесс необратимости значительных площадей сельскохозяйственных угодий. Значительные площади земель отводятся и под внутрихозяйственное строительство. При этом нередко хозяйствам потери компенсируются неполностью. По данным отдельных авторов, сумма возможных потерь больше, чем в 3 раза, меньше рассчитанной по недополученному с занятой площади дифференциальному доходу 3/. Прямые потери сельского хозяйства, например Краснодарского края, от изъятия земель для государственных и внутрихозяйственных нужд за 1976-1983 годы составили 49,9 млн. руб., а фактически возмещено только 15,9 млн. руб. (там же).

Учитывая сказанное, требуется усилить экономические меры по предотвращению необоснованного изъятия земель из сельского хозяйства. Для этого необходимо разработать научно обоснованную методику выявления убытков от изъятия земель в несельскохозяйственных целях. Существующие методические подходы к определению потерь при изъятии продуктивных земель не в полной мере улавливают фактические народнохозяйственные убытки. К тому же расходы на освоение новых сельскохозяйственных угодий взамен изымаемых не учитывают в достаточной мере плодородие почв, потерь продукции за период освоения новых участков.

1/ Там же.

2/ Рекультивация земель. Днепропетровск, 1987 год, стр. 159.

3/ Пути улучшения использования земли в условиях индустриализации сельского хозяйства. Краснодар, 1987 год, стр. 40.

Резюме

Советский Союз располагает исключительно большими земельными ресурсами, в том числе для производства сельскохозяйственной продукции, продовольствия. На душу населения приходится 2,1 га сельскохозяйственных угодий. Наблюдается абсолютное уменьшение площади сельскохозяйственных угодий, составив 4,0 млн. га за 1970-1989 годы. За этот период площадь сельскохозяйственных угодий на душу населения снизилась с 2,5 га до 2,1 га, а площади пашни - с 0,93 до 0,79 га.

СССР располагает достаточными земельными ресурсами не только для обеспечения населения страны продовольствием, по научно обоснованным нормам потребления, но и для его экспорта.

Однако изъятие сельскохозяйственных угодий в целях, связанных со строительством промышленных предприятий, гидротехнических сооружений, горных предприятий (без должной затем их рекультивации), развития городов, усложняет решение продовольственной проблемы в стране, особенно в отдельных ее регионах. Социально-экономически неоправданным является отвод плодородных земель под указанные и другие объекты. Это особенно касается таких малоземельных районов, как Средняя Азия, Северный Кавказ, Закавказье.

К тому же ситуация резко ухудшилась в связи с аварией на Чернобыльской АЭС, в результате которой произошел выброс значительного количества радиоактивных веществ. Площадь земель с плотностью загрязнения от 5 и более кюри составляет 2,8 млн. га. Если учесть загрязнение с уровнями от 1 до 5 кюри, то эта площадь значительно возрастет. Из оборота выведена часть сельскохозяйственных угодий, прекращено лесопользование на отдельных лесных территориях.

Программами ликвидации последствий Чернобыльской аварии предусмотрены меры, обеспечивающие прежде всего охрану здоровья населения, приведение агропромышленного производства в соответствие с требованиями выращивания экологически чистой продукции.

Продолжаются обследования по выявлению и уточнению радиоактивного загрязнения на территории Российской Федерации, Украинской ССР и Белорусской ССР. Вместе с тем есть необходимость в обследовании новых территорий, в частности Белгородской, Липецкой, Воронежской, Тамбовской областей РСФСР, Винницкой, Ровенской областей Украины, части Минской области Белоруссии и других.

Подлежат переселению жители десятков, а то и сотен поселений, подвергшихся радиоактивному заражению. Это значит, что дополнительно выпадут из сельскохозяйственного оборота значительные площади плодородных земель.

UTILIZATION OF AGRICULTURAL AREAS FOR NON-FOOD PURPOSES IN HUNGARY

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INTRODUCTION

In Hungary, the role of agriculture is attributed a higher importance than in European countries with a developed industry, because the aim is not only to satisfy the food requirements of the population and tourism at relatively low prices. Foreign trade has also an important role, namely, agricultural and food products present 20-23 % of the total exports of the country. The currency earning export has a special significance. It amounted in 1990 to 2.7 billion dollars, and the export-import balance showed a surplus of 1.3 billion dollars. Its significance is increased by the fact that besides agriculture only tourism is able to produce significant foreign currency earnings. (Food and agricultural imports to Hungary include tropical fruits, consumer goods and the protein to feedstuffs.) Sixteen per cent of the GDP is produced by agriculture, 1 % by sylviculture and 1.5% by the food industry. Twelve per cent of the active wage-earners are employed in direct agricultural production, 4% by the food industry and about 6 % by the non-agricultural activities of agricultural large-scale farms (commercial, service industrial etc. activities). Thus 22 % of the total number of active wage-earners is tightly attached to agricultural production.

The above results have been produced by agriculture in spite of the fact that in Hungary "the biblical seven lean years" have been repeated, because a series of years of drought hit the agriculture. Unlike other East-European former "socialist" countries, a continuous oversupply situation has developed in the food market of Hungary. However, the supply situation up to recent years was not tense, since the surplus supply was carried away by foreign trade and other interventions. The State leadership even pressed for the cultivation of marginal areas, mainly because the population of these areas had only this kind of means of subsistence. A reduction or stop of production would have increased the existing social-economic stresses in the less-favoured regions. Under such circumstances, the utilization of agricultural areas for non-food purposes arose earlier only with an experimental or research aim.

The situation has totally changed at the end of 1990 and in 1991, when more factors have had an influence on this:

- the domestic consumption has been strongly reduced due to the reduction of living standards, brought about in reality by the repeated and continuous quick modification of the deformed price system;
- the COMECON collapsed, the traditional markets belonging to the organization fell apart. The transition to dollar accounting between the previous member-countries is coupled with a number of tensions, partly because buyers are insolvent, partly because the transition means a new technique of settling. As a result, for instance, the opening of accreditives had to be postponed or arrived late;
- opening up new export markets requires a considerable time;
- agricultural export subsidies have been radically reduced, and thus a significant part of the products can be exported only with losses. In order to avoid misunderstanding, we have to remark, however, that the Hungarian agriculture received benefits from less subsidies compared to the EC countries.

In this study the authors are dealing with six subjects. In these areas, there are Hungarian experiences:
- review of the reduction of agriculturally utilized areas;
- spreading of afforestation;
- hunting, game husbandry;
- spreading of medicinal herb production;
- tourism including rural tourism offering holidays in the village;
- pushing forward of non-agricultural activities in agricultural farms.

THE REDUCTION OF THE AGRICULTURALLY UTILIZED AREA

On 70 % of Hungary's territory, food is produced; an even larger proportion can be found only in one European country. However, the agriculturally utilized areas have been radically shrinking (table 1) after the Second World War. The rapid industrial development, the widening of the residential quarters and family house building in the villages, the spreading of infrastructure occupied significant areas. All these were connected with economic development in Hungary lagging behind Western Europe.

In countries with a centrally planned economy - according to the predominant ideology - arable land had no value and price, and sale and purchase of land was restricted only to building plots, sites for weekend houses, and hobby gardens. The "land without value" principle entailed in many cases that larger areas of good quality land have been appropriated for various establishments. The agriculturally arable area (i.e. arable land, garden, orchard, vineyard and green areas) has been reduced between 1945 and 1990 by more than 1 million hectares, by 13.7 %. Half of this has been utilized for building, so it has been lost for ever for the agriculture; the other half came under afforestation. Arable land during this time has been reduced by 4.7 %, by more than 400,000 ha.

SYLVICULTURE

In the utilization of agricultural areas for non-food purposes, sylviculture has gained the greatest role. In 1945, 12 % of Hungary's territory were covered by woods (1.1 million ha), while in 1990 18 % (1.8 million ha). Thus, during that period the area of forests increased to an unprecedented degree by international standards, by more than 50 %.

Afforestations have been financed by the State budget on more disadvantageous, (from the point of agroproduction) so-called marginal areas: these are eroded hilly countries, lowland sandy soils and grassland, but in certain areas significantly increased also the territory of meadow-protecting forest strips.

The primary aim of afforestation has been the more rational land utilization and mainly so-called use-forests were established, the maximal utilizational value of which is woodfelling. However, it served also environmental protection, recreational aims, and it created also opportunities for employment; finally it resulted also in the widening of game husbandry and the related services.

The amount of planted species of trees and their related proportion is influenced by the possibilities of the growing area and the aim of utilization. Mostly quick growing, earlier utilizable species came into the limelight (generally acacia, on humid areas the cellulose aspen, poplar), but it has also been a basic viewpoint to increase at individual territories the amount of forests consisting of native tree species.

In Hungary, as in countries lacking traditional energy resources (oil, gas, coal), the rise of energy prices again and again raises the concept of establishing energy-forests. Their yield can be utilized not only for industrial processing (like production of fibreboard), but also for energy production.

For energy purposes, mainly the acacia is suitable for domestic demands. According to concrete operational tests in a two-year woodfelling 11 t/ha, while in a three-year felling 28 t dry material has been gained, translated to oil equivalent means an amount of 3.5 t/ha. On a unit of area, therefore, four to five times so much production value can be produced, than in wheat growing.

Afforestation is also justified by the fact that in Hungary the product of leafy forests amounts to 157 cu.m/ha. This is a result of soil and climatic conditions, while in Europe the same on average is 80 cu.m, in Czechoslovakia 108 cu.m/ha. Even the average of other continents lags behind, except Southern America, where this figure is 190 cu.m/ha.

In spite of the mentioned vast afforestations, the proportion of forests out of the total land in Hungary amounts to only 18 % and this places the country among the European countries to the last third part. The long-term concepts count with about 2.5 million ha forest area, so with the further afforestation of about 800,000 ha of new forest. With the afforestation on agricultural areas of lower productive value, the average efficiency of agroproduction would be improved, and the increase of domestic woodfelling, on the other hand, would bring about a reduction of imports. In case of its realization, afforestation could be carried out on approximately 200,000 ha eroded hilly plough-land, on 80,000 ha other, marginal plough-land (plough-lands wedged between forests, otherwise difficult to reach and with weak production value) and on 520,000 ha grassland. In this way, the proportion of forest areas would go beyond 25 % of the country's territory.

GAME HUSBANDRY AND HUNTING

The reserves inherent to game husbandry, to the organization of hunting, further to the connected tourism are really significant. The future of the organization of hunting parties are jointly established by the excellent quality of game stock, the fair number of gold trophies, the original "Lebensraum" offering abundant fodder which means at the same time the utilization of agricultural areas for this purpose. Namely, the big game gets back to the uninterrupted forests, to their original "Lebensraum". Their extension can be solved by the afforestation of agricultural areas wedged between the woods. Other agricultural areas can be transformed into game pastures and areas producing additional winter game-fodder. The hatching and breeding plants for small game, the hunters' lodges and other additional establishments might also reduce the agricultural areas.

Beside the traditional forms of hunting (drive) propagation of new forms of hunting can be developed which might be coupled with coach driving, riding, recreation, too.

THE PROPAGATION OF MEDICINAL HERB PRODUCTION

The utilization of plant material of natural origin in the pharmaceutical and other industries came into the centre of interest during recent years. The explanation for this is partly that following the energy crisis, the constraints aimed at the earlier total syntheses slowed down which led to the rediscovery of natural plant resources. This tendency can be felt in Hungary even in the pharmaceutical industry which is regarded as a well developed one. The interest is worldwide which is indicated by the fact that the annual foreign trade turnover of plant seeds, flowers and plant parts for medical, cosmetical, insecticide, fungicide etc. aims increased from $ US 52.9 million in 1967 to its tenfold by 1980, and this sum does not contain the traffic of volatile oils.

The increase of the production and utilization of special plant agents can be expected on the following main fields of utilization:

- in the pharmaceutical industry,
- in food and flavour industry,
- in the cosmetical and household-chemical industry and
- in the industry for plant protecting agents.

The area utilized for the production of special plant material is at present about 25,000-32,000 ha annually. The area under these cultures is scattered, the technological background is greatly differentiated. With certain medicinal herbs, an advanced technology has been developed in Hungary (for instance, poppy, ergot).

The territory utilized by growing medicinal herbs has to be increased in the near future to its twofold, by 50,000-60,000 ha, in order to meet the expected demand.

For the increase of the area and the growing of plants containing special agents, the following basic conditions must be met: the available assortment of species and variety must be protected; the R & D has to be concentrated by which the increase of their biological productivity can be secured; a market research has to be carried out in order to adapt to the internal and external market demand. It can be supposed that by fulfilling these conditions, further agricultural areas can be drawn into the production of medicinal herbs.

TOURISM AND THE ORGANIZATION OF RURAL TOURISM OFFERING RECREATION IN THE VILLAGE

Hungary's regional beauties, its cultural and architectural values, natural rarities enable the efficient development of domestic and foreign tourism. The utilization of these features is obvious too, because tourism is one of those activities resulting in revenues of convertible foreign exchange and their domestic profit rate is also higher than the average.

Tourism offers, beside agriculture, an employment chance and income through entertainment of guests, services, cleaning, guiding, etc. Tourism at the same time diverts areas from agricultural production by establishing roads, shops, restaurants, by building parking lots and roads for bicycles.

On the basis of Hungarian experiences, it has become advantageous (beside the different local, or regional programmes) to include settlements, regions, or the homestead farmer into a tourist programme of greater dimension. It is worth mentioning that more and more farm buildings are being transformed for tourist purposes, where the recreation is coupled with riding and other leisure activities.

Consequently, tourism (because of its space demand and of the load on the area) should be harmonized with the ecologic features, with agriculture, cultural possibilities, food processing, organizing shooting parties, sport angling, various sporting opportunities, as well as with transportation etc. Moreover, it is not enough to build roads, motorways, but smaller airports should also be established which again means the binding of further agricultural areas.

After a break of more decades, organized holidays in the village started again in Hungary, at the end of the 1980s. Organized holidays in the village, i.e. when rural people keep their main occupation, but as a sideline take part in the arrangement of organized holidays. This does not affect the settlement and the agricultural area of the region. The holiday village, i.e. when a great percentage of the stock of flats in the village serves vacational activities, reduces significantly the agricultural area because of the infrastructural demand on roads, buildings, on urban reconstruction and extension of the village at the expense of agricultural areas.

Medicinal tourism reduces the agricultural area by establishing swimming pools, hotels, roads, parking lots. The preconditions for medicinal tourism in Hungary are given, since almost 10% of villages can be included into the holiday home network, they have medicinal or thermal water, or beach. They are to be found throughout the whole country.

Visiting of castles and residences, spending holidays there arises similar interest. This again might reduce agricultural areas by the widening of parks around these buildings.

The national parks and landscape-protection areas attract visitors by their beauty and natural rarity. Their expansion is required because of the more effective environment protection, protection of the reserves, the special animal and plant species. In the 1980s, 427,000 ha were kept under protection out of which the territory of national parks is 121,000 ha, the rest constitutes region- and landscape-protection areas. As it has been mentioned, their extension is important, because during the last 100 years 29 species of national flora have disappeared and the existence of another 30 species is in danger. It is to be hoped that as a result of the extension, the rare animal and plant species and their symbiosis will still remain.

The sporting opportunities (golf links, riding rings and roads, fish ponds, etc.) also appear with demands for extension.

THE NON-AGRICULTURAL ACTIVITY OF AGRICULTURAL LARGE-SCALE FARMS

In Hungary, the agricultural areas with low quality soil are concentrated in areas with general economic backwardness and underdeveloped infrastructure. In such areas, there is no local industry and so about 40 % of the active population is earning a living outside agricultural production, while about 50 % commute to other settlements to work. In these regions, a great stress lies on the agrarian production, forcing the agricultural utilization of the poorest quality soils. This strain can be alleviated only if employment opportunities are created for the population of these regions in industry and in various services. Among others, the subsidies and allowances serve this aim which stimulate the agricultural large-scale farms with adverse conditions to employ their workers in non-agricultural production to a greater degree.

In Hungary, 33 % of those employed in agriculture are working in industrial, commercial, or service activities, in other words in non-agricultural activity of the agricultural large-scale farms. Fifty-six per cent of income to the farms, and 32 % of the VAT originates in such activities. Although the extension of non-agricultural activities directly do not draw away too much area from agriculture, its indirect effect is significant. Namely, the farms are not forced to establish for their workers employment opportunities in food processing.

TABLE 1: THE SHARE OF DIFFERENT ACTIVITIES IN HUNGARY'S AREA *

Denomination	A R E A				Change 1945 = 100 %
	in 1945		in 1990		
	1 000 ha	%	1 000 ha	%	
Plough-land	5 567.1	60.0	4 712.8	50.7	84.6
Garden, orchard	115.1	1.2	436.7	4.7	379.1
Vineyard	215.4	2.3	138.4	1.5	64.2
Grassland	1 600.7	17.3	1 185.6	12.7	74.1
Agric. cultivated area	7 498.3	80.8	6 473.1	69.6	86.3
Forest	1 115.5	12.0	1 695.4	18.2	152.0
Reeds	28.8	0.3	40.3	0.4	139.9
Fish ponds	14.6	0.2	26.9	0.3	184.2
Arable land	8 657.2	93.3	8 235.7	88.5	95.1
Out of cultivation	620.9	6.7	1 067.5	11.5	171.9

* 93,030 km^2

USE OF AGRICULTURAL LAND FOR NON-FOOD PURPOSES IN THE NETHERLANDS

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1. INTRODUCTION

Land may be used for agricultural and non-agricultural purposes. The agricultural output of the land within the EC ist too big for the traditional market situation and is getting bigger every year. With an increase in productivity of 1% to 2% per year and a market that remains constant, the acreage surplus in the EC rises accordingly. It is presently estimated at a total of some millions of acres.

What are the possibilities for this land? What are the alternatives? One possible alternative might be to open up new markets such as the industrial raw material market (agrification). Agrification is defined as the use of agricultural raw materials for non-food uses. Other alternatives might be use of land for non-agricultural purposes (nature, outdoor recreation and forestry).

In this paper an analysis is made for the situation in the Netherlands. After some general remarks about land use in the Netherlands (par. 2), the alternatives will be mentioned: renewable raw materials and sources of energy (par. 3), the setting-aside of land (par. 4), nature and landscape (par 5), outdoor recreation (par. 6) and forestry (par. 7). Finally the interaction between different forms of land use will be discussed (par. 8). The paper concludes with a summary (par. 9).

2. LAND USE IN THE NETHERLANDS

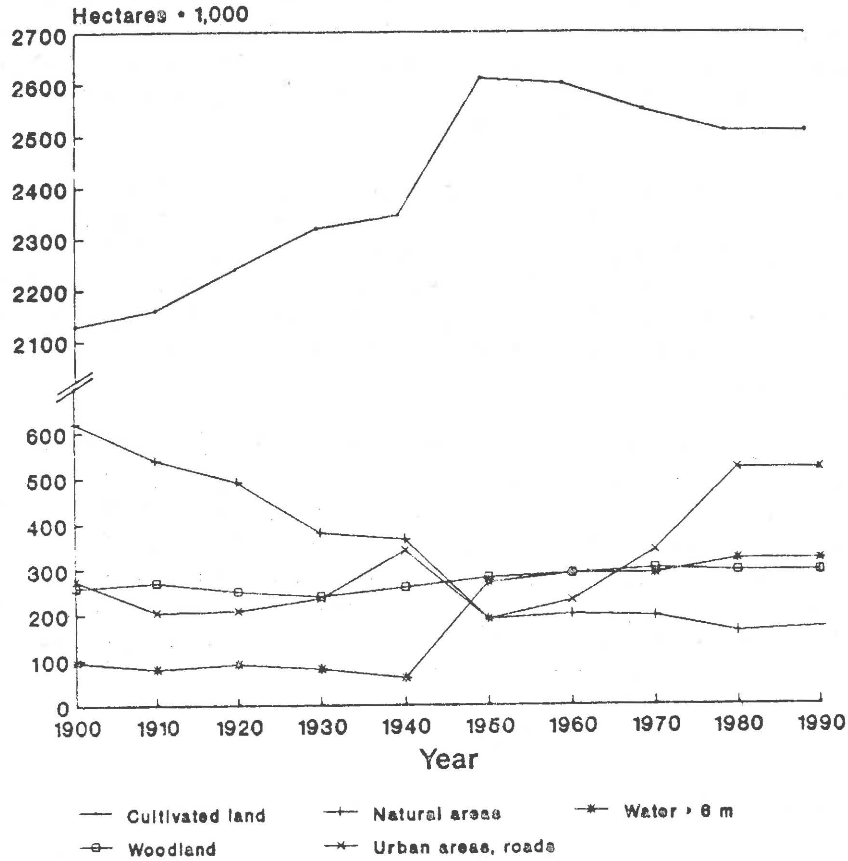
a) Aggregate land use

The total area of cultivated land in the Netherlands was 2,019,000 ha in 1988. For the same year this was an estimated 128,643.000 ha for the whole of the EC. The Dutch share in this, a mere 1.6%, is relatively small.

It must be said however, that the Netherlands are a special case. Not only because there are a number of sectors demanding more land for agricultural purposes, but the density of the country's population also calls for land for non-agricultural purposes: for urban areas, for natural and woodland areas and for outdoor recreation. There is a keen competition for land. Land prices are a good indication for the value of agricultural land.

Figure 1. gives a survey of the changes in land use in the Netherlands between 1900 and 1984.

FIGURE 1: Changes in land use in the Netherlands between 1900 and 1984.



Source: NBP, 1990

b) *Cultivated land*

Around 1940-1950 there is a gradual change in the development of land use. Agricultural use is on the increase during the first half of this century but then there is a drop. The amount of land for urban areas initially remains fairly stable but after 1950 there is a huge increase. There is an initial decrease in the land for natural areas when natural areas are reclaimed for agricultural purposes, but after 1950 such reclamation is negligible. The amount of woodland area remains virtually the same.

In table 1. a survey is given of the use of cultivated land in the Netherlands in 1989.

TABLE 1: Area of cultivated land in 1989
(water and wetlands excluded)

	Area (x 1 000 ha)	%
Grassland	1 099	55
Arable crops	801	40
incl. silage maize	208*	-
Horticultural crops	104	5
incl. under glass	9.6	-
incl. in the open	94	-
Set-aside land	5.7	-
Total	2 004	100

Source: Netherlands Central Bureau of Statistics
* mainly on dairy farms

In the Netherlands grassland and arable crops take up most of the cultivated land area. A subdivision of horticulture is the ornamental plants (the growing of plants, flowers, bulbs and trees). Ornamental plants cover about 30,000 ha. As the area taken up by horticulture is relatively small compared to the whole it will subsequently be left out of consideration.

In 1988 agricultural enterprises made up 4.5 % of the total of enterprises in the Netherlands and provided 3.9 % of the national income. Farming accounted for 5.5 % of national employment.

3. RENEWABLE RAW MATERIALS AND SOURCES OF ENERGY

Table 2 gives a survey of the division of arable land by crop. Most of these crops have non-food potential.

TABLE 2: Area of arable land by crop in 1989 (x 1,000 ha)

Cereals	204.4	
Pulses	25.8	
Cash crops	13.3	
incl. oilseed rape		6.3
caraway seed		0.6
flax		5.3
evening primrose		0.6
Agricultural seeds	25.7	
Root crops	291.4	
incl. seed and eating potatoes		104.8
industrial potatoes		60.2
sugar beets		123.8
Fodder crops	208.0	
Green manure crops	2.8	
Further crops	24.4	
Total	795.8	

Source: Netherlands Central Bureau of Statistics

3.1 Renewabel Raw Materials

a) Present situation

The production of raw materials for non-food purposes in the Netherlands has a long-standing tradition. In the late Middle Ages, in the 14th and 15th centuries already, oilseed rape, hemp, flay and dye crops were grown.

Rapeseed oil was used as lamp oil, frying oil and for various technical purposes. Hemp was used for making ropes and cloth, particularly for sailing vessels. Flax fibres were used for linen. Dye crops were used in the textile industry. In the 17th century the growing of tobacco was added to the production of non-food crops. The import of competing products such as cotton (19th century) and the competition of the petrochemical industry (20th century) had its effect on the position of the Netherlands as a supplier of raw materials and non-food crop production declined.

The potato starch and strawboard industries set up in the last century offered new opportunities for the sale of Dutch products. The strawboard industry has disappeared for environmental reasons and for its low profitability. The potato starch industry is still an important outlet for potatoes.

Production of raw material for non-food purposes is mainly found on arable farms. About 5-10 % of arable land are used for the production of non-food crops. Tabel 3 gives a survey of the main crops.

TABLE 3: Areas of non-food crops (x 1,000 ha)

	1975	1980	1985	1989	estimated share (%) non-food products
Industrial potatoes	73,0	70,6	60,2	60,2	60 %
Oilseed rape	14,1	7,9	10,1	6,3	5 %
Caraway seed	3,5	2,9	2,2	0,6	5-10 %
Flax	5,1	4,1	4,4	5,3	100 %
Hemp	-	-	-	-	100 %
Evening primrose	-	-	0,3	0,6	100 %
Total	95,7	85,7	77,2	73,0	

The main non-food crop in the Netherlands is that of industrial potatoes. They are processed into raw materials for food and non-food purposes. For the other crops practical application is slight but research is being carried out into possible wider applications. The table shows that the area of non-food crop production has fallen with 25 % over the past 15 years. The reason for this is their poor profitability compared to other crops such as sugar beets, eating potatoes and cereals.

b) Developments

Initiatives to widen non-food crop applications are being carried out by the government and trade and industry. Table 4 gives a survey of some of the crops included in the agrification study and their final products.

TABLE 4: Primary products and final products of the crops included in the agrification study

Crop(s)	Primary product	Final product (examples)
Wheat	starch	degradable plastics
Wheat	gluten/protein	calf milk
Jerusalem artichoke	inulin	solvents, coatings
Hemp and flax	bast and wood fibres	paper, composite materials
Oilseed rape, crambe, limnanthes	oils with several triglycerides	lubricants degradable plastics additives for soaps
Caraway seed (and dill)	(ethereal) oils	biocides germination inhibiting agents

The study wants to keep several options open. In the agrification study two lines in particular are being pursued:

- non-food production from existing raw materials (starch, sugar, protein, oil or cellulose)
- production of crops of specific content (fibres, particular fatty acids and alkaloids for the processing industry).

c) Backgrounds to these developments

- The growth of outlets for crops in the traditional markets is limited. A growing demand for arable crops can only come about if new applications for the non-food industry are found.

- Quite a different problem is the intensive use of agrochemicals as a result of an increased pressure of diseases and pests. This is the result of intensive cropping programmes on many arable farms (mainly cereals, potatoes and sugar beet). Diversification and intensification and/or extensification of cropping pattern is necessary. Growing new crops on a large scale may be a solution for the future.

- Developments in the scientific field over the past few years, notably the developments in biotechnology, process technology and information technology offer new prospects for processing agricultural raw materials.

d) Strategy/policy

Dutch government policy aims at economic feasibility of agrification in the long run without structural government aid. Agrification should therefore lead to attractively priced raw materials of constant quality with garantees for ready supply.

In the initial phase the Ministry of Agriculture, Nature Management and Fisheries will encourage activities in this field and support the work done at research centres and on research programmes, such as those on carbohydrates and agricultural biotechnology. The government also funds marketing studies for the flax fibre market and the agrification programmes on hemp and caraway seed which show some promise. New crops such as meadowfoam, cape marigold (dimorphotheca), sunflower, dill and herbs are also being investigated as is growth optimisation of existing small acreage crops such as flax and caraway seed.

In order to further encourage research in the trade and industry sector a grant has been introduced for agrification which is friendly to the environment. This measure aims to fund trade and industry research and feasibility programmes.

First practical applications by individual farmers are supported by promotion schemes for agricultural modernization in arable farming. Millions of guilders extra have been made available for the above activities.

e) Need for further research

There are negative and positive factors affecting agrification:

Negative factors:
- price
  This is an important negative factor. Arable farming products are too expensive compared to petrochemical alternatives.
- technology
  Scientifically and technically agrification lags behind the developments in the chemical and petrochemical industries.

Positive factors:

- environment
  This is a definite advantage: products are degradable, less fossile fuels are used.
- high-quality raw materials
  On the basis of agricultural raw materials it is possible to make high quality materials which can hardly or not at all be reproduced by the chemical industry.

The strenght of a product's application lies in whether or not it is environmentally sound and/or contains high-quality material. Research will have to focus its attention on these aspects.

A precondition for the success of agrification is that these products are further developed and marketed by trade and industry. In some areas pilot projects seem a possibility in 2-5 years, the first practical applications in 5-10 years' time. Large-scale applications, however, seem a more remote possibility: large-scale application will not be possible for the first 10 years.

3.2 Sources of Energy

a) Present situation

A great many crops may be used for the production of energy. They include sugar beets, cereals, potatoes, chicory roots and oilseed rape. In the Netherlands agricultural raw materials are not yet used commercially for energy purposes.

b) Developments

Discussions in the Netherlands and in the EC have chiefly centred around the use of bio-ethanol as an additive to petrol and diesel oil or as a 100 % replacement of fossile fuels. In addition there is an interest in diesel oil additives and in the replacement of diesel oil by vegetable oil. Industry also takes an interest in energy from vegetable sources as a way to roll back environmental pollution caused by the use of fossile fuels.

It may safely be said that the production and the use of bio-ethanol is a positive development from an environmental point of view. Economically however, it has its drawbacks. The technology for the production of bio-ethanol is readily available, but the price of the raw materials needed for its manufacture ist still too high.

The study mentioned before shows that the cost price of bio-ethanol is higher than that of fossile fuel such as petrol (see table 5).

TABLE 5: Cost prices of the transport fuels bio-ethanol and non-esterified rapeseed oil on the basis of agricultural raw materials (excl. and incl. present EC regulations for processing procedures) and cost price of petrol

Raw Materials	Specification	Price unprocessed products Dfl./t	Cost price as transport fuel excl. EC-support Dfl./litre	Cost price as transport fuel incl. EC-support Dfl./litre
sugar beet	A/B mix price	130,-	1.60	
	C price	80,-	1.10	
Wheat	EC internal	400,-	1.40	
	World market	250,-	1.05	
Oilseed rape	EC intervention	1075,-	1.85	0.75
	World market	510	0.83	
Petrol	Oil price US $	18		
	US $ rate Dfl.	1.80	0.50	

The conclusion is that the higher cost price of bio-ethanol and non-esterified rapeseed oil compared to that of petrol is still an impediment to the use of these alternative sources of energy.

c) Backgrounds to these developments

In the light of the recent rise in fuel prices the production of bio-ethanol from beets, cereals, potatoes and chicory roots is again under discussion. Less than half of the national energy consumption in the Netherlands relies on mineral oil. The use of bio-ethanol would lessen our reliance on fossile fuels. A 5 % admixture of ethanol to one third of the amount of petrol used in Europe would create a market of 25 million hl of bio-ethanol. This equals the output of 800,000 ha of cereals, beets and potatoes.

d) Strategy/policy

Dutch government policy demands that energy from biomass should be economically feasible in the long run. Activities in trial periods may be encouraged but so far bio-ethanol application have been limited for economic reasons:

- As a fuel in its own right its future mainly depends on how prices of oil products will develop;
- As an additive to petrol the future of bio-ethanol depends on the acceptance of stricter environmental norms, alternative additives and market trends (cooperation between the petro-chemical and car industries among other things).

The production of bio-ethanol can be technically realised in the short term. There is no financial basis to come to large-scale applications and there has been a lack of political will so far to subsidize this.

e) The need for further research

Expectations are that the trends in agriculture towards better crops and higher yields will continue. The prime costs of raw materials from agriculture will fall whereas oil prices will rise. It would therefore be wise to follow developments closely and to take steps as soon as the production of raw materials for energy production becomes economically attractive in a structural way.

4. SET-ASIDE OF ARABLE LAND

a) Present situation

Set-aside of arable land is not very common in the Netherlands; it is only done in cases where farmers are subsidized to do so. Within the EC there is a regulation which provides for set-aside schemes on a national basis. The aim of such schemes is to try and roll back the production of surpluses.

In the Netherlands the set-aside scheme makes it possible for farmers to receive grants for land set aside for cover crops, afforestation and non-agricultural purposes.

Those involved in the scheme receive a grant of 700 ECU (Dfl. 1854,-) annually for each ha of arable land taken out of production and half this sum if the land is used for non-agricultural purposes.

By the end of 1990 more than 14,000 ha of arable land had been taken out of production under this scheme. This covers about 4 % of the aggregate acreage which might qualify for this scheme (the crops under rigid market regulation such as cereals, sugar beets, industrial potatoes). Some 7 % of cereal acreage have been set aside.

b) Developments

The number of applications for the set-aside scheme will increase if present policies do not change. The price of cereals has fallen and for industrial potato growers the scheme is becoming more attractive. Large-scale set-aside programmes will however lead to problems in several areas: financially (heavy claims on the budget), socio-structurally (employment opportunities), in the area of landscape (physical planning) and regionally (the quality of life).

c) Backgrounds to these developments

A more market-oriented approach leads to lower prices of the crops under market regulation. When the difference between prices and the level of grants becomes smaller the alternative of the set-aside scheme will become more attractive for farmers.

In other EC countries these grants are lower and therefore less arable land is taken out of production. Overall, set-aside in EC countries does not (yet) lead to smaller output in real terms as arable land in production is yielding bigger crops.

d) Strategy/policy

The aim of the set-aside scheme is to take arable land out of production so that surplus output is reduced and production is brought in line with the demands of the market.

The scheme is in fact a temporary measure in anticipation of a more structural solution.

In the Netherlands with their high quality lands (level grounds, good drainage) set-aside is in fact economically unprofitable.

The EC Council of Ministers has decided to make land under the set-aside scheme available for the purpose of non-food production. The grants will then amount to a maximum of Dfl. 1300,-, that is 70 % of the sum granted under the set-aside scheme for land taken out of production.

This has now been laid down in an EC regulation. The EC regulation is primarily directed at the production of cereals. Whether or not the regulation will be implemented nationally will yet have to be decided.

5. NATUR AND LANDSCAPE

5.1 Nature

a) Present situation

The total amount of nature areas (woodland excluded) in the Netherlands has fallen from over 600,000 ha in 1900 to about 180,000 in 1990. The sharpest decline took place in the first half of this century. Much of what constitutes the value of nature and landscape is integrated in the agricultural landscape, such as meadow birds, grassland vegetations or small-scale landscapes.

In addition to the ecological values present in the agricultural landscape there is the general quality of the environment. Environmental policies (manure legislation, legislation on herbicides and pesticides) are high on the government's agenda which has consequences for farming practices.

b) Developments

There has been a sharp decline in the reclamation of nature areas for agricultural use since 1950. After 1970 there has been no reclamation of natural land at all.

In many areas specific natural values inherent in the agricultural landscape have disappeared due to the more intensive methods of farming.

c) Backgrounds to these developments

After 1970 the government has prevented further reclamation of waste land for agricultural use. The decline in natural values on agricultural land is due to more intensive farming methods (the use of fertilizers, pesticides and drainage).

It is not easy for the government to implement measures for the management of natural values which are so closely related to methods of farming.

d) Strategy/policy

In addition to preserving the general quality of the environment throughout the country, government policies are also aimed at preserving the natural values in agricultural areas of outstanding environmental quality. In some of these areas it is possible for farmers to manage, under certain conditions, the natural values (the so-called management areas) on their farm. Where this is not possible agricultural lands are taken out of production altogether (reserves). Farmers in management areas can adapt their farming methods to the values of nature and landscape with the support of grants. To this end the farmer enters into an agreement with the government. The grant received will be similar to the loss of earnings incurred by the use of less intensive farming methods. The amount of the payment depends in the package of measures agreed upon and varies from Dfl. 270 to Dfl. 1500 per ha per year. The contract is valid for six years and may be extended. Agreements can be drawn up for 100,000 ha.

Areas of natural values which are incompatible with farm management will be withdrawn from agricultural use and made into nature reserves. The purchase of land for nature reserves takes place on a voluntary basis. The total amount now covers 100,000 ha. As a temporary measure farmers can enter into a management agreement with the government until the land is made into a nature reserve.

Right now management plans have been drawn up for 50,000 ha of land, for 13,000 ha management agreements have been entered into. 30 % of the farmers involved are participating in this scheme. About 8,500 ha have been made into a nature reserve.

e) Adaptation needed

During the early years of the management scheme there was great reluctance among farmers to cooperate. But the introduction of milk quotas, which led to a surplus of land for the production of roughage, made it more attractive for some farmers to participate in the scheme. Government information has not always been satisfactory. The government should take steps to approach more actively the farmers qualifying for the management scheme.

Also for management to be carried out properly the agreement should cover the whole and not part of a plot of land.

5.2 Landscape

a) Present situation

Elements such as hedges, coppices, ponds and pools are characteristic features of the cultivated landscape. The fact that these are often part of a farm makes it impossible to estimate the area they cover.

b/c) (Backgrounds to) developments

Growing timber used to be functional in the past for fencing or as sources for timber and firewood. Ponds and pools served as watering places for cattle. The intensification of farming methods led to an increase in scale and with the advent of new sources of energy these elements were no longer functional.

As a consequence farmers neglected their upkeep and the result is that many of these elements are threatened or have already disappeared.

d) Strategy/policy

Government policy aims to preserve these landscape features. To that end the minister of Agriculture, Nature Management and Fisheries has designated 66 areas which qualify for the maintenance scheme. Maintenance agreements have been entered into for 1250 km of hedgerows or shelter belts, 300 ha of coppice, 34,000 pollards and 1,250 pools and ponds. Per farm the support varies from Dfl. 500 to Dfl. 2,500,- per year dependent on the measures needed for their maintenance.

e) Adaption

The scheme is satisfactory.

6. OUTDOOR RECREATION

a) Present situation

Outdoor recreation in agricultural areas is limited to so-called recreational shared use. The main opportunity for farmers to derive an income from this is to provide camping facilities on the farm and to sell products from the farm.

Farmers who take arable land out of production for large-scale activities such as golfing, are exceptional. This is mostly done by large estate owners.

b) Developments

Camping in the Netherlands is regulated by law. Camping on a farm is permitted to a maximum of five places per farm. At present there are over 1,100 registered farms which provide camping facilities. The sale of products from the farm provides the farmer with the opportunity to increase the added value of his product. The sale of cheese is most common. But primary products such as eggs and fruit are also sold. There are no data available on the developments of these activities.

c) Backgrounds to these developments

It is important for farmers who provide camping facilities and sell their products from the farm that their farm is in an area that attracts day-trippers and holiday makers. Camping on farms occurs in areas which have a tradition of outdoor recreation such as the coast and wooded areas. In some areas outdoor recreation adds substantially to the farmers's income.

The sale of products from the farm has the best chance of success in areas on the fringes of urban conglomerates or in areas that attract day-trippers and holiday makers.

d) Strategy/policy

There is no specific policy to encourage farmers to develop these opportunities further to add to their income. The Fourth Policy Document on physical Planning just out indicates areas where agriculture and recreation are interwoven but does not mention government aid to develop this further. What the government will do is support planning measures, if necessary, to make these areas more attractive for outdoor recreation.

The Camping Act regulates opportunities for the farmer to provide camping facilities.

e) Adaptations

Right now the Camping Act is being reviewed. One of the things under review is the number of places at the farm which will be increased to ten. The reason for this is the growing demand for this type of facilities.

7. FORESTRY

a) Present situation

The Netherlands are among the most sparsely wooded countries in Europe. 8 % of the country consist of woodland. The Netherlands heavily relie on the import of timber as their own production covers only a limited amount of their need for timber and timber products.

b/c) (Backgrounds to) developments

The area of woodland has remained fairly constant over the years. That is because wooded areas are protected in the Netherlands: replanting conditions are enforced on private owners if trees are felled. Without this condition large areas of woodland would have been converted into agricultural land. Forestry is an uneconomic branch of agriculture in the Netherlands. Foresters are therefore supported by government subsidies.

d) Strategy/policy

The area of woodland in the Netherlands should expand over the years to meet domestic demand for timber. This can be done by afforestation of multifunctional woodlands and the plantation of fast-growing timber. Individual farmers can plant fast-growing timber on agricultural land. The rotation of these crops is about 20 years. These lands must be fit for agricultural use again after the timber has been felled.

The government intends to subsidize the plantation of 15,000 ha of fast-growing timber by means of a block grant of Dfl. 3,000,- per ha. Felling can take place after 15 years when a minimum of 200 m^3 per ha can be harvested. Applications for this grant have been made for over 3,000 ha. A total amount of Dfl. 13,000,000,- is available for the period 1988-1993.

With the increase of problems for arable farmers the number of applications for these grants has risen sharply.

e) Need for information

The plantation of fast-growing timber has problems of its own:

- after the felling of timber there are replanting conditions. This does not hold for farmers felling fast-growing timber on agricultural land. However, farmers fear that these conditions will be forced on them by the time they start felling their timber.
- there is a fear among neighbouring farmers for shade damage and the increased pressure of pests and diseases.

8. INTERACTION BETWEEN DIFFERENT FORMS OF LAND USE

In the preceding paragraphs possible alternatives for the use of agricultural land were discussed. Interaction between these alternatives is possible. The following can be said for the situation in the Netherlands.

Land prices in the Netherlands are high and there is keen competition between the different forms of land use. From sectors with great purchasing power there is a heavy demand for land for agriculture, nature, woodland and for non-agricultural purposes. There are also great regional differences. The high price of land makes it difficult for farmers to realise the necessary agricultural expansion. This has a negative effect on the cost price per product unit. There is a shift in land within the agricultural sectors for reasons of profitability: at present there is a demand for arable land for labour intensive, knowledge intensive and kapitalintensive crops like vegetable growing, bulbgrowing and for dairy farming. The need for more land influences the price of land and thus affects arable farming opportunities.

The area of land for non-food crops (agrification) in the arable farming sector has declined over the past 15 years. It is only in the long run, that is, after 10 years or so, that the first, new large-scale applications of these non-food crops are technically possible. It still remains to be seen whether or not the Netherlands will join in this new technology: land prices are relatively high in the Netherlands for bulk production. A substantial demand for land for non-food crops is not expected for some time. Other factors too determine whether or not production can be competetive. In the Netherlands the emphasis will have to be on relatively small-scale high-quality applications.

In areas where the pressure for land is high it will be hard to meet the social demand for land for nature and woodland areas and for outdoor recreation, without paying high prices.

What will come out of developments in the field of alternative land-use cannot be said. What can be said, however, is that some agricultural land will be converted into urban areas or will be taken out of production for afforestation or nature areas. There is no surplus of land which is economically unfit for exploitation.

AFFORESTATION AS AN ALTERNATIVE OF NON-FOOD USE OF AGRICULTURAL LAND

E. Unteregger, Graz

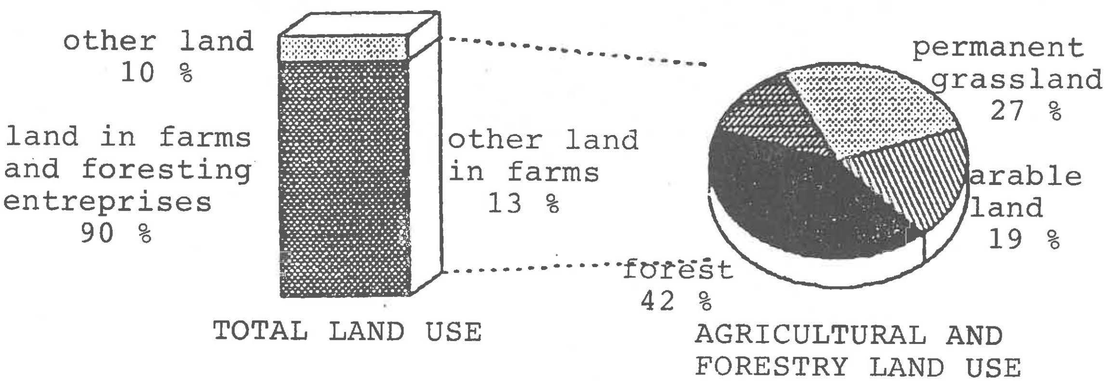
INTRODUCTION

There are a lot of possibilities to use agricultural land for non-food production. One of them is afforestation. Wood is a substance usable as a raw material for many applications. Wood is a very marketable product at this time and will also be in the future. In addition, in periods of chronic overproduction afforestation is a long-term possibility to take away farmland from agrarian production.

SITUATION IN AUSTRIA

In order to show the situation in Austria, some figures are presented below. The total area of Austria is about 8.4 million hectares. 90 per cent of this area is farm land and woodland or managed in any related way. Only 10 per cent are not managed by farmers, foresters or other landowners working in primary production (fig. 1).

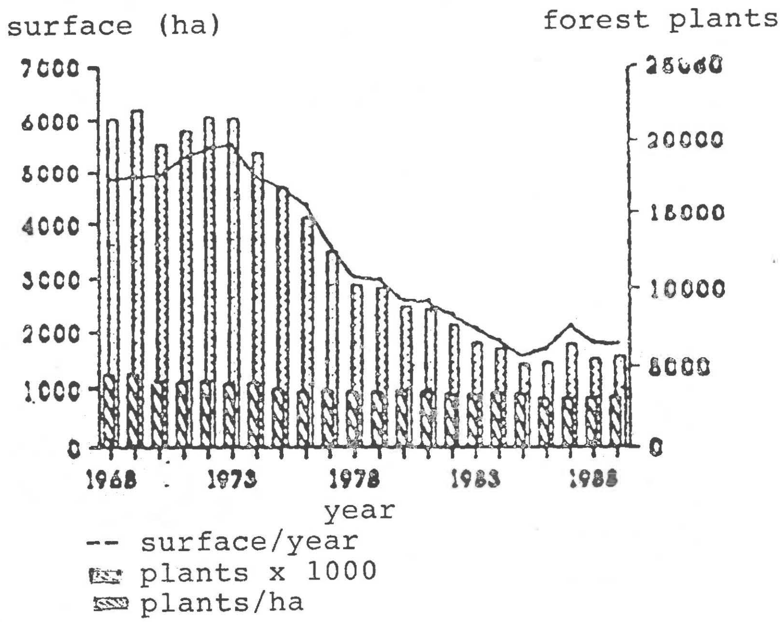
FIGURE 1: Land use in Austria (total surface: 8 385 300 ha)



42 per cent of the farm and woodland are covered by forests, 19 per cent are managed as ploughing land, 27 per cent as meadow land mainly for livestock fodder. The rest, 13 per cent are managed in another way or are unproductive areas.

Austria is a country rich in woodland. Nevertheless, the rate of afforestation is proportionally high. This does not mean the reafforestation of cut areas which is regulated and dictated by law, but it means the new afforestations changing farmland to woodland. From the fifties to the middle of the seventies, (exactly until 1973) the annual afforestation rate was about 5,000 to 6,000 hectares. In the following years until 1983 the rate decreased constantly and now seems to find its level at nearly 2,000 hectares (fig. 2).

FIGURE 2: Annual afforestation in Austria (1968-1989)



The same trend running parallel is shown by a number of planted trees even though a change in planting density should be observed. In the fifties more than 5,000 barerooted trees were planted per hectare. This number has decreased constantly to a level of nearly 3,500 trees per hectare at the present time. This results, last but not least, from the activities by the advisory service of state boards of agriculture and forestry and several public advisory services.

The consulting aim in the last twenty years was to propagate an economic planting system, because it would not be reasonable to create high density stocks causing a lot of expense when planted but also causing a lot of expense by thinning. Therefore, it is more favourable to start with a low number of plants. The lower margin of planting density lies at 2,500 plants per hectare for spruce, but higher for most other kinds, especially pines and deciduous trees. This may also be a reason for landowners to prefer planting spruce even against the recommendation of forest advisors.

PUBLIC INTEREST

The public interest in new afforestation is high. It is caused less by taking out farmland from agrarian production than in view of the social and productive effect of forests and to improve the economic structure of forest owning farms or small forest enterprises. Reducing the agrarian area is a more agreeable concomitant.

It may be of interest that nearly 26 per cent of Austrian woodland is divided out to farmers or forest owners possessing not more than 20 hectares of woodland. In many cases this small area is also split into pieces scattered over one or more communities.

Unfortunately, all efforts for the reparcelling of woodland failed due to the mentality of the landowners. Therefore, the possibilities for specific afforestation preventing unwelcome inter-connections and effects are reduced to a few cases in a region. An unwanted effect is, for instance the alteration of the landscape combined with the slowly progressing change in the economic structure of a region. A high number of uncontrolled afforestation plots darkens a landscape even though the single plot is not too large. As a consequence, this may affect tourism or the population drain.

LEGAL REQUIREMENTS

The individual relations between neighbouring landowners may also be very often burdened by afforestation influencing adjoining fields or ploughing land. For instance, maize fields bordering with a new afforestated plot will be shaded in the future and also influenced by the far-reaching root systems of the trees growing on the adjoining plot. In the future, the yield will decrease more or less rapidly.

In the past there was an unintentional oust of land suitable for agricultural production followed by a reduced economic efficiency of the affected farm. Therefore new afforestation near the boundary of owners' land is regulated by a law protecting farmland. In a zone of 30 meters near the border, permission for afforestation from the local administration is inevitable.

Another legal requirement limiting landowners rights after afforestation is the ban on clearing afforestated areas. With this requirement it is very difficult to get permission for clearing woodland and a landowner should consider a new afforestation very carefully before doing it. Once done, it is done for the future and the area is lost for agricultural use.

PUBLIC SUPPORT

Afforestation of agricultural land is supported by the government. The amount of support depends on the kind of tree planted. For instance cultivation of pure spruce plantations is supported with S 4,500,--, mixed cultures of spruces and Douglas firs or deciduous trees with S 15,000.--. This seems to be an unjustifiable high difference but is explained in the following manner: by planting mixed forest cultures, a better stability of later stands will be achieved rather than by planting monocultures especially of spruce. In this way a mixed forest carries out its protective and social function better and in addition it produces a higher value over a long period. On the other hand, spruce afforestation is considerably cheaper than afforestation with other kinds of trees. Both higher stability in the future and cheaper planting costs warrant the higher support of mixed culture afforestation.

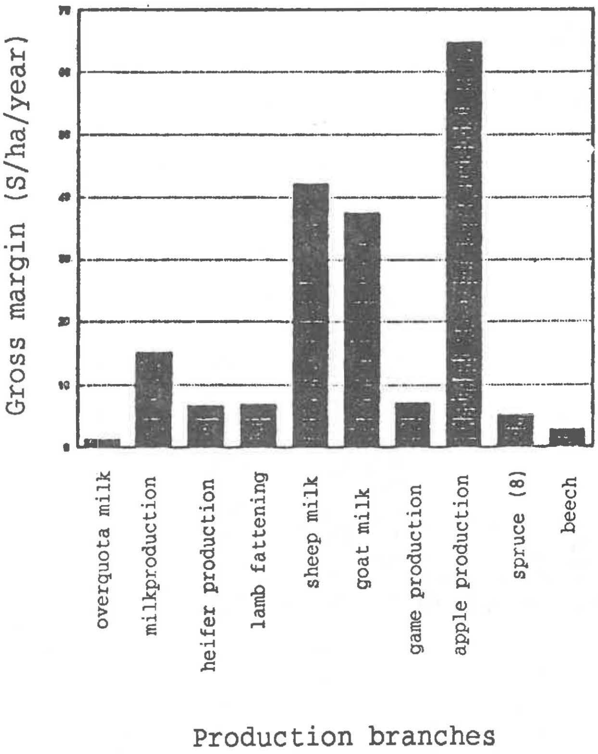
PRIVATE INTEREST

All long term aspects of afforestation which have to be solved by political decisions are important for the public of course, but don't influence the individual decision substantially. Individuals decide in accordance with economic requirements.

ECONOMIC DECISION

A very important assistance to decide how to change a production branch is the calculation of costs depending on production volume, production output and organization of production. These costs, also named as variable costs, are lost by closing down a certain branch of production. To calculate farmers' income, the variable costs are to deduct from gross proceeds. We call it the "profit contribution" (= gross margin).

FIGURE 3: Gross margin per hectar and year for various production branches



In comparison with other branches the foresty profit contribution per hectare is low (fig. 3). On the other hand, forestry does not involve much work per hectare and year (fig. 4). Thus the profit contribution per man-hour is high (fig. 5).

Another way to assist decision-making is the distribution of work during the year. Forestry work can be done during the wintertime or in periods of lower workload in agricultural production. Therefore, it may be favourable to manage forests as a second economic branch.

Intensifying a certain branch of agrarian production may demand an extensification of another one, especially in the case of limited man-hours. Figure 4 demonstrates very well the different workload in several agrarian production systems. According to the workload in the main branch during the seasons, a farmer will decide to choose a more intensive or more extensive management for the second branch.

FIGURE 4: Gross margin
Working hours per year and hectar for various production branches

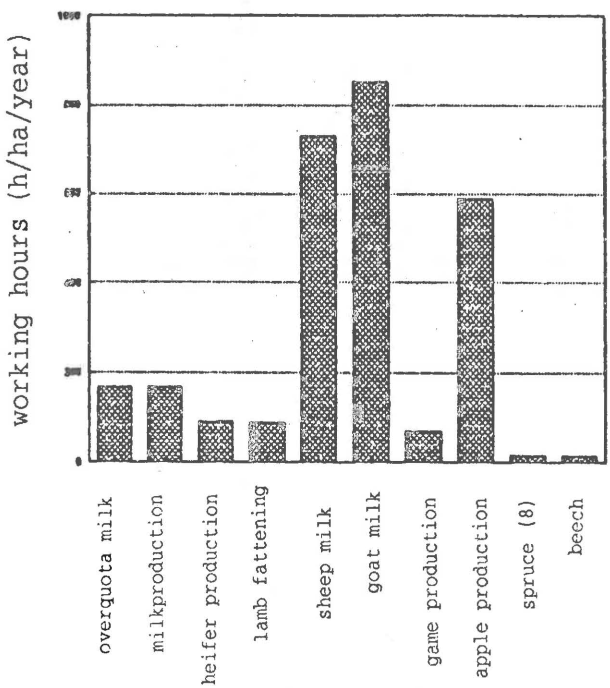
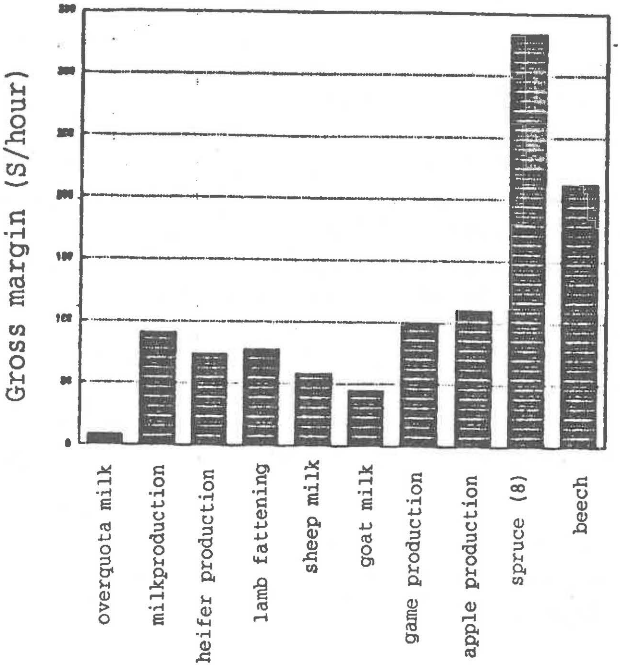


FIGURE 5: Gross margin per working hour for various production branches



Afforestation may be a good possibility for sensible use of a part of land managed in an extensive manner. The workload is very flexible and modest and the income per man-hour is high. But the user has to realize that afforestated land is to manage in an extensive way.

LAND SUITABLE FOR AFFORESTATION

As a rule, land for afforestation is not high yielding or it is less valuable for the landowner. It may be too steep and not suitable for machines or too far from his home. Really good agrarian soil is not afforestated very often. The good plots are rented and only the poor ones are afforested.

THE USE OF AGRICULTURAL LAND FOR NON-FOOD PURPOSES IN AUSTRIA

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PREFACE

Special attention in plant breeding has been focusing on an appropriate supply of the population with high-quality food and on the production of feed for productive livestock and breeding animals. The progress in technology and in plant growing has led to a considerable stabilization and increase of productivity, so that we have not only reached the full covering of requirements in principal products, such as corn, milk and meat, but also an immense overproduction, especially concerning corn. One of the main concerns of the Austrian agriculture is the reduction of the overproduction of corn and maize, because it becomes more and more difficult to find new outlets. In the next few years, it will be necessary to substitute about 200,000 to 300,000 hectares of cornland.

Part I

1 A SURVEY OF THE AMOUNT OF NON-FOOD CULTIVATION OF AGRICULTURAL AREAS

1.1 Renewable raw-materials

By cultivation renewable raw materials (growing of industrial plants), agricultural area is used for the production of basic substances for the non-food and energy field. So, we can differ between raw materials and substances for the production of energy.

1.1.1 Raw materials

1.1.1.1 Plants containing starch and sugar

In our country, especially the following field plants belong to this group: starch-potato, grain maize, winter wheat, winter barley, true millet, sugar beet, fodder sugar beet, sugar millet, chicory, topinambur; sugar millet, chicory and topinambur are not yet cultivated because of the lack of economic efficiency. In the field of non-food-production, at the moment only potato, maize and sugar beet play a certain role. The production of starch-potato and sugar beet is realized on a constract basis.

In 1990, 170,000 tons of industrial starch-potatoes were used up; 159,000 tons for the production of starch and 11,000 tons for the distillation of alcohol. At a medium production rate of 26.9 tons of industrial starch-potatoes per hectare, the whole amount of starch-potatoes is correlated to an area of about 6,230 hectares. The content of starch in potatoes is about 17.5 percent, so that in 1990 about 28,000 tons of dry substance were produced, which corresponds to 33,000 tons of commercial starch. After deducting 10,000 tons for food, 23,000 tons of potato-starch per year (70 percent) remain for industrial processing. The most important buyer is the paper industry. New technologies on the basis of industrial starch gain more and more importance for the production of packaging materials for food (fast food, eggs, fruit, vegetables, etc.)

In Austria about 60,000 tons of industrial starch maize (medium content of starch of 68 percent) are used. This quantity is correlated to an area of about 7,500 hectares. Out of this amount about 39,000 tons of maize-starch, modified starch and starch derivatives and also 16,500 tons of by-products (feed concentrate, maize germ and maize gluten) are produced: the share for the technical field is about 90 percent. For technical usage, as in the production of corrugated paper, the sizing of paper and in the building industry, the starch has to be adapted by aggregates and derived to what is needed.

In 1989, an area of about 47,500 hectares was covered by sugar beet. The medium beet yield per hectare was 55,61 tons. The medium yield of sugar per hectare was 8.87 tons (17.76 percent of sugar-content, 15.95 percent gain). In total, 421,300 tons of sugar were produced. In the non-food-field (pharmacy, fermentation) about 70,0000 tons of sugar and sugar-like products (glycose sirup) were used.

Altogether, about 200,000 hectolitres of ethanol are now produced from starch and sugar containing raw materials (maize, potato, molasses, green sirup). About 70,000 hectolitres come from agricultural distilleries, which use about 30,000 tons of potatoes and 10,000 tons of grain maize and grain-maize silage. About 40 percent ethanol are produced out of beet-substances (molasses and green sirup). About 11 percent of the production of ethanol are used for cosmetic, medical and hygienic purposes, and 25 percent are used in the technical field.

1.1.1.2 Plants containing oil and fat

The most important representatives of this group are rape and sun-flower, moreover flax, safflower, gold of pleasure and abessinian cole, whereas gold of pleasure and abessinian cole are used only for tests and flax only for the production of linseed. The future importance of this group is the usage for lubricants, flax is also suitable for paint and varnishes (and even pharmacy).

In Austria in September 1990, a decree on certain lubricant additives and the usage of chain-saw oils was published. According to this decree, it is prohibited after the 1st of January 1992 to sell, and after the 1st of May 1992 to consume lubricants for motor-saw, which were produced of common and water-polluting mineral-oil. Within 21 days there-after, lubricants for motor-saws have to be reducible to a minimum 90 percent and should not cause any phytotoxic damages in a concentration of 10 mg lubricant per litre during the germination test of garden cress.

The Austrian National Forestry Company, which cultivates about 15 percent of the Austrian woodland, has already been moving over to the greasing of chain saws with rape-oil. Their annual need is about 150 tons of lubricant, which corresponds to an area of about 150 hectares of rape. The need of lubricants for chain saws can be assumed to be between 2,000 and 2,500 tons. Out of this amount approximately 60 to 70 percent already work on the basis of plant-oil, but only 600 to 700 tons (conforming to 600 to 700 hectares) of this oil are produced in Austria.

According to the opening of experts, the need of biogenic lubricant could increase in the next years up to 10,000 tons because the usage for hydraulic systems (for example tractors, self-propelled harvesters, forest machines) could gain more importance.

1.1.1.3 Fibre plants

The only representative of this group is the cultivated flax. The production of cultivated flax in Austria in 1990 covered an area of 485 hectares. Austria has two swingles, which could work over up to 1,500 hectares of flax. Today the growing of cultivated flax is only possible with high state support because of the price and the low amount of long fibres, which is partly caused by weather conditions.

1.1.1.4 Pharmacons, pigments

At the moment only the cultivation of pollinating plants with an area of about 220 hectares is important. Medical plants for the requirements of pharmacy have so far reached only a very small amount.

1.1.2 Plants rich in energy

1.1.2.1 Plants containing starch and sugar

1.1.2.2 Plants containing starch and proteins

The so called "Austroprot"-project, which provides the production of 100,000 tons of alcohol on the base of agricultural raw material for the ÖMV (Austrian petroleum administration company) will soon be operational. 100,000 tons are calculated for an addition of 5 percent bioethanol to carburettor fuel, which is sold by the ÖMV (this is 70 to 80 percent of the Austrian consumption). The plant for the production of ethanol will start its work in 1993. Depending on the chosen raw material (maize, wheat, grain-pea), an area of about 34,000 to 165,000 hectares will be needed herefor.

The outcome of the programme of alcohol fuel production on the basis of ethanol, depends on a price decrease by state-subsidies or on tax-differentiation of products on oil-base and fuel.

Products with a low productivity (for example the pea) are interesting for diminishing the areas causing overproduction. These products lead to higher production costs of ethanol, but the support per hectare is lower. Another aspect is the usage of the by-product of protein feed which has a receptive market.

1.1.2.3 Plants containing oil and fat

For the production of rape methyl ester (RME) as a diesel fuel substitute in Austria, two different methods are applied:

- mini oil plants with a capacity of 500 to 2,000 tons per year, grown on an area of about 500 to 2,000 hectares of oil-fruit fields. A co-operative of farmers is in charge of the esterifying plants, in which the rape (delivered by the farmers themselves) ist esterified. The products of RME and colza cake are returned to the farmers in proportion to their deliveries. By 1991, already 4 plants of this kind (including a pilot plant in Silberberg in Styria) will be operational.

- commercial oil plants with a capacity of 10,000 to 15,000 tons per year selling biodiesel and colza cake through free trade-channels. In 1991, such a plant in Upper Austria will start work and a second one is planned to be built in the eastern part of Austria.

1.1.2.4 Plants containing cellulose and lignocellulose

The production of biomass from quickly-growing species of wood in the short cycle of cultivation has to be mentioned first. The total cultivated area is about 600 hectares.

The project "grass as a carrier of energy" (about 100 hectares in Styria) had to be given up because of the poor price; although there are several reasons for the growing of grass. For example the diminuition of nitrate-pollution of the underground water, the reduction of the usage of plant protectants, the auto supply of a whole region with energy, may be listed as reasons.

By now, also about 5 hectares of testing areas with giant raimie exist. However, in the second year of harvest it would still be too early to make statements about the economic value of the raimie.

1.2 Fallow-land

The Austrian state programme to lay fallow cultivated areas is useful in the first place to diminish the production.

Only a small part of the land is laid fallow to protect the environment. In 1990, the area of green fallow land covered 14,660 hectares, by 1991 20,000 hectares should be reached.

1.3 Measures in the fields of agriculture and ecology

1.3.1 Soil conservation and the green spaces when land is consolidated

At the end of the fifties, we started to preserve the countryside in the areas of cultivation. The primary aim was the prevention of soil-drift in areas exposed to the wind, and the amelioration of the microclimate.

Especially in the last years, beside soil conservation the agroecological pursuit has gained more and more importance. The modern form of cultivation has taken away the natural living space of hundreads of wild growing plants and free-living microorganisms. During the last years, it has been discovered that the lack of countryside elements and original nature is a big disadvantage. Now we try to create green spaces when the land is consolidated and to make the owners lay their land fallow (see 1.2). In these areas the different kinds and species of the agroecological system should find the necessary shelter, food and living space. From 1980 to 1986, each year an average of 44 hectares have been included, while in 1987 already 86 hectares, in 1988 301 hectares and in 1989 202 hectares.

1.3.2 Nature conservation

The nearly 180 nature reserves in the 9 Austrian federal-states cover about 2,400 km² and account for 2.8 percent of our territory. The highest amount are alpine countryside, lakes and ponds with their embankments, low marsh swamps and high bogs, lowland forests and wet land. The so called dry areas, which are often still home to warmth-loving southern and eastern plants and animals, take up only a small part of the territory mentioned.

1.4 Installations for leisure activities

It ist very difficult to gain information about this sector. It is therefore only possible to assume that agricultural areas are used for golf and riding. In Austria, there are about 50 golf links. Each area covers in addition to the number of holes about 25 to 60 hectares, so that we can assume that golf links by now take up a space of 2,500 hectares.

Of the about 45,000 horses in Austria, probably about 40 to 45 percent are used for riding due to their race. To provide the hay and oats for one horse, we need about 1 hectare, to provide the straw-requirement about 0.8 hectares.

2 AGRICULTURAL POLICY ASPECTS OF THE DEVELOPMENT IN THE NON-FOOD SECTOR

The world-wide increase in agricultural production on the basis of technological progress (biological, technical and improvements in organisation), and the sluggish commercial demand for food have led to growing surpluses on the agricultural markets and to an international fall in prices.

The area of farms and cultivated forests by the statistics of 1990 covers in total 7,535,000 hectares. 43 % accounts for wood, 26 % for permanent grassland, 19 % (1,406,000 hectares) for tilled land, 1 % for vineyards, orchards, tree nurseries, back gardens and market gardens and 11 % for other kinds of cultivated land. On about 67 % of tilled land corn and grain maize are grown, which led in 1990 again to an overproduction of about one million tons. This overproduction is related to an area of about 200,000 hectares of tilled land.

At the beginning of the eighties, the state started to give subsidies for rape and grain legumes, in order to prevent a further growth of corn surpluses and to increase the amount of self-supply with plant-oils and with Austrian protein feed. The subsidy was later extended also to other oil-bearing seeds and marketable agricultural products, to improve the Austrian situation and to reduce the areas with corn and maize. In 1989/90 the self-supply-percentage was 121 % for corn (including grain maize) and 44 % for plant-oils and fats (1981/82 5 %). In 1990, the subsidized cultivation of oil and protein plants reached an area of 124,800 hectares (1986: 26,700 hectares). Furthermore other alternative plants, such as bird-seed, medical and spice plants covered an area of about 7,150 hectares (1986: 1,915 hectares).

In 1987, Austria started to subsidize green fallow land, in order to take arable farmland temporarily out of cultivation and so to diminish the production of corn and maize and improve the ecological situation. In 1987, the green fallow land covered 956 hectares, in 1988 8,638 hectares, in 1989 11,089 hectares and in 1990 14,660 hectares.

To reestablish the growing of flax, which had a former tradition in Austria, test-growing was started in 1982. Since 1988 Austria has tried by introducing subsidies to increase the growing of flax. On the one hand, the Federal and the Provincial governments grant subsidies for capital expenditures, when swingles are erected or weeding- and turning machines and harvesters are bought. On the other hand, the growing of flax is subsidized by the state in form of premiums for the flax-area and the product. At the moment in Austria 485 hectares of flax are grown.

The Federal and the Provincial governments also subsidize bioenergy-projects. The oil crisis in the middle of the seventies was the reason for the Ministry of Agriculture and Forestry to start research work in the Federal Institute of Agricultural Science in Wieselburg on the subject of "plant oil as a substitute for mineral oil". The esterification is also tried on a small scale in Silberberg in Styria. On the base of the positive results of these tests, a large plant (Aschach/Upper Austria: 10,000 to 12,000 tons of annual capacity) and three small plants (Asperhofen/Lower Austria 500 hectares, Güssing/Burgenland 1,800 hectares per year, Mureck/Styria 500 hectares annual capacity) were built. Another large plant and several small plants are in planning.

For the erection of such plant the Federal and provincial governments introduced a subsidy for capital expenditures. On the other hand, they subsidize the cultivation of oil fruits by a premium for oil fruit areas and products. The height of this premium is the difference between the producer guiding price and the world market price. Now, almost exclusively rape is used for the production of energy, but other oil fruits could also be used. The Austrian agriculture has now an annual consumption of diesel of about 300,000 tons/year.

The increasing usage of biomass (wood, wood-chips, straw and so on) is also speeded up by the Ministry of Agriculture and Forestry concerning research work and subsidies (research work in the Federal Institute for Agricultural science, subsidies for biomass heating systems, subsidies for cultivation tests of wood as an energy carrier). This has the aim of doubling the former contingent of biomass, which was 10 % of the total consumption of energy in Austria.

A recent decision stipulates to start a project (in discussion for many years) that is the addition of bioethanol to carburettor fuel. The plant for the production of 100,000 tons of ethanol is expected to begin work in 1993. Another promising part of the market besides the production of RME and bioethanol and a second alternative to the common agrarian production is the usage of plant oils and fats as a starting material for the petrochemical and lubricant industry. Economic efficiency is more likely to be reached in this field than in the field of fuel production.

Part II

1 FLAX FIBRE

1.1 The cultivation of flax in Austria

On the present Austrian state territory about 5,000 hectares of flax were grown at the turn of the century. During world War II, the area of flax cultivation was enlarged again. In the years after the war the percentage of flax areas diminished every year, so that in 1962 the last swingle was closed. Looking for alternative products in 1982 flax was tested again. In 1988 the first modern swingle started work in Styria, in 1990 another one started in the Waldviertel in Lower Austria.

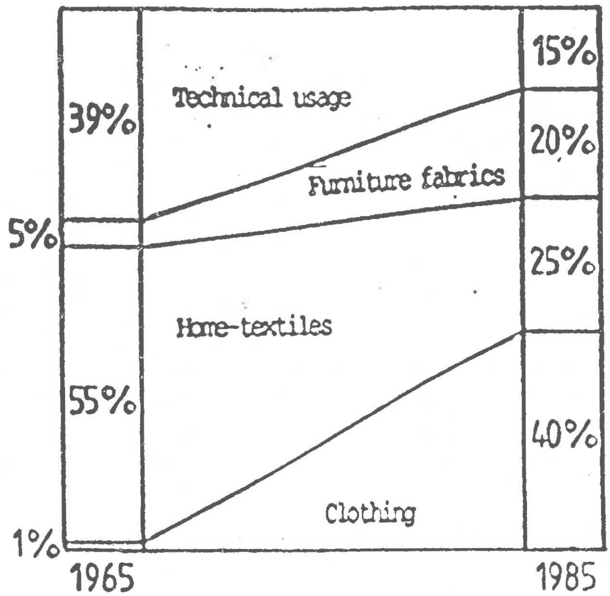
TABLE 1: Development of the cultivated areas (in hectares)

	1988	1989	1990
Burgenland	23	43	26
Carinthia	21	27	-
Lower Austria	103	176	235
Upper Austria	32	32	14
Salzburg	-	15	13
Styria	156	176	198
Total	335	469	486

1.2 The situation on the market

Austria is the owner of one of the largest linen mills in Europe, which processes about 5,000 tons of raw flax into linen yarn. About 80 % of the finished products are exported. As you can see from table 2, the clothing industry plays a more and more important role.

TABLE 2: Changes in the market during the last 20 years



Source: Dachler, M., Wissa, S.: The cultivation and the utilization of flax in Austria, page 13.

From the point of view of the processing industry, an extention of the cultivation of flax would be desirable, although from the farmer's point of view today's situation is very bleak. On the one hand, there was a fall in price for long and short fibre - especially the price for short fibre fell rather low -, on the other hand, the weather conditions had especially in 1989 caused a low gain of long fibre. However, there might still be expected some improvements in the technique of production, so that medium yields could increase.

1.3 Profitability

The cultivation of flax is subsidized in Austria. As you can see from the calculation of the cross margin (table 3), the foreseen standard subsidies for flax areas and products (premium for flax areas ATS 4,000/hectares, ATS 0.80/kg for flax straw) are not nearly enough to reach a satisfying repayment of costs. In 1988 and 1989 the medium subsidies per hectare were about 14,500 ATS. Also for 1990, high refunds to serve the cultivation of flax will again be necessary. The Federal and Provincial governments granted high subsidies for capital expenditure on the buying of harvesters and the erection of swingles.

TABLE 3: Calculation of the cross margin for fibre flax (medium gain/hectare: 6,000 kg flax straw, 200 kg linseed; 3,600 kg shives)

	Variant 1 11 % long fibre + 14 % short fibre	Variant 2 8 % long fibre + 17 % short fibre
long fibre - profit ATS/hectare	13.068	9.504
short fibre - profit ATS/hectare	2.100	2.550
linseed - profit ATS/hectare	880	880
shives - profit ATS/hectare	1.080	1.080
premium for products ATS/hectare	4.800	4.800
premium for areas in ATS/hectare	4.000	4.000
Total gross profit	25.928	22.814
seeds, fertilization		
plant protectants, hail insurance	5.541	
variable costs for machines	1.550	
harvest of the flax (weeding, turning, pressing)	5.455	
transportation	1.200	
swingle costs	12.000	
Total variable costs	25.746	
cross margin/hectare	182	- 2.932

Source: Own calculations

2 WOOD AS A SOURCE OF ENERGY

2.1 The cultivation of wood for energy production in Austria

We have had test areas with fast growing kinds of wood for about 10 years in Austria. Since 1987 the areas of wood for energy production have steadily increased, as you can see from table 4. Since then we have set standards, according to which the cultivation of wood for the production of energy is supported out of state funds (30,000-40,000 ATS/hectare).

TABLE 4: The development of wood cultivated for energy production or for energy production tests in Austria

	number of projects	area in hectares
1987	199	105
1988	362	193
1989	301	186
1990	209	129
Total	1.071	613

2.2 The situation on the market

Table 5 shows you the consumption of renewable energy carriers from 1983 to 1988. According to it the contigent of renewable energy carriers in the total consumption of energy is about 10 percent.

An extention of the energy share of biomass is possible on the basis of the non-used potential of additional forestral by-products and of forest thinning in the range of 3 to 6 million cubic metres (this conforms to 21.6 to 43.2 petajoule). On the other hand it is feasible on the basis of supplementary cultivation of wooden plants to produce energy or on the use of one-year (or older) agricultural economic plants as energy plants. Concerning agricultural economic plants, however, we cannot rely on many years' experience under our climate and soil conditions.

TABLE 5: The consumption of renewable energy carriers from 1983 to 1988 in terajoule (TJ)

	1983	1984	1985	1986	1987	1988
fire wood	37.935	43.952	45.106	54.975	57.234	55.269
burnable waste	(23.658)	(29.344)	(35.240)	(31.272)	(34.629)	(39.172)
therefrom:						
straw	775	852	980	643	835	952
straw briquettes	35	41	50	42	34	34
wood-chips	2.138	2.638	3.377	3.321	3.760	4.249
other saw by-products	378	404	455	402	887	980
bark	6.968	8.749	10.586	4.107	5.044	5.313
briquettes out of wood/bark	200	226	248	295	347	409
spent sulfate and sulfite lye	9.070	11.974	14.764	15.077	15.666	17.505
garbage and other refuse	4.094	4.460	4.780	7.385	9.056	9.730
biogas	27*	277	344	396	399	402
Total	63.520	76.469	84.392	86.264	91.891	94.843
share of the total energy consumption	6,8 %	7,8 %	8,4 %	8,6 %	8,85 %	9,3 %

* The reutilization of sludge has not been included.
Source: Plank, J.: The fuel market in Austria, The Agrarische Rundschau 5/1990, page 10

We do not have to discuss the supply of land faced with the fact of overproduction of the other kinds of economic plants. Choosing, however, the line of products, we have to view some criteria, such as the possible cross margin per hectare, the investment costs and the operation costs for the processing plants, the flexability in agricultural production, the required subsidy per hectare, the ecological value and so on.

2.3 The economic efficiency of wood cultivation for energy production

The most efficient kinds of trees for energy production are the willow and the poplar. The intensive cultivation of willows and poplars is rewarding only in mild and well-watered locations on well-ventilated, fresh and humus soils, rich in nutrients. The cultivation of wood for the production of energy is very labour-intensive, especially the planting and the manual harvest. For the harvest of thin young growth fully-mechanised systems would be necessary, but the technique of harvesting has not come to that point yet. From the economic and ecological point of view, however, it is better to opt for longer rotations of cultivation including manual harvest.

The most important criteria for the economic efficiency are the cycle of cultivation, the length of cultivation, the yield and the price for the chips. The calculations pictured in the appendix (table 1 and 2) do not consider the granted subsidies for the cultivation of wood for energy production. The amount of the subsidy is according to the species of wood ATS 30,000 to 40,000 per hectare. This fact causes a rise in the economic efficiency.

From the economic point of view, for the present, only agriculturally used areas giving medium or low yields come into consideration for the cultivation of wood to gain energy.

3 PRODUCTION OF RAPE METHYL ESTER (RME) IN AUSTRIA

The following description of the RME-production stems from the study of Hubert Janetschek, written at the Federal Institute for Agricultural Economics, about "The possibilities and borders in production and usage of RME as a substitute for diesel oil".

3.1 The methods of the RME-production

In Austria we differ between two types of plants for the RME-production:

a) Co-operative-industrial processing of rape oil into ester in normal pressure plants including the utilization of the by-products of glycerine, fatty acid and mucilage.

   The utilization of these products is realized over already existing sales organisations. The project is coordinated by the working group BIODIESEL, which is situated in Aschach/Donau (plant I). Another plant of this type is planned in Bruck/Leitha.

b) Farmers' common plants, which ester the mechanically pressed oil into fuel. This method drops the half-raffinate step and the glycerine regeneration. The farmers who are contributing members of the plant, deliver the raw material and get for it fuel and feed (colza cake) avoiding the common trading stages. They are located in Silberberg and Mureck in Styria, Neulengbach (plant II) in Lower Austria and in Güssing in Burgenland.

Principally we can differ between 4 systems of RME-production:

1. Delivery of raw material
2. Production of RME
3. Consumption of the main product
4. Consumption of by-products

According to our experience, the costs for the raw material, the sale of the by-products and the substitution value of the main product are the economically sensitive points of many renewable raw materials. These difficulties, on the one hand, result from the replacement of existing, very productive cultures, such as winter wheat and grain maize, and on the other hand, the main product is not competitive yet; moreover the marketing of the by-products is not ensured as yet.

The following table informs about the theoretical ouput, which differs according to the type of plant.

TABLE 6: The theoretical output rates of the two Austrian RME-plants

	plant I	plant II
oil content of the rape-seed %	41	41
required seed/kg oil	2,703	2,941
yield %	90,33	82,96
husk (colza cake)/kg oil	1,545	1,823

3.2 The economic efficiency of the RME-production

3.2.1 The costs of the raw material

In the field of conversion of winter rape into diesel fuel, the costs for the raw material have an decisive influence on the economic efficiency. In the RME-production, they amount to a minimum of 70 % of the production costs.

The calculation of the costs of the raw material contains the variable special costs for winter rape plus the opportunity costs of the substitued areas. As a basis for the calculation of the exploitation costs, the standard cross margins of every district for winter wheat, winter barley, summer barley and oats were used. On average, in 1988 in regional with a potential basis of raw material, the costs of the raw material worked out at ATS 687-641/deciton rape at a yield of 27.6 decitons/hectare.

3.2.2 Conversion costs

The most important positions of the conversion costs for the plants I and II can be seen from the following table.

annual capacity in t RME	P L A N T I 12.480 ATS/t RME	P L A N T II 410 ATS/t RME
variable costs	1.340	1.477
fixed costs	1.106	3.205
CONVERSIONS COSTS	2.446	4.682
including storage and transportation	3.676	5.749

(For details see appendix, table 3)

3.2.3 Production costs

They include no supports or subsidies, neither for the raw material nor for the conversion. Concerning the lower heating value of RME (about 8 %) the production costs can be compared to the litre price of usual diesel without taxes. The production costs (= raw material + conversion + storage and transportation - extra incomes) amount on average for all regions for plant I from ATS 20.8 to ATS 19.2 per litre RME and for plant II from ATS 24.1 to ATS 22.4 per litre RME.

3.2.4 An estimate of the production and sales potential

The sales potential for the main product (RME) facing the present production possibilities seems to be inexhaustible, if one considers that only the diesel consumption in agriculture is concerned, which works out at 18 % of the total diesel consumption. However, in addition to the main product, by-products turn up inevitably which have to be utilised or sold, too.

TABLE 7: Comparison of the sales and production potentials for RME including its by-products (plant I)

	production 1,000 t	sales potential (Austria) in 1.000 t	in % of the production
RME (Austria)	288	318	90,6
coarse colza meal	426	210,5 1)	49,4
pure glycerine	26	6,5	6,2

1) 70 % of the import of soja (= 329,000 t) minus coarse extraction meal from the oil mill Bruck (= 118.500 t)

The comparison of rates in table 7 permits us to assume that the situation for the sale of by-products in Austria is not inexhaustible. Especially concerning the expensive pure glycerine, the production exceeds the sales limits many times. The planning of further RME-production capacities has a very narrow margin because of the sales limits of the by-products on the Austrian market.

3.2.5 The need in subsidies

In the economic sense, a realistic evaluation of the fuel substitution by RME demands the selling price at petrol stations without taxes (= ATS 3.37/litre) as a comparative basis. If we took bearings of a production of 150,000 hectares, at a price of ATS 3.37/litre RME, a support of totally 1.55 billion ATS would be necessary. If we compare the necessary RME-support with the presently existing support to rape seeds for consumption oils, the required subsidy will nearly conform to the support of rape seeds for consumption oils. If there were a possibility to rearrange the support of the cornexport, at a low world market price for corn, a 511 million ATS lower support would be necessary in the RME-production.

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APPENDIX

TABLE 1: Cross margin poplar

COSTS: rotation = 10 years length of cultivation = 30 years	8 t dry substance/ hectare/year	man-hour output	10 t dry substance/ hectare/year	man-hour output
VARIABLE INITIAL OUTLAY (planted poplars 4,0 x 4,0 m)	19.213,--	87	19.213,--	87
VARIABLE COSTS/rotation	63.100,--	709	67.718,--	857
GROSS PROFIT/10 years	115.000,--		143.750,--	
cross margin/10 years	51.900,--		76.032,--	
CROSS MARGIN/HECTARE/YEAR	5.190,--		7.603,--	
total production time in the length of cultivation	2.214		2.658	
cross margin in the length of cultivation	155.700		228.096	
CROSS MARGIN per man-hour output	70		86	

Source: Kreisl, R.: What is the economic efficiency of the cultivation of wood to produce energy?
Der Förderungsdienst/Beratungsservice - number 8/1987.

TABLE 2: Cross margin willow

COSTS: rotation = 3 years length of cultivation = 21 years	10 t dry substance/ hectare/year	AKh
VARIABLE INITIAL OUTLAY (planted willows 2.20x0.45 m)	40.232,--	168
VARIABLE COSTS in the 1st year (annuity, care)	8.005,--	43
VARIABLE COSTS in the 2nd year (annuity, care, fertilization)	11.175,--	26
VARIABLE COSTS in the 3rd year (annuity, harvest)	10.977,--	266
VARIABLE COSTS/3 years	32.099,--	335
GROSS PROFIT/3 years	43.500,--	
cross margin/3 years	11.401,--	
CROSS MARGIN/HECTARE/YEAR	3.800,--	
total production time in the length of cultivation	2.513	
cross margin in the length of cultivation	79.807	
CROSS MARGIN per man-hour output	32	

COSTS: rotation = 6 years length of cultivation = 30 years	10 t dry substance/ hectare/year	AKh
VARIABLE INITIAL OUTLAY (planted willos 2.20x0.90 m)	29.724,--	113
VARIABLE COSTS/6 years	45.698,--	498
CROSS PROFIT/6 years	87.000,--	
cross margin/6 years	41.302,--	
CROSS MARGIN/HECTARE/YEAR	6.884,--	
total production time in the length of cultivation	2.603	
cross margin in the length of cultivation	206.510	
CROSS MARGIN per man-hour output	79	

Source: Kreisl, R.: What is the economic efficiency of the cultivation of wood to produce energy? Der Förderungsdienst/Beratungsservice - number 8/1987.

TABLE 3: Comparison between two of the Austrian RME-plants concerning the conversion costs

	PLANT 1	PLANT II
annual capacity in t RME	12.480	409,8
	S/t RME	S/t RME
electricity	446,88	237,92
heating oil	112,07	14,65
steam	103,39	0,00
total energy costs	662,34	252,57
cooling water	44,88	79,06
phosphoric acid	7,90	0,00
podzol	14,30	0,00
potash lye	208,12	274,09
methanol	217,72	574,68
sulphuric acid	8,01	25,89
Total chemicals and water	500,93	953,71
maintenance costs	161,65	270,60
other costs	15,22	0,00
VARIABLE COSTS	1.340,14	1.476,88
capital expenditure	770,00	2.328,72
personnel expenditure	256,41	468,52
overhead costs	61,74	377,50
maintenance costs (fixed)	17,96	30,07
FIXED COSTS	1.106,11	3.204,81
CONVERSION COSTS	2.446,25	4.681,69
storage of raw materials	692,31	761,35
transportation of raw materials	288,46	104,69
transportation of RME	150,00	150,00
transportation of scrap metal	98,94	51,11
Total storage + transportation	1.229,71	1.067,14
IN TOTAL	3.675,96	5.748,83

Source: Janetschek, H.: "The possibilities and borders in production and usage of RME as a substitute for diesel oil".

CONTRIBUTION OF AGRARIAN STRUCTURAL LAND REORGANIZATION TOWARDS PROVIDING AND DEVELOPING LAND FOR NON-FOOD PURPOSES AND TOWARDS RESOLVING LAND USE CONFLICTS

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1. GENERAL AGRICULTURAL AND ENVIRONMENTAL POLICY CONDITIONS

The latest proposals of EC Commission and more far-reaching national concepts for an EC agricultural reform with reference to the GATT negotiations are directed towards a more effective reduction of surplus production, set-aside and extensification. Increased promotion should be given in future to environmentally sound types of production and to the production of renewable raw materials with regard to a future-oriented peasant agrarian structure. The reform of the European agricultural market initiated, marked by market pressure relief from surplus products and the realization of ecological limits of intensive farming, has already today substantial effects on the orientation of land use in the rural areas in Germany and in Europe.

Add to this the demands society makes concerning the conversion of agricultural areas into traffic, settlement or recreation areas and the increasing withdrawal of land from agricultural production for nature and environmental protection with a view to maintaining the natural bases of life. Changes in agricultural an environmental policy objectives have an impact on the appearance of the cultivated landscape and on the economic strength of rural areas. Their implementation in terms of land must, therefore, be accompanied by a regulation policy concept. Agrarian structural land reorganization (land consolidation) has proved to be a suitable instrument for drawing up a concept for organized land use and for solving conflicts in the case of opposing requirements of use. The basic agricultural and environmental policy conditions which determine land consolidation and their contribution to the reorganization and future use of the land taken out of agricultural production will be described in the following sections.

2. PROGRAMMES FOR LAND USE EXTENSIFICATION AN CONVERSION

The existing programmes of promotion primarily serve the market policy requirement of restricting agricultural production. Nevertheless, the extensification of landscape management programmes with a regional and sectoral approach primarily pursue ecological aims with the opposite effect of production reduction. This also applies to the use of farmland for regional development.

2.1 EC programmes and national implementation

The market and environmental policy request for an EC extensification of farming and withdrawal of farmland from production was met by the following EC programmes which were translated into national laws and Laender directives:

2.1.1 Promotion of the cessation of farming (Act on the Promotion of Cessation of Farming)

Under the Act on the Promotion of Cessation of Farming agricultural entrepreneurs can receive a production cessation pension of the either set aside the land of their farm (this also applies to afforestation) or they hand it over for the purpose of structural improvement. Under the Act on the Promotion of Cessation of Farming a total of about 64,100 ha has so far been mobilized of which about 5,500 ha were set aside and about 100 ha were afforested for the first time. The volume of applications for making use of the production cessation pension has continuously increased in the last few years. This scheme will also in future be of special importance in the east German federal states.

2.1.2. Set-aside of farmland (Set-aside programme)

The land participating in the programme can be set aside in the form of fallow (rotation of permanent fallow), afforested or used for non-agricultural purposes. Since 1988 until today about 310,000 ha of 4,3 % of the total farmland were set aside in the Federal Republic of Germany. Add to this about 600,000 ha alone or about 13 % of the farmland for which requests for set-aside were made in eastern Germany until the end of 1990.

2.1.3 Extensification of agricultural production (extensification scheme)

The aim of the national principles of promotion adopted in 1990 is to reduce surplus products in quantitative terms or to reduce production by less intensive farming methods.

2.2 Renewable raw materials

The cultivation of renewable raw materials (non-food products) is also important for land use. At present, about 170,000 ha are predominantly used for the chemical-technical sector in the old federal states. The medium-term potential is estimated at about 420,000 ha. Another 1 to 2 million ha is estimated for the production of energetic raw materials. Figures for eastern Germany, where a great importance is attached to this sector, are at present not yet available. The federal government strongly supports the production of renewable resources as an essential element of EC agricultural reform.

2.3 Laender, regional and sectoral programmes

For reasons of natural resources protection, nature conservation and landscape management land which has so far been used for agricultural purposes is increasingly set aside in the hands of owners or acquired by appropriate agencies in the interest of environmental conservation. Add to this a great number of areas on which management conditions are imposed for which compensation is paid which participate in moist meadow, lower mountain range or other landscape management schemes. The agencies responsible for these schemes are the federal states, districts, communities, private nature conservation associations, water supply facilities to safeguard their protected drinking water collection areas or water resources and soil corporations for the designation of strips of land alongside water bodies.

2.4 Infrastructural measures

Finally, land almost exclusively used for agricultural purposes is used for infrastructural projets - in particular for the purposes of transport, construction and settlement as well as for leisure and recreation. By implementing the interference and compensation regulation additional land demands can be made under the Federal Nature Conservation Act which can exceed the demands of interference. According to the land use statistics the utilized agricultural area has been declining in the last few years by about 42,000 ha per year in the western federal states. This volume does not include the areas withdrawn under the landscape management scheme which continue to be recorded as utilized agricultural areas.

3. NEED TO REORGANIZE LAND USE

The reorganization of land use developed into an essential element of the policy for rural areas. The structural change in agriculture is marked today apart from a reduction of the number of farms also by changes in the types of farming (part-time main income farms and supplementary income farms) whose existence depends on income combination possibilities and on direct income transfers. The production of food and industrial raw materials is contrasted with services in the field of environmental and nature protection or in tourism as well as compensation payments for types of farming stipulated by contract and for restrictions on use for market and environmental benefits.

The development of rural areas is therefore no more marked primarily by the development of farms. Nowadays, the development of farms is primarily determined by the development of rural areas. Consequently, the policy for the rural areas becomes more and more a sector of agrarian structural policy aimed at organizing the environment of competitive peasant farming. With the decline in the number of farms and owing to the withdrawal from land the influence of agriculture and forestry is also declining. The use and reorganization of the land taken out of farming is a regional policy and environmental policy issue which is, however, of great agricultural policy importance owing to the socio-structural component.

Regional development strategies - as far as not yet confirmed by the current development - are based on a three-part differentiation of land use in rural areas. Thus intensive production under environmentally sound conditions is continued on sites favoured by nature. Furthermore, areas with less intensive production will develop through income effective obligations imposed in the interest of environmental protection or tourism. These areas are contrasted with areas where land use is geared towards landscape management services with compensation payments depending on living standard requirements. These development strategies require a regionally different reorganization.

The reorganization requirements result from the protection of property rights, in particular of the usufructuray right inherent in property. Land reorganization measures are always required if the usufructuray rights of land owners conflict with agricultural, environmental and regional planning interests and require clarification.

A development approach oriented towards the conservation of rural areas is of additional importance in all countries faced with agricultural surplus problems and increasing ecological orientation of society. As a result of a European technical meeting on land consolidation it could be stated that land reorganization measures are regarded as a suitable instrument of reorganization everywhere in Europe, where land taken out of agricultural production must be transferred to new uses. Such land so far accidentally located can be used for other purposes to a limited extent only, because a specific use requires a specific location, shape, size, development and neighbourhood relations.

4. AGRARIAN STRUCTURAL LAND REORGANIZATION AS AN INSTRUMENT FOR ACTUAL AND LEGAL REORGANIZATION OF LAND USES

Apart from the real estate transactions law and the tenant law the agrarian structural land reorganization with the instruments of ***agrarian structural preplanning*** and the reorganization procedures under the ***Land Consolidation Act*** are of central importance.

The aim of agrarian structural preplanning, promoted within the framework of the Joint Task of the federal government and the Laender "Improving the Agrarian Structure and Coastal Protection", is, inter alia, to ascertain in large-scale preplanning areas the extent and consequences of taking land out of agricultural production under agrarian structural, ecological and regional planning aspects. It is designed to assess the need, urgency and suitability of land reorganization and use and to propose suitable land reorganization measures.

The future priority areas of land consolidation in Europe are agriculture, nature and environmental protection as well as regional development.

Land consolidation which is also promoted within the framework of the Joint Task aims under its national legeal mandate to improve the production and working conditions in agriculture and forestry as well as the general use and development of land. This includes also the implementation of programmes and measures to extensify land use in conformity with the objectives established.

According to its assignment of functions to maintain peasant agriculture it is necessary to improve the input structure of the individual farms through a reorganization of their real property in such a way as to diminish the labour input, to improve management by expanding an effective infrastructure and to allow an adjustment to changed market conditions. This makes it possible to open up income combination possibilities for part-time main income and part-time supplementary income farms and to take over new tasks for example in the field of landscape management. An environmentally compatible reorganization serves the interests of nature and environmental protection as well as integrated plant protection by providing agro-ecological compensation areas and by their integration into a biotope network. The use of land is secured to landowners who do not cultivate their land themselves, but lease it, in terms of preserving and improving the real property value.

One aims at durable solutions in land consolidation. Therefore, in particular the programme parts with long-term objectives, that is durable extensification or set aside, provide effective possibilities of implementation or support. These include:

4.1 Use of land for the purposes of nature and environmental protection (set aside programme, Act on the Promotion of the Cessation of Farming, other schemes concerning the protection of species, biotopes and water)

On the basis of an interdisciplinary inventory and assessment a land use planning concept is drawn up for economically and ecologically sound uses in the land consolidation area. An important criterion of land consolidation is that the planning concept must be put into practice. The reshaping of the land consolidation area (size of parcels, installation of public and common utility facilities, soil and water conservation, nature conservation and landscape management) is coordinated with the envisaged land use. This includes the provision of areas for ecological purposes to set up a biotope network (safeguarding and regrouping biotopes, establishment of strips of land alongside roads, water bodies and tilled land as well as regrouping and enlargement of all types of protected areas).

The necessary ecological development measures are implemented and the facilities are handed over to appropriate agencies. Farmers can take over income effective landscape management tasks on the basis of management concepts. The extent and willingness of farmers to render landcape management services mainly depends on the willingness of public authorities to grant compensation payments on a sustainable basis for extensive land use and for the management of quasi-natural areas. It is the explicit aim of the German government to carry through the remuneration of landscape management services at the national and EC level.

Consequently, land consolidation does not only assign functions to the reorganized parcels of land, but it initiates their development through construction measures and subsequently takes the management requirements of cultivated landscapes into account. Reorganization is not only planned, it is also implemented and safeguarded on a durable basis.

4.2 Afforestation (set aside programme, Act on the Promotion of the Cessation of Farming, other schemes)

Within the framework of integral planning areas which are suitable for afforestation can be designated and subsequently be made available on the right place. An important function of land consolidation is the planning and financial coordination of identical land use demands. Thus afforestation can serve as a cooperation model for different structural concerns with identical objectives if afforestation also meets the aims of water conservation, landscape management, recreation area reorganization and forestry and can also be financed by pro rata contributions of the interest groups concerned. Moreover, the interdependence between town and country is important for regional development. Land consolidation meets this request by drawing up landscape management plans as well as by taking the requirements of recreation and tourism into account.

4.3 Providing land for measures relating to infrastructure and economic structure (Act on the Promotion of the Cessation of Farming and other infrastructure projects)

In connection with the Act on the Promotion of the Cessation of Farming and other infrastructural projects (supra-local transport facilities, water management facilities, communal facilities etc.) land is acquired within the framework of land consolidation on the basis of long-term practical experience and designated where the agency responsible for the project can use it properly. The special ***land consolidation*** procedures combined with projects of public interest have proved to be a suitable instrument for the development of rural areas to realize infrastructural projects if land must be provided on a large scale and, moreover, the disadvantages resulting from the use of land require a comprehensive reorganization of the area concerned. In 1990, about 700,000 ha were subject to reorganization in 730 special land consolidation projects.

ПРОИЗВОДСТВЕННОЕ ИСПОЛЬЗОВАНИЕ РАЙОНОВ, НАХОДЯЩИХСЯ ПОД ЭКОЛОГИЧЕСКОЙ УГРОЗОЙ, ДЛЯ ПРОИЗВОДСТВА НЕПРОДОВОЛЬСТВЕННЫХ ТОВАРОВ

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Преобразование экономической структуры Польши в рамках осуществляемой в нашей стране рыночной экономики неразрывно связано с неодходимостью рацинального использования производственного пространства и защитой прирородной среды. Необхидимость эту усиливает существующее загрязнение среды, особенно в районах больших промышленных городов. Обстоятельством, способствующим рационализации использования производственного пространства, являются относительные излишки продовольственных товаров, возникшие в результате либеральной политики правительства относительно их импорта. Таким образом возникла альтернатива для производства продовольственных товаров на плохих почвах, расположенных в трудных географических условиях и прежде всего в районах экологически опасных.

В Польше самым индустриальным и одновременно наиболее экологически загрязненным районом является Верхнесилезский Промышленный Округ (ВПО). Сосредоточенная здесь промышленность занимает территорию длиной в 60 и шириной в 40 километров. Применяемые здесь устаревшие технологии и сопутствующия концентрации промышленности большая плотность населения и урбанизация приводят к тому, что здесь возникает 30% пылевых и 39% газовых загрязнений всей страны. В то время как на одного жителя Польши количество эмиттируемой SO_2 составляет 120 кг, то в этом округе данный показатель составляет 825 кг в год. Тревогу вызывают также статистические данные относительно отвода в реки неочищенных промышленных и коммунальных сточных вод.

На территории катовицкого воеводства, охватывающего ВПО и занимающего 2,1% территории страны, проживает 10,4% населения, т.е. 597 человек на 1 кв. км. Здесь выпускается 15,5% общей проышленной продукции. 87% сельскохозяйственных и лесных угодий воеводства, лесистость которого состаляет 28% находится в зоне, подверженной промышленным выбросам. В зоне расположения крупнейших металлургических заводов, производящих железо, цветные металлы, металургической промышленности и шахт находится 15 больших и средних по величине городов и около 34 тысяч гектаров земельных угодий. На поверхность почвы вблизи металлургических заводов, шахт и главных коммуникационных маршрутов опускаются в большом количестве пылевые и газовые осадки, содержащие главным образом тяжелые металлы. Эти загрязнения убрать с почвы практически невозможно. Можно лишь путем разнообразных приемов в некоторой степени смягчить отрицательные результаты их концентрации. На расстоянии больше десяти километров от крупнейших металлургических заводов почва и растения чрезмерно пресыщены тяжелыми металлами, в частности свинцом, кадмием, цинком. Районы эти густо заселены , а земля возделывается с разной степенью интенсивности. Однако уровень загрязнения почвы, воды и воздуха практически исключает земледелие в этих районах, поэтому оно должно быть здесь немедленно ликвидировано, тем более, что и качество почвы, преимущественно песчанистой, здесь низко. В непосредственной близости крупных эмиттеров загрязнений следует безусловно отказаться от выпуска сельскохозяйственной продукции не только овощей и фруктов, производимых жителями для собственных нужд, но также от выращиания традиционных для этого района ржи, овса, картофеля и кормовых культур.

Самым сложным вопросом является обоснованное в общественном, экологическом и экономическом планах преобразование существующей структуры сельскохозяйственных угодий в другие искусственные экосистемы. Целесообразно создание экосистем улучшающих микроклимат и дружелюбных к человеку рядом с городскими микрорайонами, участками плотной пригородной и сельской застройки. В первую очередь следует заложить новые парки и рощи с намеченными прогулочными дорожками и коммуникационными трассами для экологически безопасных транспосртных средств. (машины с электродвигателями, велосипеды) /Зона А/. На более увлажненных постоянных земельных угодиях можно разводить ивняк (с разными местными решениями относительно организационной формы производства и обработки). На землях, используемых до сих пор для выпуска сельскохозяйственной продукции, следует обязательно наладить выпуск другой продукции. В первую очередь предлагается поддержать и даже развернуть садовое производство, в том числе выращивание цветов в теплицах и под фольгой. Существенную роль может сыграть здесь создание лесных питомников для вращивания декоративных кустарниковых растений и деревьев и массовое производство питомнического материала для парково-лесных культур для зоны, окружающей жилые массивы, и рекультивации шахтных отвалов, сырьевых выработок, оползней и западин, возникших в результате проваливания шахтных выработок.

Земельные угодия, расположенные вне городской и пригородной зон, должны изменить характер выпускаемой продукции на непродовольственную. Предлагается создание зоны Б, в пределах которой, на территории не занятой под древесные насаждения, кроме продукции как в зоне А, выпускались бы сельскохозяйственные непродовольственные товары Это могуть быть промышленные растения для производства технического масла, табак и волокнистые растения, а также рожь и ячмень для производства технического и пищевого спирта. Подходящими растениями, обогощающими почву и экосистемы, выращиваемыми на семена и запахивание являются люпин желтый и голубой, сараделла, эспарцета, лядвенец и полевой горох. Мотыльковые растения следует насаждать в большом количестве на всех этапах севосмена для сохранения баланса органической материи на легких почвах.

Зона В с уменьшенными прямыми осадками, но с высокой степенью кумиуляции токсических веществ в почве и грунтовой воде стала бы зоной предпочтения выпуска непродовольственных товаров. Здесь не было бы запрета на производство продовольственных товаров, но стимулировался бы выпуск продукци для промышленности. Рекомендуемый подбор растений как в зоне Б с тем, что постоянные земельные угодия использовались бы для производства комбикормов в немногочисленных хозяйствах, занимающихся скотоводством. Возможно здесь в небольшом масштабе свиноводство с использованием закупаемых концентрированных кормов, собственных хлебов и пропашных культур. Предполагается, что 50% растительной продукции можно в этой зоне предназначить для нужд промышленности, выпускающей для промышленных целей масла и технический крахмал и для текстильной промышленности. Возникает здесь также возможность производства семян всех культивируемых растений. В микрорайонах со значительным количеством постоянных земельных угодий существуют условия и возможности для развития коневодства в больших коллективных хозяйствах (государственных и кооперативных). Имеется в виду коневодство в крупных масштабах и выращивание лошадей, в том числе и верховых.

Общее количество населения, проживающего в Силезии, может создать большой спрос и интерес для развития верховой езды в лечебных, спортивных и развлекательных целях. В некоторых районах можно также развивать выращивание лошадей для убоя.

Представленная концепция направления производства в районе, экологически опасном, осуществлялась бы в рамках существующей структуры собственности земли, которая лишь в отдельных случаях (главным образом в зоне А) может быть выкуплена гминой. Отдельные экономические субъекты должны, с учетом собственной экономической выгоды, предпринимать преобразования в структуре производства. Изменение характера использования земельных угодий и создание на их месте парка, рощи и т.п. осуществлялось бы по предложениям самих крестьян или местного самоуправления с учетом экономической выгоды. Потери, связанные с изменением характера использования земельных угодий и расходы на развитие нового производства, компенсировались бы так называемой экологической рентой, выплачиваемой всем производителям зон А, Б, В. Часть регионального экологического фонда следовало бы предназначить на дешевые инвестиционные и реструктуризационные кредиты.

Использование земли согласно с экологическими рекомендациями должно обеспечить прибыль нетто больше получаемой при существующем профиле производства. В целях защиты производителей рекомендуется ввести гарантию приема готовой продукции (контрактация) и определение максимального допускаемого уровня производства (контингент). Разработанные до сих пор диагнозы указывают не только на обходимость, но и на реальную возможность осуществления представленной концепции.

RAPESEED OIL AS AN ALTERNATIVE FUEL

P. Martykan, Prague

A growing amount of information on exploiting vegetable oils as an alternative fuel for diesel engines, as well as ecologically sound lubricants and hydraulic oils for use in agriculture and forestry have been published in various periodicals in recent years. The relevant issues are being investigated in Austria, Germany, Sweden, the USA and other countries. The world is seeking renewable sources of energy.

Winter rapeseed is grown for production of edible vegetable oils and fats on 130,000 ha, i.e. approximately on 2 per cent of Czechoslovak arable land area, with average yields of about 2.8 tons per ha. This makes a total output of 360,000 tons of seed per year. So called 00-varieties with reduced erucic acid and glucoseinolate contents account for 60 per cent. The remaining 40 per cent are 0-varieties (having no erucic acid). The oil content of these variety groups varies between 45 per cent with the net oil output reaching 40 to 42 per cent. The total yield of rapeseed meets completely the food industry's demand for edible vegetable oils and fats in our country.

To grow winter rape for energy purposes, it would be necessary to use up-to-date technology. The economic side of the problem would undoubtedly be of crucial importance. In the first place, yields need to be stabilized at 3.0 - 3.5 t/ha. This is technically possible. Areas must be sown with 00-varieties, because this guarantees that all the seed can be used for oil cakes and meals. Of equal importance are the quality and price of the secondary products of oil chemistry (glycerine and methylalcohol). This would be a timely change to environmentally sound lubricating and hydraulic oils with an oil yield of about 40 per cent.

At present it takes between 19 and 21 hours of work per hectare which equals 7 - 8 hours per ton which could be further lowered. It is very interesting to compare mineral oil consumption (about 87 litres/ha) with the hectare yield of biodiesel (1,000 litres ex 0.95 efficiency = 950 litres of comparable fuel).

Due to increased agricultural productivity by the year 2,000, the required area of arable land in Czechoslovakia can be expected to be reduced by 500,000 to 700,000 ha. This area would substantially increase the possibilities for growing special crops, particularly crops exploitable as a renewable source of energy. The share of vegetable oil crops in the crop rotation could be increased from the current 2 per cent to 12 per cent. Practically, this means that at least 10 per cent (50,000 ha) of arable land could be used for growing the 00-varieties of winter rape for energy purposes.

Total yearly output of rape oil methylester from those 50,000 ha of winter rape would correspond to 50,000 tons of rape oil methylester. This quantity represents only 0,003 per cent of the total mineral oil consumption per year in the CSFR.

The ecological soundness of products based on vegetable oils is the result of their easy biological decomposition. This applies especially to lubricating oils for chainsaws and to hydraulic oils which in their classic form are a significant source of contamination of soil, water, silage and hay. In addition, these alternative fuels and lubricants produce up to 10 times less SO_2 and 50 per cent less smoke.

At present, the most important crop for the production of vegetable oils in central Europe is winter rape with regard to its sowing area, its yields, available production and harvest technology and multipurpose utilization of the crop. Besides the wide extent of rape oil utilization in the food industry and in industrial processing (fuel, lubricants, hydraulic oils), an important secondary product is oil cake for feeding purposes. Simultaneously, considerable attention is paid to the improvement of a number of oil yielding crops (sunflower, false flax and others), some of them having a greater oil yield and often a very favourable composition of fat acids.

Direct use of rape oil in standard combustion motors proved to be unsuccessful owing to a series of unsolved technical problems. For this reason a new motor, so-called duothermical diesel engine (firm Elsbett, Germany) has been designed which is capable of exploiting raw vegetable oil without further chemical treatment. Up to now, the results of technical tests have been positive. However, disadvantages are the excessive purchase price of the new motor and the necessity to change existing engines.

Another way of exploiting rape oil is its esterification for the purpose of gaining a fuel compatible with common diesel engines. So far, this application seems to be the most promising since no change is needed in the design of existing motor types. In comparison with diesel, this fuel has the great advantage of being more sound environmentally.

Processing into rape methylester begins with crushing rape seeds in a cylinder crusher. Preheating and pressing of the oil in a screw press follows. As a secondary raw material, oil cake with a fat content of 8 to 10 per cent, and contents of raw protein (34 per cent) and water (6 per cent) is obtained. The pressed oil is cleared of impure and muddy components, deoxidated and esterified with an ingredient of methylalcohol and alcalin catalyser. The final product is rape oil methylester being a fuel convenient for diesel engines. The secondary oil cake is a high-value protein feedstuff for cattle, pigs, sheep and poultry. Methylester-oil output can be expected to be up to 33 per cent. With a standard yield of 3.0 tons of winter rape seed per ha, this means approximately 1,000 kg biodiesel from 1 ha.

To date, operational and laboratory tests with methylester in Czechoslovak Zetor tractors have been conducted in two plants. The tests took place in the second half of 1990. The results achieved were similar to those gained in Wieselburg, Austria.

The production of biodiesel is dependent on building a processing equipment operating with a new technology. The large-scale production of 5,000 to 10,000 tons of methylester oil per year has the obvious disadvantages of a high capital investment, long time for construction and especially a vast supply area (at least 150,000 ha arable land). This increases transport costs and hinders a continuous and timely feeding of cakes with a limited storability. A number of medium or small scale plants in a greater number of agricultural enterprises with yearly capacities of between 0.5 to 5.0 tons of methylester-oil per plant seems therefore more convenient under Czechoslovak conditions. An important item in the general economy of methylester production is the transport of oil seed rape to the processing plants and the transport of oil cake to agricultural enterprises. These distances ought to be less than 50 km.

It is necessary to point out that presently rape oil methylester cannot compete with mineral oil fuel due to higher costs. However, this alternative is one way of becoming at least partly independent from mineral oil imports. Further reasons are of sociologic, agronomic, technical and, last but not least, of an ecologic nature. Production of methylester-oil has a positive influence on employment, soil regeneration and the environment. There is no need to make changes in engine design. In addition, winter rape can be grown in regions which are heavily contaminated with industrial emissions. Lower concentration of sulphur in winter rape and its ability to clean contaminated soils have been proved by experiments. This is of practical importance especially in the North Bohemia region.

The preliminary price calculation of biodiesel at 1990 price levels, with a yearly production capacity of 5,000 tons, comes to 14 Czechoslovak crowns per litre. At 1991 price levels, this figure would be more than 19 crowns per litre. Nevertheless, it is possible to compensate this loss through lowering the input costs or subsidizing winter rape production.

There are further possibilities of using rape oil in the area of oil chemistry. This is the question of hydraulic oils, lubricating oils for two-stroke motors and others. These oils made by FUCHS are now being tested in hydraulic systems of Zetor tractors. The production of environmentally sound hydraulic oils will certainly be efficient even at higher prices, first of all in livestock keeping and forage production.

PROSPECTS OF THE UTILIZATION OF AGRICULTURAL LAND FOR NON-FOOD PURPOSES

M. Svatoš, Prague

INTRODUCTION

The process of transformation in the Czech and slovak economy and society is directed towards an entrance of the country to Europe. This process is most complicated and has its impact also on the sector of agriculture and nutrition.

These facts influence indeed all principles, aims and tools of the socio- political and subsequently agrarian spheres. In this sense, the problem of utilizing agricultural land for other than food-producing purposes in the Czech and Slovak Federal Republic will be given attention partly from the aspects of its recent development and partly with regard to fundamental changes. These are associated with an application of a market economy to the sector of agriculture and nutrition.

1. BASIC CHARACTERISTICS OF THE UTILIZATION OF AGRICULTURAL LAND FOR NON-FOOD PURPOSES IN THE CZECH AND SLOVAK FEDERAL REPUBLIC

In 1989, agricultural land covered an area of 6.75 million ha. Trends in the development of agricultural and forest soils and a quantification of losses and increments produce basic characteristics of the utilization of agricultural land for non-food purposes.

Among the most remarkable features, there is the long-term trend of changing agricultural land into forest cultures, (this may be regarded as a utilization of agricultural land for non-alimentary purposes over a certain span of time). Another remarkable trend of recent years is a slowing down in the rate of loss of agricultural land. This means its irreversible utilization for non-agricultural purposes and hence also for non-food purposes.

Apart from these fairly stable changes, there are also various modes of utilizing agricultural soil for non-alimentary purposes, which are of a temporary nature.

The area under plants which may be suitable for an alternative utilization (other than food) characterizes recent development (Table 2).

Some of the basic categories of agricultural land that is not intended for food products are:
- creation of renewable resources of raw materials and energy;
- asserting nature protection in close connection with a reasonable utilization of agricultural soils;
- limiting the volume of agricultural production in connection with an existing surplus production;
- building recreational facilities etc.

TABLE 1: Development of agricultural, forest and other land of the Czech and Slovak Federal Republic

	Area in ha		Structure in %		Changes in %
	1980	1989	1980	1989	1989/80
Total area	12 788 847	12 789 970	100	100	100.0
from this					
- forests	4 578 354	4 615 021	35.8	36.1	100.8
- agricultural land	6 851 082	6 749 141	53.6	52.8	98.5
- arable land	4 809 633	4 741 268	37.6	37.1	98.6
Annual increment of agricultural land total	6 614	4 308	0.052	0.034	65.1
from this					
- deforested land	1 007	2 289	0.008	0.018	227.3
Annual loss of agricultural land total	79 130	19 758	0.619	0.154	25.0
from this					
- aforestation	45 391	5 920	0.355	0.046	13.0
- built-in area	7 041	5 006	0.055	0.039	71.1
Land temporarily not used (taken out and not cultivated)	127 108	117 666	0.993	0.920	92.6

TABLE 2: Area occupied by selected plants grown for other than food purposes

	1980 (ha)	1980 %	1989 (ha)	1989 %
Oil plants, total	127 638	2.65	186 214	3.93
from this				
rape 1/	90 624	1.88	132 583	2.80
Flax	31 787	0.66	26 388	0.56
Potatoe	198 863	4.13	170 742	3.60
Sugar beet-industrial	210 784	4.38	181 239	3.82
Tobacco	3 889	0.08	3 521	0.07
Aromatic plants	3 563	0.07	6 048	0.13
Medicinal plants	1 891	0.04	3 007	0.06
Horticulture plants (flower, stock, etc)	5 426	0.11	6 119	0.13
Plants for green fertilization (primary plants)	4 835	0.10	2 492	0.05
Remaining areas (incl. experimental plots, non-sown areas)	6 917	0.14	13 233	0.28
Total area	4 809 633	100	4 741 268	100
Seedplant:				
- clover	59 614	1.23	39 910	0.84
- perennial grasses	18 798	0.39	13 868	0.29
- maize			17 343	0.37
- sugar beet	4 866	0.10	2 165	0.05
- vegetables	3 467	0.07	4 722	0.10

1/ Average hectare yield in 1989 = 2.93 t. In case of support, we expect an enlargement of the area to about 300 000 ha.

2. FACTORS INFLUENCING THE RECENT DEVELOPMENT OF AN ALTERNATIVE UTILIZATION OF AGRICULTURAL LAND

Top priority under conditions of a centrally planned economy was given to achieving self-sufficiency in the production of foodstuffs grown in the temperate zone. A relatively high level of food consumption was stimulated by an inadequate supply of consumer goods in general. The market was unable to satisfy demands for foodstuffs products, hence there were no incentives for the development of an alternative utilization of agricultural land.

A specific situation of the Czech and Slovak agriculture was reflected by the position of the so-called subsidiary (non-agricultural) activities under-taken by agricultural enterprises. On a national average, subsidiary production participated with more than one half in the formation of the total profit of all agricultural enterprises. Their share in earnings was about one fifth. Therefore, a number of agricultural enterprises regarded agricultural production as a burden, because losses stemming from agricultural activities were settled from profits made by non-agricultural activities. Most indicative of the depth and seriousness, from territorial and sectorial aspect, is the following example; in 1988, 95 per cent of the total profit of Slovak agricultural cooperatives were produced by the sector of subsidiary production and 5 per cent only by agricultural activities. Nonetheless, even these economic facts were not strong enough to stimulate a development of an alternative utilization of agricultural land.

Similarey, the easy imports of oil from the USSR, the complete disregard of steadily increasing ecological problems, little progress in the development of tourism and its hinterland did not exert enough pressure on atampts for alternative utilization of agricultural land.

3. INFLUENCE OF ECOLOGICAL FACTORS ON THE UTILIZATION OF AGRICULTURAL SOILS

An important point that ought to be considered in the utilization of agricultural soils is the influence of ecological factors on agricultural production and on the environment. Areas requiring a specific soil management represent prospective sites of an alternative utilization of agricultural land in the form of extensive management or other activities. Data in the table below were obtained from an inventory of soils of the Czech and Slovak Federal Republic made in 1989/90:

	ha	% agri. soil
agri. soil along line structures (motorways etc.)	65 000	0.96
agri. soil strongly affected by erosion	1 177 000	17.40
agri. soil in heavily SO2-polluted zones (zone III and IV, total 4 zones)	191 000	2.80
agri. soil in a protected landscape area (zone I and II, total 4 zones)	839 000	12.40
agri. soil in protected areas with a natural accumulation of water	755 000	11.20

Interference with the management of agricultural soil has been particularly marked in areas along the state frontier (technical buildings) and along hygienic strips protecting water sources.

In spite of a recent decrease in measurable emissions, there has been an increase in forest areas damaged. In 1980, 777 000 ha of forest areas representing about one sixth of the total forest area, were damaged by emissions. In 1989, already 2,310 000 ha were damaged and they represented one half of the total forest area of the Czech and Slovak Federal Republic.

Measurable emissions (kg. km -2)	1980	1989
- solid emissions	10.7	7.8
- SO_2	21.8	20.0
- NO_x	7.8	8.8

The present situation of Czech and Slovak agriculture necessitates an increased attention to problems of ecological stability in agriculture. The importance of solving these problems is confirmed by new facts of a threatening surplus of agricultural products and a separation of the so-called marginal soils. The distribution of these soils throughout the country is most uneven and their expansion will depend upon the implementation of agricultural policy. However, an element of limiting the social and economic progress of entire regions has been involved in every case.

4. PROSPECTIVES OF AN ALTERNATIVE UTILIZATION OF AGRICULTURAL LAND

Progress in utilizing agricultural land for other than food purposes has been slow and setting off rather from a traditional pattern of agricultural production in the Czech and Slovak Federal Republic. The main motivation for an alternative utilization of land was the necessity of procuring renewable sources of raw materials and introducing a management that will partly respect the influence of ecological factors including the protection of nature.

The present period of transition in the Czech and Slovak economy to a market economy is characterized by the programme of privatization and the liberalization of prices and macroeconomic regulations. A greatly restrictive policy and subsequent drastic reduction in price subsidies is the reason for the high surplus of agricultural products. This situation requires fundamental changes in the structure of agricultural production.

Production of non-foodstuff biomass may soon turn into a desirable component of a new strategy in solving agricultural surplus production and may, in addition, have a beneficial affect on the ecological situation. It is expected within a relatively short time that agricultural land will be made available for leisure activities. Also, official programmes anticipate a dynamic development of alternative agriculture.

The stimulation of an alternative utilization of land is starting from an assessment of the recent developments and from the identification of priorities in this sphere. They will have to influence the agrarian policy, objectives of research work and implementation efforts. Unfortunately, at present the realization of an alternative utilization of agricultural land is impeded by legislation, the effects of a market economy and by lack of money.

5. PROGRAMME FOR THE NON-FOOD USE OF RAPESEED

An alternative utilization of agricultural land is expected to be closely associated with rape and flax cultures. The portion of agricultural land occupied by other plants such as tobacco, medicinal plants, ornamental plants etc. will not be too high. In the case of important industrial plants, (sugar beets, potatoe), comprehensive ideas about their use outside the alimentary sphere are non-existant as yet. An inclusion of rapeseed stands in an alternative utilization of land is being discussed at present.

The prospective alternative utilization of agricultural land intended to meet industrial purposes will undoubtedly be associated with the growing of rape in the Czech and Slovak Federal Republic. In addition to a quantitative and mainly qualitative increase in rape cultures grown for use in the food industry, prospects of utilizing rape in other spheres of production are most promising. This has been indicated by data on recent developments and by an assessment of the situation of Czech and Slovak agriculture in the future.

An extended use of rapeseed outside the food industry will lead to a diversified use of rape oil and to a greater stability on the market which is one of the primary conditions of a market economy. This fact together with international favourable results of rape growing in the Czech and Slovak Federal Republic have given rise to the so-called oleoprogramme suggesting an increase in rape cultures:

The programme consists of three parts:

- using rape oil as a raw material in the chemical industry;
- using rape oil as a lubricant and in hydraulics;
- using rape oil as a propellant.

The chemical industry has a number of uses for rapeseed oil such as component in the production of washing powder, varnish, lacquer, etc. Attempts of replacing petrochemical productions are supported by targeted cultivation programmes. Products made of plant oil are biodegradable and hence beneficial to the environment. Rapeseed oil is used in hydraulics of engines in agriculture, forestry, the building trade etc., as a lubricant for power saws, harvesting machines, feeding machines, etc.

Plant oils are used as propellants of ignition engines (Biodiesel or Ekodiesel). According to recent experience, the use of untreated rapeseed oil in ignition engines has not been successful. A construction of the so-called duothermic engines (adapted to the properties of plant oils) is not likely to be started in the Czech and Slovak industry in the near future. The most promising application appears to be that of plant oils treated for use in ignition engines. A treatment of plant oils involves pressing and esterification (methyl ester, glycerol, forage cakes).

Facts supporting an alternative use of rapeseed oil are as follows:
- a reduced dependence on crude oil imports in that we make use of our own renewable energetic sources;
- an alternative utilization of land leads to a reduced surplus production of a number of agricultural products;
- ecological aspects of an alternative use of rape for other than alimentary purposes are very significant;
- generally satisfactory results (both in production and economy) of rape culture in the Czech and Slovak Federal Republic till now do not produce solid bases for entering into competition with fossil energy sources.

In order to fulfill this prospective programme in the Czech and Slovak agriculture, it is necessary to define a long-term goal in the agricultural policy within the framework of the whole socio-economic programme and principally to decide about the subsidy policy in agriculture.

UTILISATION DES TERRES AGRICOLES A DES FINS TOURISTIQUES, SPORTIVES ET DE LOISIRS

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Les perspectives de reconversion à des fins non alimentaires des terres agricoles sont liées aux évolution dans les années à venir des besoins et des comportements des populations. A cet égard, tout le monde s'accorde à dire qu'une tendance lourde est l'accroissement de la consommation de biens et services de nature touristique, sportive et de loisirs. Ainsi, le rapport au Conseil Economique et Social sur "L'évolution et les perspectives des besoins des Français et de leurs modes de satisfaction" (rapport n° 16, 27 juin 1989) souligne-t-il que l'on s'attend à une forte croissance des dépenses liées à ce secteur. Cette analyse recoupe les projections de l'Institut National de la Statistique et des Etudes Economiques pour la période 1985 à 2000.

Certes, ces prévisions ne vont pas sans une certaine incertitude, qui tient à deux causes majeures:

- on sait que les dépenses de cette nature sont sensible à la conjoncture économique, et que ce poste est souvent un des premiers touchés par les restrictions du budget des ménages;
- par ailleurs, si l'on connaît assez bien les pratiques touristiques, on manque de données sur la demande de loisirs et l'évolution des comportements en ce domaine.

Néanmoins, il n'est pas douteux que le secteur "tourisme-sports-loisirs" constitue un marché en expansion.

Dans quelle mesure cette tendance constitute-t-elle une opportunité pour la reconversion de terres agricoles, et offre-t-elle une alternative aux agriculteurs? Cette question doit être envisagée sous deux angles:

- quantitatif: combien d'hectares de terres agricoles et combien d'agriculteurs sont-ils susceptibles d'être concernés?
- qualitatif, en fonction de l'objectif que poursuivent les politiques de reconversion:
  + contribuer à la maîtrise de la production et à la réduction des pollutions d'origine agricole dans les zones d'agriculture intensive;
  + favoriser le dynamisme économique et la création d'activités dans des zones rurales en voie de désertification ou de dévitalisation.

Le présent document vise à répondre à cette question. A cette fin, il n'examine:

- que les activités de reconversion qui se traduisent directement ou indirectement par une consommation d'espace significative (il laisse de côté pour cette raison une bonne partie des formules de tourisme rural, telles que gîtes ruraux, fermes-auberges, etc. ...).
- que les activités de reconversion auxquelles les agriculteurs peuvent avoir part.

1. LE CAMPING A LA FERME

1.1 *Definition et organisation*

Le camping se définit comme l'ensemble des pratiques touristiques de plein air fondées sur l'utilisation par le touriste d'un hébergement léger et mobile (tente, caravane, ...). On distingue en France quatre types d'installations:

- les campings-caravanage à la ferme, situés obligatoirement sur une exploitation agricole, et dont la capacité ne peut excéder 6 installations;
- les aires naturelles de camping peuvent accueillir jusqu'à 25 tentes sur des terrains à vocation agricole sommairement aménagés;
- les terrains de camping-caravanage aménagés, dont la capacité dépasse 6 installations;
- les parcs résidentiels de loisirs, sur lesquels sont implantées de manière permanente des caravanes ou maison mobiles de vacances.

Les installations réalisées sur des exploitations agricoles se rattachent presque exclusivement aux deux premières catégories, très peu nombreux étant les agriculteurs ayant réalisé des équipements plus importants.

Le camping à la ferme fait l'objet de deux labels definissant des normes de densité maximum et d'équipement minimum:

- la charte des campings-caravanages à la ferme, élaborée par la Fédération nationale des gîtes ruraux de France; elle a été souscrite par environ 1000 exploitants.
- la charte des campings en ferme d'accueil, élaborée par l'Association "Agriculture et Tourisme", rattachée à l'Assemblée permanente des chambres d'agriculture (APCA); elle a été souscrite par environ 1200 exploitants.

1.2 Avantages et inconvenients de cette formule pour l'agriculteur

- Le principal avantage de cette formule est qu'elle ne réclame qu'un investissement réduit. L'étude effectuée par l'APCA (1) donne un chiffre moyen de 55.000 F en moyenne, pour une capacité d'accueil moyenne de 12,7 emplacements et 45 personnes. C'est la formule de tourisme à la ferme qui requiert le plus faible investissement. De ce fait, l'annuité de remboursement de prêt moyenne est de 1.580 F, soit un peu plus de 10 % de la marge directe.

- Ses inconvénients sont de deux ordres:
  + la rentabilité de l'investissement est très liée à la qualité de l'environnement naturel (qualité des paysages, choix du site); on ne peut créer de camping à la ferme partout.
  + pour des raisons faciles à comprendre, l'activité est très saisonnière; la période de haute activité s'étend sur 10 semaines, pendant lesquelles sont réalisés 89 % des recettes.

Par ailleurs, comme la plupart des formules d'agro-tourisme, le camping à la ferme s'analyse comme une sous-location lorsqu'il est exercé sur des terres faisant l'objet d'un bail rural, et nécessite donc une autorisation du propriétaire.

1.3 Résultats techniques et économiques (Source: enquête APCA)

- Les produits:
  + le chiffre d'affaires moyen est de 20.000 F (2): le camping à la ferme est l'acitivité agro-touristique qui dégage le chiffre d'affaires le plus faible. Les valeurs extrêmes vont de 7.000 à 40.000 F.
  + la marge directe (avant remboursement des annuités) est de 13.000 F par exploitation, avec des écarts allant de 1 à 16; par emplacement, elle varie de 240 à 1.600 F; elle correspond à 55 % des recettes.
  + le résultat net (après annuités) est de 11.500 F en moyenne (il varie entre 1.500 F et 24.260 F), ce qui est relativement bon par rapport aux investissements et aux recettes.

- Les charges:
  + les charges opérationnelles représentent en moyenne 20 % des recettes, mais ce taux varie de 29 % pour les campings les moins performants à 17 % pour les plus performants.
  + les charges de structure sont en moyenne de 24 % des recettes, et varient de 45 % à 16 % selon le degré des performances.

- Le temps de travail: le camping à la ferme exige un temps de présence qui s'étale entre 400 et un peu plus de 800 heures, pour une moyenne de 600 heures. Environ 60 % du temps de présence correspond à un temps de travail effectif.

1.4 Criteres determinant pour les résultats

Deux critères apparaissent très liés aux résultats éconmiques:
- la qualité de l'environnement: 90 % des campings à la ferme dégageant une marge brute égale ou supérieure à la moyenne sont dans une zone où l'environnement est favorable ou très favorable.
- la capacité d'accueil: si l'on compare les campings avant les marges directes les plus faibles et les plus élevées, on constate que ces derniers, pour une capacité d'accueil et un besoin de travail double et une durée de saison pratiquement équivalente, ont une marge 15 fois plus élevée alors que la marge par nuité reste identique (environ 12 F par nuité).

1.5 Conclusion

Le camping à la ferme apparaît comme une solution valable pour amorcer une reconversion de la main d'oeuvre agricole: il peut ne constituer au départ qu'une activité annexe et n'exige pas de gros investissements.

En revanche, il ne joue aucun rôle en termes de reconversion de terres agricoles: si l'on estime qu'un camping-caravanage à la ferme couvre 0,3 à 0,5 hectares et une aire naturelle de camping 1 hectare, les superficies occupées en France par ces installations ne dépassent guère le millier d'hectares.

3. LES FERMES EQUESTRES

2.1 Definition

La ferme équestre est une exploitation agricole qui propose des stages ou séjours d'équitation. Cette activité est souvent liée à l'élevage et l'entraînement de chevaux de selle. Dans pratiquement tous les cas, elle est couplée à l'hébergement des clients, et fréquemment à une activité de restauration.

Il existe un label "Ferme équestre" mis au point par "Agriculture et Tourisme". Environ 200 exploitations l'ont obtenu. Pour en bénéficier, l'agriculteur doit remplir des conditions à la fois en ce qui concerne le cadre agricole et en ce qui concerne la pratique équestre (qualification).

2.2 Avantages et inconvénients de cette formule pour l'agriculteur

- Par rapport à la plupart des activités d'agro-tourisme, la ferme équestre présente deux avantages essentiels:
  + une saisonnalité moins marquée: la durée de la haute saison est en moyenne de 15,4 semaines.
  + une importance moins prononcée de l'environnement naturel.

  Ceci est lié aux motivations de la clientèle, qui recherche plus la pratique d'un sport qu'un cadre naturel ou des sites exceptionnels.

- Les inconvénients sont de deux ordres:
  + les investissements nécessaires sont importants: ils sont en moyenne de 250.000 F par exploitation, selon l'enquête de l'APCA, et varient entre 145.000 F et 385.000 F. C'est pourquoi l'annuité moyenne est de 14.000 F. C'est de loin le montant le plus élevé pour les activités agro-touristiques. Elle ne représente cependant que 9 % des recettes, mais les écarts sont importants selon les exploitations.
  + cette activité exige un temps de travail élevé: les exploitations enquêtées par l'APCA emploient, sur la partie agricole et la partie touristique, au total 4 personnes en moyenne. Toutes participent à l'activité touristique, dont deux de façon prépondérante. Beaucoup d'exploitations ont recours à une main d'oeuvre extérieure, qu'elle soit bénévole ou salariée (on compte que globalement 1 emploi est crée pour 7 chevaux).

2.3 Résultats techniques et économiques (source: enquête APCA) (3)

Compte tenu de l'hétérogénéité de l'échantillon (selon les formes d'équitation, la présence ou non d'hébergement ou de restauration) ces chiffres représentent des ordres de grandeur. Ils portent sur l'ensemble de l'activité touristique des exploitations concernées; en revanche, elles n'incluent pas les résultats des activités d'élevage équin qui y sont associées éventuellement.

- Les produits:
  + le chiffre d'affaires moyen est de l'ordre de 255.000 F, mais varie fortement (89.000 à 501.000 F). Par animal, il évolue entre 4.900 F et 15.800 F.
  + la marge directe moyenne (avant annuité) est de 55.000 F, ce qui représente un peu plus de 17 % du chiffre d'affaires. Ce résultat est le plus faible de toutes les activités agro-touristiques.
  + le résultat net (après annuités) se monte à 37.000 F (un peu moins de 15 % du chiffre d'affaires), avec des écarts allant de - 20.000 F à + 103.000 F.

Il faut souligner que cette activité se caractérise par une proportion significative de résultats négatifs, y compris les exploitations réalisant un gros chiffres d'affaires.

- Les charges:
  + les charges opérationnelles représentent en moyenne 51 % des recettes, et varient de 97 % dans les exploitations les moins performantes à 37 % dans les plus performantes.
  + les charges de structure représentent en moyenne 32 % des recettes, avce une amplitude allant de 43 % à 24 %.

  Les charges opérationnelles directement liées aux chevaux sont à peu près les mêmes (environ 3.500 F par animal) quelle que soit l'exploitation, mais les charges opérationnelles globales croissent avec le chiffre d'affaires.

- Le temps de travail: le temps consacré à l'activité touristique se monte à 3.835 heures par an pour une moyenne de 25,6 animaux; il varie de 2.163 heures à 4.840 heures.

2.4 Criteres determinants pour les résultats

Les résultats apparaissent corrélés avec la taille de l'atelier touristique. Les fermes équestres ayant les mailleurs résultats ont en moyenne 32 chevaux, contre 18 pour celles ayant les plus mauvais. Dans les premières, la marge directe est de 5.500 F/animal, alors qu'elle est de - 1.000 F dans le secondes.

Ils sont également liés avec la possibilité d'étaler les investissements. Les fermes équestres les moins performantes sont souvent celles qui réalisent l'essentiel de l'investissement au démarrage de l'activité.

Enfin, les fermes équestres qui dégagent les mailleurs résultats se distinguent par la qualité de l'animation et des services et par leurs efforts de publicité et de promotion. Cette activité est une de celles où le professionalisme apparaît le plus indispensable.

2.5 Conclusion

La ferme équestre est une possibilité de reconversion délicate (cf. la forte proportion d'exploitations dont les résultats sont négatifs). Néanmoins, cette formule peut ouvrir aux agriculteurs des perspectives très intéressantes. Il s'agit d'une reconversion fondamentale: dans les exploitations enquêtées, 70 % du chiffre d'affaires provient du tourisme et 30 % de l'agriculture.

Elle semble posséder un potentiel de développement important. Malgré cela, on peut penser que son impact sur la reconverion des terres agricoles à des fins non alimentaires sera extrêmement marginal (on peut estimer à moins de 10.000 hectares la superficie actuellement couverte par les fermes équestres existantes).

3. LES ACTIVITES DE DECOUVERTE DE LA NATURE

La perte de contact progressive avec la nature a donné naissance depuis un certain nombre d'années à un nouveau marché des loisirs, celui des activités de découverte de la nature. Ce phénomène se manifeste sous des formes variées dont les deux principales sont les fermes-témoins et les zoos. Ces établissements accueillent principalement des enfants, mais ont donné aussi naissance à des produits touristiques destinés à un public plus large. Les fermes témoins ne se bornent généralement pas à offrir la possibilité de voir des animaux, des plantes et des activités agricoles, mais permettent aussi de prendre part à celles-ci (soins aux animaux, transformation des produits).

Bien qu'il ne s'agisse pas d'une innovation, ces formules sont encore mal connues. De plus, elles ont été initiées très souvent par des municipalités. On dispose donc de très peu de références sur les possibilités réelles de reconversion d'activités agricoles qu'elles offrent, et sur les conditions de leur viabilité. C'est pourquoi il n'est pas possible dans le cadre de ce rapport d'apporter des éléments précis sur ces points.

Une description sommaire de deux projets en cours de montage peut toutefois illustrer le type d'opérations qui pourraient se développer:
- projet de création d'une exploitation pastorale et touristique: ce projet est monté à l'initiative d'une municipalité dans une zone en déprise agricole située dans l'arrière-pays de la Côte d'Azur. Son objet est de:
  + conforter l'agriculture locale en offrant des activités alternatives,
  + initier les citadins et notamment les enfants aux techniques agro-pastorales traditionnelles.

Le projet repose sur deux entités:
- une ferme pédagogique fonctionnant également comme centre de loisirs,
- une exploitation agricole dont les produits sont destinés essentiellement aux activités de restauration qui seront implantées sur le site.

Une structure juridique (société d'économie mixte, associant des capitaux publics et privés) a été montée pour réaliser les équipements et gérer les activités touristiques (accueil de chasses vertes, restauration. ...)

- projet de création d'une ferme d'élevage de bovides primitifs: ce projet est en cours de démarrage dans le massif du Jura, dans le cadre d'une installation de jeunes agriculteurs. La zone concernée est un site touristique classé, connaissant déjà une fréquentation importante.

Le projet consiste à implanter un élevage d'espèces bovines peu connues (aurochs, bisons, Highland Cattle, etc. ...) qui constituera un point d'attraction pour des visiteurs et des activités de découverte du milieu.

A cette fin, l'exploitation recoit le support de deux sociétés: une Exploitation agricole à responsabilité limitée (EARL) pour l'activité d'élevage proprement dit, et une Société anonyme à responsabilité limitée (SARL) pour la partie touristique.

4. LA CHASSE ET LA PECHE

Les terres agricoles sont souvent également le support d'activités de pêche et de chasse, qui viennent se superposer, à titre accessoire, à l'activité agricole. L'idée a été émise d'aller plus loin, et d'affecter spécifiquement certaines terres agricoles à la pratique de la pêche et de la chasse. Dans la perspective d'une reconversion de ces terres à des fins non alimentaires, il ne s'agit pas de développer des élevages de poissons ou de gibier destinés directement à la consommation. Il s'agit plutôt de monter des produits de loisirs axés sur l'exercice de la chasse ou de la pêche, et donc d'une activité liée au tourisme.

Il existe en France sons doute près de 4 millions de pêcheurs et 1,9 million de chasseurs: donc une clientèle potentielle importante. La clientèle réelle est cependant notablement inférieure, car la chasse ou la pêche de proximité n'entrent pas dans le cadre d'un produit touristique. En revanche, il y a une clientèle étrangère pour ce type de loisirs (4,5 millions de chasseurs en Europe, hors la France).

Les réflexions en ce sens sont récentes. Il n'y a pratiquement pas en France d'expériences suffisamment anciennes pour en tirer valablement des conclusions, et les références économiques font défaut.

4.1 La chasse

En ce domaine, la reconversion des terres agricoles à des fins non alimentaires prend la forme du développement des cultures pour du gibier sauvage destiné à des chasses touristiques. Il s'agit donc d'un produit différent des chasses commerciales classiques reposant sur un repeuplement artificiel. Sur la base des expériences en cours ou en phase de montage, on voit se dégager deux tendances:

- la passation de conventions entre des agriculteurs et des chasseurs, par lesquelles les premiers s'engagent à réserver une partie ou la totalité de leurs terres à des cultures dont le gibier vient se nourrir. Dans la mesure où la prestation des agriculteurs se réduit à la fourniture de la nourriture des animaux, le montage financier de l'opération est délicat. C'est pourquoi l'une des toutes premières expériences enregistrée en France a eu recours à un montage différent. La gestion de la première ferme "cynégétique" de Bretagne est en fait assurée directement par une association de 24 chasseurs, à laquelle l'agriculteur qui en est le propriétaire l'a louée. Pour le reste, la ferme fonctionne comme une exploitation normale (elle produit du maïs, du blé noir, des choux, du colza, du tournesol), à ceci près que la production n'est pas vendue, mais consommée sur place par le petit et le gros gibier des alentours.

- la passation de conventions entre des agriculteurs et des tour-opérateurs qui proposent à une clientèle extérieure des séjour cynégétiques. Plusieurs projets sont en cours de montage selon un éschéma général qui est le suivant:
  + engagement des agriculteurs d'une zone délimitée (1.000 hectares minimum) à produire des cultures déterminées en fonction du type de gibier, à adapter des pratiques quant aux intrants (pesticides notamment) permettant un développement et un renouvellement normal du gibier; à aménager le territoire pour y permettre le séjour des animaux élever et lâcher le gibier qui à moyen terme redeviendra sauvage.
  + commercialisation de séjours cynégétiques comprenant un forfait chasse, l'hébergement, la restauration, et éventuellement des activités touristiques, sportives ou de loirsirs annexes.

Une simulation sur une zone de 2.000 hectares laisse espérer une recette annuelle de plus de 2 MF (taxes d'abattage + frais d'organisation + hébergement et nourriture) par an, correspondant à un bénéfice d'environ 1 MF.

Dans ce montage, les agriculteurs peuvent être alternativement ou simultanément prestataires de services ou associés dans la structure juridique qui coordonne l'ensemble.

Il n'est pas possible d'apprécier véritablement l'impact spatial global que pourraient avoir de tels projets. Ceux-ci se caractérisent par leur dimension unitaire très importante. Mais leur nombre risque d'être limité par deux facteurs:
- ils ne peuvent être conçus comme des implantations isolées de leur environnement. Les inconvénients que pourrait présenter leur insertion dans des zones d'agriculture intensive ou de pression urbaine conduit à les localiser plutôt dans des zones en déprise, c'est-à-dire loin d'une bonne partie de leur clientèle potentielle.
- en raison de leur étendue, ces projets concernent de nombreux agriculteurs, d'où un travail de préparation et d'animation très lourd.

4.2 La pêche

La pêche est "consommatrice" de terres agricoles dans un cas de figure: lorsque des parcelles sont mises en eau pour créer des étangs. Dans les dernièrs années, quelques opérations de ce type ont été menées dans le centre de la France. On peut en tirer quelques données technico-économiques qui sont à considérer comme des ordres de grandeur:
- la transformation de terres en étang nécessite un investissement d'environ 50.000 F par hectare (terrassements, mise en eau, évacuation; création de diguettes ou d'alvéoles pour les pêcheurs), mais peut atteindre le double si des aménagements particuliers sont nécessaires.
- les recettes tirées de la pêche de loisirs (hors prestations annexes telles que l'hébergement) sont comparables à celles que l'on peut tirer d'une intensification de l'élevage piscicole: la marge brute peut atteindre jusqu'à 6.000 F par hectare, soit entre le double et le triple de la pisciculture extensive, avec des frais d'exploitatioon très faibles.

Le bilan que l'on peut dresser des opérations analysées met en évidence les enseignements suivants:

- la mise en eau de terres agricoles constitue un investissement lourd nécessitant un apport financier important. C'est pourquoi l'appel à des investisseurs extérieurs est parfois inévitable. Cependant, ces investissements présentent l'intérêt de pouvoir être réalisés de façon étalée dans le temps.
- malgré le poids des investissements, les projets de tourisme lié à la pêche constituent une opportunité intéressante pour valoriser des terres agricoles. Ils exigent toutefois de pouvoir s'appuyer sur une clientèle important, ce qui restreint leur localisation aux zones proches des agglomérations.

4.3 Conclusion

La pêche et la chasse touristique sont un des modes de diversification de l'agriculture qui ouvre apparemment les perspectives économiques les meilleures, à la condition d'être menées de façon très professionelle; cependant, le manque de références ne permet pas encore de conclure définitivement.

En tant que mode de reconverion de terres agricoles, la chasse touristique (plus que la pêche) est susceptible d'utiliser des surfaces relativement importantes, compte tenu de la dimension physique qu'impliquent les projets. Toutefois, il s'agit rarement de reconversion totale des terres, et en général des activités agricoles subsistent en complément de l'activité de loisirs (la pêche touristique est ainsi pratiquement toujours associée à l'aquaculture). De plus, la localisation des projets se heurte à des contraintes géographiques qui restreignent les possibilités.

5. LE GOLF

Le golf est un sport considéré comme particulièrement porteur. D'environ 40.000 pratiquants au début des années 1980, on est passé à environ 150.000 à la fin de la décennie et on prévoyait près de 500.000 en l'an 200 1. Même si ces prévisions ont été revues à la baisse récemment, il reste que cette activité a un potentiel de développement très important.

5.1 Les golfs classiques

Les golfs classiques sont des opérations coûteuses:

- en investissement:
  + les fourchettes de coût communément admises pour les parcours proprement dits sont les suivantes:
    . parcours 9 trous homologables (18 à 25 ha): 3 à 6 millions de francs,
    . parcours 18 trous homologables (45 à 60 ha): 5 à 15 millions de francs;
    les coûts variant selon les contraintes d'adaptation au site.
  + s'ajoute à ses coûts la construction du bâtiment d'accueil qui, sur la base d'un prix unitaire variant de 4.500 à plus de 8.000/m² selon l'ampleur et la qualité des prestations, peut varier entre 7 et 23 millions de francs.

- En fonctionnement:
  Un golf est une "société de service consacrant 50 à 70 % de son budget à la rémunération d'un personnel employé surtout le week-end et les jours fériés" (avant-propos du plan comptable des golfs). Cette activité se caractérise donc par l'importance des charges fixes, mais le niveau de celles-ci dépend beaucoup du niveau des services offerts (type de clientèle, degré d'ouverture au public, standing).

  On considère qu'en 1989, un golf "économique" (3,5 employés pour l'entretien, 0,5 pour le secrétariat) coûtait 1 à 1,5 millions de francs par an, mais ce ciffre peut pour d'autres golf dépasser 3,5 à 4,5 millions de francs. Par ailleurs, les recettes sont obérées en France par une fréquentation inférieure à celle d'autres pays: 20.000 parties par an pour un golf privé et 35.000 pour un golf public, contre respectivement 31.000 et 55.000 aux Etats-Unis.

  Dans ces conditions, on s'accorde sur le fait que:
  + la rentabilité n'apparaît qu'à moyen terme (5 ans)
  + l'équilibre financier des projets est souvent fragile les premières années;
  + la rentabilisation passe souvent par des investissements immobiliers pour les golf privés ou commerciaux.

5.2 Des opérations qui ne sont à la portée que d'une minorité d'agriculteurs

Toutes ces caractéristiques font que la création d'un golf est une opération que peu d'agriculteurs sont à même de réaliser.

Le premier obstacle est évident: c'est le montant de l'investissement. Hors de portée de l'agriculteur individuel (sauf emprunts très lourds), il implique soit l'association avec d'autres agriculteurs, soit l'appel à des capitaux extérieurs, cas le plus fréquent.

Le second obstacle tient aux compétences exigées: les connaissances agronomiques ne suffisent pas, il faut un savoir-faire commercial et la capacité à maîtriser des projets complexes. La création d'un golf est une opération d'industrie légère.

La troisième difficulté est l'état du marché: si globalement ce dernier est en expansion, une bonne partie du territoire, sous-diversifié, n'offre guère de perspectives, et d'autres zones (Côte d'Azur) sont à la limite de la saturation.

Ceci explique qu'à côté de quelques réussites on trouve un nombre non négligeable d'échecs aux conséquences lourdes. Tel cet agriculteur du Nord acculé à la faillite avec 20 millions de francs de dettes.

5.3 Les golfs rustiques, une alternative?

Les golfs rustiques sont parfois présentés comme une formule plus adaptée à la reconversion d'agriculteurs.

Ils présentent un avantage incontestable: il s'agit d'une formule plus accessible en raison de son coût. Selon sa dimension (9 ou 18 trous) et son équipement (bâtiment d'accueil ou non), son coût varie entre 2 et 5 millions de francs, soit du même ordre de grandeur qu'un investissement moyen dans une serre horticole. En outre, du fait du caractère restreint des aménagements, il s'agit d'une opération qui est souvent réversible.

Il ne s'agit pas pour autant d'un "golf au rabais", mais au contraire d'un produit bien spécifique. Intéressant surtout les débutants, il nécessite un parcours adapté et sa création doit être accompagnée par la mise en place d'un programme de stages de formation.

Il apparaît donc que les golfs rustiques sont une formule intéressante pour les agriculteurs mais qui, dans le cas français, en sont encore au stade expérimental et n'ont pas encore vraiment trouvé leur créneau.

5.4 Conclusion

Quantitativement, le golf aura, en raison de ses perspectives de développement et des surfaces qu'exige chaque projet, un impact sur la consommation de terres agricoles plus important que beaucoup d'autres alternatives à l'agriculture. Mais cet impact sera malgré tout extrêmement limité. Compte tenu des chiffres de départ (380 golfs couvrant 26.600 hectares actuellement), un rythme de progression de 10 à 15 % par an se traduirait sur 10 ans par la reconversion de moins de 50.000 hectares agricoles. En raison des contraintes de clientèle, ce mouvement intéressera essentiellement les zones péri-urbaines ou les sites de tourisme de masse. Du fait du caractère délicat de ces opérations, il n'est pas certain que beaucoup d'agriculteurs pourront y trouver leur place.

6. CONCLUSION GENERALE

L'enseignement majeur à tirer de ces analyses est qu'en tant que mode de reconversion de terres agricoles, les activités touristiques, sportives et de loisirs n'auront qu'un impact extrêmement marginal. A ce titre, elles ne constituent pas une solution aux problèmes de maîtrise de la production.

En revanche, elles offrent des perspectives de diversification pour les exploitants: c'est donc plus une modalité de reconversion de la main d'oeuvre agricole. A cet égard, elles peuvent apporter une contribution directe, limitée mais utile, à la revitalisation des zones rurales en voie de désertification, et indirecte à l'équilibre des marchés agricoles.

(1) Et des références technico-économique d'exploitations agro-touristique. APCA, Juin 1989.
(2) Valeur de franc: 1 F = 0,17 dollars ou 0,295 DM.
(3) Non compris les cessions internes à l'exploitation (p. ex. valeur des céréales produites sur l'exploitation et consommées par les chevaux).

EC POLICY ON MARKET ORIENTATION (LAND SET-ASIDE) - ITS IMPLEMENTATION IN GERMANY

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The decisions of the European Council of 12 February 1988 on a reform of the EC agricultural policy comprise apart from the early retirement scheme and the budget stabilizing guarantee thresholds for cereals, oilseeds and protein plants also the commitment of member states to offer farmers supply control measures for set-aside, extensification and conversion of production against compensation for loss in income. A decisive breakthrough was thus achieved in the necessary reorientation of agricultural policy. Supply control measures can now be implemented on a voluntary basis. But the original intention of the EC commission and of most member states did not materialize to reach a solution to the market and financial problems solely through price cuts.

The aim of these supply control measures is to avoid the exceeding of the guarantee thresholds - for example for cereals the guarantee threshold is a volume of 160 million tons - with a view to keeping the effect of the stabilizer mechanisms, that means of the mechanisms for automatically cutting farm prices, as small as possible. The supply control measures are reflected in various EC regulations. The following measures are presently offered at the EC level in all member states:

- set-aside and
- extensification.

Market pressure relief and budget stabilization figure in the forefront of these measures. These measures can, however, also help ensure farm incomes and improve the natural and environmental situation.

The national implementation of the EC regulations in Germany takes place under the Law on the Joint Task of Improving the Agrarian Structure and Coast Protection through socalled principles of promotion.

Financing takes place within the framework of a special indicative plan which covers the period from 1988-1993. The federal government assumes 70 % of the funds for this special indicative plan and the Laender (states) 30 %.

The body taking decisions relating to the Joint Task is the Planning Committee on Agrarian Structure and Coast Protection (PLANAK) which consists of the Farm Ministers of the Laender as well as of the Federal Farm Minister and the Federal Finance Minister. This Committee adopted for the first time in 1988 principles for the promotion of setting aside farmland.

Farmers who want to take part in the measure on a voluntary basis must commmit themselves to set aside for a period of 5 years at least 20 % of the farmland cultivated with market regime products during a reference period.

Set-aside can take place through
- fallow (rotation fallow/permanent fallow)
- afforestation
- conversion into extensive grassland
- use for non-agricultural purposes.

Farmers have to meet certain requirements. For example, in the case of fallow land the areas set aside must be planted with non-productive plants (e.g. grass, clover). Self-planting is allowed. The Laender may impose specific conditions on planting non-productive plants. The areas may not be fertilized and not be treated with plant protectants. A minimum number of existing rows of trees and hedges must be ensured, the growth must remain on the areas (laender specific exceptions for nature reserves and protected water collection areas) and it is not allowed to carry out amelioration measures and to plough up grassland.

The amount of the aid which was maintained in the first three years when the measure was applied consists of a basic amount of DM 700 up to an average yield index of 25 and a supplement of DM 20 per additional yield index point. The maximum premium, however, amounts to 1,416 DM/ha.

The Laender may reduce in the case of permanent fallow the aid by up to 20 %.

In the case of extensive grassland use the aid is reduced by 40-60 %, for non-agricultural uses by the amount of the earnings from use.

SET-ASIDE IN THE FIVE NEW FEDERAL STATES

- The compensation to be expected for the still existing differences in yields between the old and new federal states
- a lower per capita consumption of cereals in the new federal states
- a lower share of cerals in feeding and
- the use of an acreage under potatoes of about 250,000 to 300,000 ha which will be abandoned and used for cereal production

will lead according to estimates to an additional production of about 3.3 million tons of cereals and to a lower domestic demand of about 2 million tons of cereals in the five new federal states.

For these reasons it was absolutely necessary to introduce supply control measures also in the former GDR. On 13 July 1990 a "Directive on the Promotion of Setting Aside Farmland" was put into effect.

This measure which is solely financed at the national level, that means without EC refund is largely based on the principles of promotion so that it can be applied without special difficulties as an EC measure as from the beginning of the farm year 1991/92. This is the reason why the set aside scheme for the former GDR is limited to 12 months.

Nevertheless, some special conditions in the former GDR had to be taken into consideration - the relevant EC regulations were amended accordingly.

The directive corresponds in many parts to the principles of promotion. The most important criteria are the following:

- Promotion is granted for the set-aside of farmland with an average valuation index of field as from 18 on which products were cultivated in 1989 for which a market regime existed in the former GDR (potatoes are also covered by it),

- types of set-aside
  = fallow (no differentiation between permanent fallow and rotation fallow because of 12-month period of commitment),

  = afforestation,
  = non-agricultural uses,
  = conversion into extensive grassland,

- area to be set-aside as a matter of principle 20 % for the farmland cultivated in the reference period with market regime products; as from a reference area over 750 ha the minimum area to be set aside is 150 ha,

- if farmland is taken out of an enterprise a maximum of 50 % of the farmland of the new farm can be set aside,

- eligible for promotion are owner-operated enterprises, i.e. collective farms (LPGs) or other legal persons as well as peasant family farms; publicly owned enterprises (state farms) are expressly excluded,

- the amount of the aid depends on the loss in income resulting from set-aside, that is on the gross margin. The latter is in the former GDR below the level in the old federal states, the reasons being, inter alia, a great input of fertilizers and plant protectants with at the same time lower yields per hectare. For that reason and because of the possibility to save fixed cost on a pro rata basis in the case of the area volume to be set aside, the amount of the aid in the five new federal states had to be markedly lower.

  It amounted to
  = 500 DM/ha for soils with a valuation index of field of 18-25, moreover, DM 10 for each additional valuation index of field point, however, a maximum amount of 750 DM per hectare
  = as in the old federal states deductions in the case of conversion into extensive grassland and crediting of income in the case of non-agricultural uses.

RESULTS

The set-aside scheme has found a favourable acceptance among farmers in the old Federal Republic of Germany.

In the first year of applying the set-aside scheme in the old federal states 165,125 ha were taken out of production. In the farm year 1989/90 a volume of about 57,000 ha was added. According to preliminary results another 90,000 ha will be set aside in 1990/91 so that in the old federal territory about 312,000 ha were set aside by about 44,200 farmers. This corresponds to about 4.3 % of the farmland in the federal territory. Apart from a somewhat lower acceptance in North Rhine

Westphalia (3 % of the farmland) and Bavaria (3.4 % of the farmland) a relatively even distribution over the whole federal territory can be noted.

With about two thirds of the land permanent fallow is predominant over rotation fallow accounting for about one third. Extensive grassland use, afforestation as well as non-agricultural uses are of no importance.

Set-aside has also been broadly accepted in the five new federal states. The competent authorities received 2,206 requests covering an area to be set aside of 599,243 ha. This is with a farmland of 4.7 million ha a share of 12.8 %.

Like in the old federal states fallowing at 93 % is the most important type of set-aside in the former GDR. No use was made of the other set-aside variants apart from regional exceptions (in Saxony and Thuringia exctensive grassland use about 16 %).

The reasons for the very good participation in the new federal states should be the following:
- the legal uncertainty with regard to property relations
- The uncertain future prospects
- the unfavourable output/input structure with at the same time attractive set-aside premia
- the fact to be able to give up surplus capacities in potato production.

The following balance sheet can be drawn up for the whole federal territory: About 900,000 ha were set aside of 7,6 % of the farmland.

According to conservative estimates and on the assumption that only acreages under cereals and/or potential acreages under cereals were taken out of production, the reduction in production amounted to 3.74 million tons of cereals. These estimates are based on average cereal yields of 4.7 t/ha in the old federal states and of 3,8 t/ha in the new federal states.

Whether the aim of market pressure relief can be achieved to an adequate extent primarily depends on how the measure will be applied in the other member states of the European Community.

Summing up, one can say that the voluntary set-aside scheme can help

- relieve market pressure, because less is produced
- relieve strain on the budget, as the cost of surplus disposal, that means export refunds and cost of storage, are on the average of several years to the amount of about 2,000 DM per hectare higher than the set-aside premium
- ensure incomes, because deficiency payments are granted which make a constant contribution to incomes also if additional price cuts are made due to the stabilizer mechanisms.

Last but not least set-aside has also a positive impact on nature and the environment if one thinks of the diversity of species and the reducion of the discharge of substance. However, opinions with regard to the environmental effects are greatly diverging. Some scientists give preferences to rotation fallow. This set-aside variant has the advantage that nitrate leaching and thus the danger of nitrogen discharge in the groundwater is largely avoided as in the case of the five-year permanent fallow. Other scientists consider permanent fallow to be the more useful set-aside method for reasons of diversity of species. In this respect, precise statements can only be made if the final research results are available from additional scientific studies.

OUTLOOK

The Planning Committee on Agrarian Structure and Coast Protection is expected to adopt principles of promotion for set-aside at the end of June for the farm year 1991/92. These principles will apply to the whole federal territory. The specific problems in the five new federal states will be taken into consideration.

The new principles of promotion for set-aside have been supplemented by a variant "cereal cultivation on land set aside for non-food purposes". That means that in future on a maximum of 50 % of the areas set aside cereals can be cultivated for the non-food sector (for example ethanol production) provide the producer can present a contract with a processing enterprise. The amount of the aid granted under this variant will amount to a maximum of 70 % of the normal set-aside aid. This level has already been fixed by the relevant EEC Regulation.

Set-aside is exposed to criticism in public discussion. Criticism is justified to the extent that these measures cannot solve all agricultural policy problems.

It is, however, also evident that one cannot do without supply control measures. The alternative to cuts to subsidies must be a reduction of the production level. The latter should be the priority aim. To achieve that aim, a reduction of the EC support level will not be avoidable.

Set-aside should, therefore, be intensified at the EC level, in other words, efforts should be made to apply this scheme in all member states.

The EC Commission has meanwhile met this request. Within the framework of the farm price negotiations it has submitted a proposal to the Council for a one-year special set-aside scheme in 1991/92 which has meanwhile been adopted.

This measure is compulsory for member states, for farmers it is again voluntary. The presumable conditions are broadly the following:

- minimum level of set-aside 15 % of the acreages under market regime products in the reference period
- reference period presumably farm year 1990/91
- period for commitment 1 September 1991 to 31 August 1992
- type of set-aside: fallow
- specific conditions (planting with non-productive plants e.g. grass, clover) as for the 5-year scheme
- relief from the co-responsibility levy which was raised from 3 % to 5 %
- amount of the aid not yet fixed; will, however, be fixed in such a way that the 1-year as well as the 5-year set-aside scheme will be similarly attractive.

With this measure greater emphasis is given to the pollutor pays principle, that means that farmers who participate in the set-aside scheme will be exempt from the co-responsibility levy.

Farmers can choose between

- a production without consideration for quantities. Then they have to accept also lower cereal prices or
- a production which is oriented towards demand.

THE INDUSTRIAL VILLAGE IN ISRAEL
A PROGRAM FOR THE RURAL INDUSTRIAL DEVELOPMENT OF THE SEGEV REGION, ISRAEL

M. Cohen, Tel Aviv

1. INTRODUCTION

At the end of the 1960s, the idea was first raised in Israel to establish a village in which industry, tourism, and services would serve as the major economic branches. The aim was to settle areas the development of which had been hitherto postponed due to the scarcity of land and water.

The idea grew out of the fact that more and more entrepreneurs in the rural sector in Israel favored developing non-agricultural initiatives as a supplemental or main source of income, or began full- or part-time employment outside the village.

Nevertheless, the Segev Region is the first one in Israel to be established from the very beginning on the basis of an overall plan for the development of a regional area on an economic, not agricultural, foundation.

The first development plan for Segev which was announced in 1976 introduced a model of "industrial villages" attached to local and regional level economic and social support systems. At the time, this was a revolutionary approach in Israel. Over the years, it has undergone several changes but its basic principles have been retained until this very day.

Although industry has already developed in rural settlements in other areas, Segev was the first region in which industry, tourism and services were the sole means of production in the rural settlements whose organizational structure was a cooperative in the accepted meaning of the concept in Israel: kibbutz, moshav, and rural community.

Particular emphasis was placed on planning the development of regional systems, including private and public services and an infrastructure for economic development.

The main emphasis in economic development is the creation of an environment conducive to the encouragement of initiatives among the inhabitants of the region.

The implementation of the program began in 1977. Since then, twentyseven villages have been established with about 1,055 housholds numbering about 4,200 people.

In the framework of developing the economic initiatives of the residents of the region, about 108 various plants and businesses have been established. They employ about 500 workers, who make up about a third of the local work force.

2. THE INDUSTRIAL AND COMMUNAL VILLAGE

Although industry became an important economic element in other forms of settlement in Israel, the village or the communal settlement have been found to have the most suitable organizational and settlement framework for the business initiatives in the village sector after the kibbutz whose cooperative structure gave it special advantages in this field.

The model of the communal village was developed in the mid-1970s, its principles being:

a) The number of units is restricted to about 250-400 families
b) The village is organized as an overall cooperative association in which there is a total identification between the association and the local committee.
c) Each settler must be a member of the association.
d) The regulations of the association and the settlement ensure the preservation of the character of the settlement and define the mutal relations between the community and its members.
e) The village has the appearance of a "closed club", and members are accepted through a screening committee with the participation of a public official.
f) It is possible to organize economically on an individual or group basis.
g) The residents may work in the settlement, within the region or outside of it, in intensive agriculture, industry, tourism, or services.
h) The settlement is integrated in the regional system of education and culture as well as in joint economic fields.
i) The cooperative association is the owner of public buildings in the village, as well as the industrial structures that it rents to entrepreneurs who are members of the association. It does so in order to avoid irregular uses which will adversely affect the quality of life and regulations

of the association. The public areas, including the industrial area, are leased by the association from the Israel Lands Authority.

j) The association provides basic municipal services to its members, maintains social and cultural activities and taxes its members to finance its institutions.

The communal village enabled settling areas whose development has been delayed due to the constraints of extensive agricultural development, and created a framework for non-agricultural economic development based on the individual abilities of the members, cooperation among them and with external factors, while preserving the principles guiding the way of life in the village.

It should be noted that in its first years of existence the communal village resembled an Israeli moshav, in other words, included also the involvement of the association in obtaining credit for the members while granting mutual guarantees, purchase of inputs, marketing and financial management.

All of these subjects were discovered to be irrelevant for the non-agricultural economic development and no longer exist. The association's role in economics was gradually reduced to other fields, as mentioned earlier.

3. PLANNING AND DEVELOPMENT OF THE SEGEV REGION

a) Description of the region

The Segev region is situated in northern Israel in the Lower Galilee. It is a hilly area, reaching an altitude of about 600 meters above sea level. The average annual precipitations is about 600-700 mm, and the weather is pleasant with a typically Mediterranean climate.

Some of the region is covered with natural forests while other parts have forests planted by man. Only a small amount of the land is suitable for agriculture, except for those areas devoted to pasture. Water for irrigation and drinking is not available locally and must be brought in from outside.

Carmiel, a town in the center of the region, was founded about twenty-five years ago. It has a population of about 20,000 inhabitants, and most of its economy is based on the development of high-tech industries.

Segev is located about forty kilometers from Haifa, the largest city in northern Israel, and about 130 kilometers from Tel-Aviv.

b) Planning and development of the region

The development plan for the Segev region was an outgrowth of a general plan approved by the government for the distribution of Israel's population.

The first regional development plan was prepared in 1976, when there were only two rural settlements and one town in the region. In 1981, another plan was prepared which set the physical goals for establishing twenty-seven different kinds of rural settlements with a target population of about 4,000 households. The plan related to an area of about 500 km^2.

In 1985, yet another plan was prepared for the region. It was called "Plan for the 2,000 Region", and it determined future development concepts based on four principal components: Creation of a supporting infrastructure and environment for economic development based on encouraging local initiatives and granting preference to sophisticated high-tech industry; development of accessible systems and communications; development of a variety of high-level educational systems; and the development of a special organizational system for the region. This plan has served as a conceptual basis for development until the present.

In the development of the region, emphasis was placed on the following components:

1. Optimal distribution of rural settlements in the area. Various kinds of settlements were established, but the most dominant was the communal village.

2. Access roads between the settlements were improved in order to ease the mobility of the workers and to enable convenient economic and commercial movement within the region and outside of it to Carmiel, Haifa and Tel-Aviv. In addition, various kinds of communications systems were installed: Telephone, facsimile, and computerized communication.

3. A regional council was set up with representatives from all the settlements. Its role is to provide most of the necessary municipal services according to the law in the fields of education, maintenance of access roads, removal of garbage, sanitation, health-care, fire prevention, sewage and security. In addition, ways for cooperation between the rural and urban sectors were established, mainly in the fields of purification of sewage water, fire prevention, and education.

4. Ways of assistance and incentives for economic development and for construction as is customary in Israel were established, but particular emphasis was placed on the planning and implementation of the development of a suitable infrastructure for industry, tourism, and services.

The actions enabled the creation of a framework for a high personal and social quality of life as well as an infrastructure for economic development.

c) Population and society

The settlers in the region are young people who usually move there from the city at the age of 25 to 30, after completing their military service. They are educated with a varied academic background or training in technical professions.

The attraction to the region stems from individual motives such as a search for a quality of life different than that of the city, from social and ideological motives of fulfillment in a framework of communal life in a village, as well as from a desire to enjoy conditions of assistance granted for both housing and economic development.

The general assembly of members is the decisive factor in the field of decision-making, and each village elects annually which of its member will serve on the committee which manages the everyday activities of the settlement.

The regional council is elected and includes one representative from each settlement. The head of the council is elected by popular vote by all the members of the settlements once every four years.

d) *Economic development*

Economic development depends on several factors: Direct assistance for the development of individual initiatives, development of a physical infrastructure, attracting large enterprises from outside which will serve as economic "anchors", and assistance for improving accessibility as an auxiliary factor for work outside the area and for economic and commercial activity.

The original plant determined that 60 % of the workforce would work in the region in the target year, while 40 % of the workforce would work outside the area. Among the people employed in the region, about 20 % would work in industry, about 9 % in agriculture, about 6 % in tourism and commerce, and about 25 % in community services.

The actual situation is similar to what was planned, although the development of local initiatives developed above and beyond expectations, as will be described below.

In each settlement, the economic infrastructure includes a small industrial structure divided into units of about 300 m² which is suitable for beginning initiatives, and a medium-sized structure of about 500-700 m² which is suitable for containing the developing industries. In addition, an infrastructure was developed and buildings were erected in the regional industrial center for more advanced industries which employ more than 30 workers in an enterprise. Likewise, a similar infrastructure was created for those industries which it was preferable to locate outside the settlement in order to prevent damage to the quality of life of the inhabitants.

In this way, large enterprises were established within the region and in the city of Carmiel by outside entrepreneurs.

The region enjoys various incentives given by the government of Israel and the Jewish Agency. The incentives are given to individual settlers or to organized groups of settlers in the form of grants, as a relative or permanent fraction of the entire investment and in the form of easy loans. The assistance for establishing infrastructures is given as a grant. Likewise, government assistance in the form of grants and loans is given for constructing houses for the settlers.

Special assistance is given to new entrepreneurs in preparing a business plan, checking preparedness, professional training including a course in the development and management of entrepreneurships, marketing consultancy and assistance, assistance in research and development, professional accompaniment and tutoring.

Experience indicates that investment by local entrepreneurs was preferabel in the long-run to attracting enterprise from outside, since the enterprises established by the people from the region were found to be more suitable to its residents, they usually contain all the components in the production chain beginning with development and ending in production lines, and the profits which are received are usually re-invested in the region itself for the purposes of additional development. The survival capacity of the entrepreneurs and the local enterprises is high, and about 80 % of the enterprises that were established continue to function and develop.

On the other hand, an enterprise that was brought from outside the area by an external entrepreneur has advantages in supplying immediately many employment opportunities and in giving an opportunity to create additional service industries around it.

But they have a disadvantage since the development and engineering departments usually remain outside the region and the profits received were directed to other investments.

e) The situation of development in the Segev region in 1991

From the aspect of physical infrastructure and the location and establishment of the settlements, the entire plan was carried out. Since development work began about twelve years ago in the region, twenty-seven settlements have been established, of these six are kibbutzim, two are moshavim shitufim, and nineteen are communal villages.

The present population is 4,200 in 1,055 households. The largest settlement is 150 households and the smallest one is 25. The annual growth rate is about 120-150 additional families.

Roads within the region have been improved as well as from the town of Carmiel to the rest of the region, and from the region to Haifa and to Tel-Aviv. The plan for the roads has not been entirely completed.

Until the present, the residents of the villages have established 108 economic enterprises in the fields of industry, services, and tourism which employ more than 500 workers, as follows:

70 production and industrial enterprises employ about
400 workers
24 planning offices employ 55 workers
14 tourism enterprises employ about 60 workers

In addition, about forty people are employed in the intensive agriculture branch, the growing of houseplants, flowers, and ornamental plants. A special research and development station dealing with the development of new products and exctension was established to give a foundation to this branch. About another forty people work in conventional agriculture. These data indicate that out of about 1,500 people, who make up the workforce in the region, about a third are employed in entrepreneurships that were developed by people from the region themselves. The number of initiatives makes up about 10 % of the number of households, while the number of entrepreneurs reaches about 15 % of the households (Some of the enterprises have two to five partners).

As for future development, it may be stated that the region is found - like all of Israel - in a stage of re-planning, in the face of the large wave of immigration from the Soviet Union which began in 1990, the aim of which is to double the region's population to about 8,000 households within about five years in the village sector, as opposed to about 4,200 at present, and to about 60,000 households in the town of Carmiel instead of the 25,000 planned for today.

The plan will also relate to additional components such as employment and services in order to maintain the present level which was an important component in the successful populating of the region.

THE USE OF AGRICULTURAL LAND FOR NON-FOOD PURPOSES IN ITALY

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The utilization of agricultural land for non-food purposes is an emerging theme and will probably gain increasing attention in the present decade. For the time being, however, the area involved is still very modest according to the statistic information available, which, by the way, are far from exhaustive. In this report we propose to review the situation in Italy with special attention to the areas involved in the following activities and programmes: a) renewable raw materials for non-food purposes; b) set-aside; c) conservation and protection of nature; d) agro-tourism and leisure activities.

Before proceeding to illustrate the Italian case, with a view to place the theme under discussion on a broader perspective, it may be useful to recall some of the basic motivations which are behind present land diversion programmes and trends.

MOTIVATIONS AND ALTERNATIVE APPROACHES

There are several motivations which help to explain the emergence of the theme under consideration. One can analyze them from two main observation points which tend to stress different causes. It can be shown that although the ultimate effects of the forces at work, to a large degree, seem to coincide - less land needed for food production - their implications are somewhat in contrast and, what is more important, demand separate approaches.

The first viewpoint, which for purposes of convenience could be denominated "the crisis of traditional agricultural policy", stresses the need or, to use a stronger term, the necessity to steer away from a number of undesirable consequences of the protectionist agricultural policies pursued, with some variations from country to country, since the end of World War II. These consequences are well known and therefore a brief list may be sufficient for our purpose. They are:

a) the accumulation of costly surpluses of staple foods which do not find outlets in the domestic (or community) markets and must therefore be disposed of at below cost in other markets or be destroyed (case of perishable commodities);
b) the depressing effects of such policies and commercial practices on world prices;

c) the deterioration of world trade relationships especially between major blocks of countries which have contrasting interests in agricultural world trade;
d) the pervers income redistribution effects which assistance to agricultural producers primarily through price support policies engenders, both within the agricultural sector (between different farm size classes and between different agricultural areas), as well as between producers and consumer;
e) the negative environmental impact of highly intensive agricultural forms of production, stimulated by high and stable prices.

The more these effects have come to be perceived as undesirable and in the long run unbearable, the more efforts have been put in the search of ways and means to stop or at least contain them, putting a brake, at the same time, to the tendency towards expanding costs (both in terms of budget outlays and of social and political costs). The EC policy of budgetary discipline, the producers' co-responsibility, quotas, set-aside, and other structural measures for extensification, afforestation, etc... are examples of the initiatives so far designed to remedy these undesirabel effects. Other actions shall probably have to be introduced, under the pressure of internal forces as well as of international events. Similar steps have been taken or are being considered in countries outside of EC (EFTA Countries, for instance). The situation is for the time being somewhat different in the eastern European countries and in the USSR. The identification and promotion of alternative productive uses of the redundant resources (of which land is but one) now deplayed in food production can, therefore, be looked upon, from this viewpoint, as a partial re-orientation of policies conceived three to four decades ago, in socio-economic contexts which no longer prevail.

The second viewpoint which, for want of a better term, could be labelled "Growing demand for diversified land and countryside services" brings forward an additional set of motivations, reinforcing the need for agricultural policy reform and for fresh approaches to land utilization. The emphasis, here, is on the demographic, economic and anthropological features of the populations of developed societies, especially those of western Europe. Two main issues are worth mentioning: one concerns the expectations for food demand, domestically produced, the other addresses the role of the countryside in the overall welfare of populations which already enjoy high levels of material well-being but are threatened by overcrowding and pollution in the main metropolitan areas and most favoured regions and, at the same time, by marginalization of the least favoured areas.

The food issue can be synthesized as follows:
a) in western societies per-capita food intakes, with all likelihood, will not expand beyond present quantitative levels; they may even fall somewhat because of health reasons or "look" fashions; these expectations are, of course, compatible with a further rise of per-capita food expenditure levels because of quality shifts and continuous development of consumer services;
b) any future growth in the overall demand for food will, then, be driven only by population increase which is forecasted slow or even negative for most countries;
c) whatever growth in food demand may occur, if any, will be considerably smaller than the potential additional supply obtainable from new technologies;
d) last but not least, for reasons of international trade in a less protectionist world and in a perspective of gradual integration of Western and Eastern European contries, at least part of the now domestically produced commodities will have to be imported from lower cost producers;
e) the final result of the above trends and projections is that internal food production will require less land than is presently employed for that purpose; there is therefore space and scope for the production of non-food commodities (biomass, timber and wood products, fibres, etc...), especially of those which are not readily available in world markets and/or are based on advanced technologies for production and processing if there is an economic justification for them and for the production of countryside services; this leads to the second issue, i.e. the role of the countryside.

The justification for an increased role of countryside services in contemporary developed societies can be described as follows:
a) as a consequence of the complex forms of economic and social organization and of the high level of material well-being, which is however obscured by the threat of more ruinous environmental damages, these societies seem to put forward a variety of new needs which in order to be satisfied, among other conditions, require a fresh approach to the problems of land use;

b) increasingly, land resources and the countryside are becoming recognized as suppliers of space for recreation, leisure, sport and cultural activities; as the proper site for fauna and flora protection; as a place of enjoyment from landscape amenities and cultural goods - which need to be organized, managed and, if necessary, reproduced-. Widespread motorization, shorter working time, social security protection and relatively high per-capita income all contribute to enlarge the demand for new countryside services and, at the same time, to provide the motivations, the rationale and the resources for actions designed to meet this demand. To avoid any misunderstanding, it is not only a question of a still growing demand for second houses and apartments in the country or on maritime and lacquering shores, but of a wider array of services which are less amenable to be satisfied by private initiatives via the market and which tend to fall in the category of "public goods".

When adopting the first viewpoint one is still moving within a traditional farming culture or ideology. Farmers, generally, have considered themselves as producers of agricultural goods only; as such they had to take good care of land (and water) resources because of their scarcity and the consequent necessity to maintain or improve their productive capacity. Whatever additional service (positive externality) they rendered through farming was simply a by-product, which, perhaps, added to their self-consideration or to some recognition from other social groups, but could not be considered as an outright alternative to their proper role of agricultural producers. The idea of being assigned, by state agencies and with public funds, the task of gardening the countryside to the benefits of city dwellers or of society at large, for a long time, has been looked upon by farmers and representatives of the agricultural profession (including educational institutions) as a disdainful proposition. This sort of attitude, although weakened, is widespread even at present.

The second viewpoint, on the contrary, introduces another type of culture of ideology and adopts a conceptual framework which envisages production of agricultural commodities, of food in particular, as but one of the possible legitimate forms of land utilization. In this context what matters if the well-being (material and psychic) of the entire poopulation - including people living in rural areas and, of course, farm families.

The first is an agricultural viewpoint (a sort of agricultural fundamentalism), the other is rather a societal or holistic viewpoint. Given the on-going structural changes in society, the holistic ideology can be considered as an evolutionary form of the agricultural ideology: consequentially, the two outlooks, although in sharp contrast, are not necessarily mutually exclusive, and their corresponding empirical forms (policies, institutions, production organizations, etc...) can well coexist and, probably, will have to.

The recent resumption of rural development as a central theme within EC economic and social policies in preparation for the Single European Market can be interpreted as a first and still very partial step to accomodate the two cultural outlooks. The Commission document entitled "The Future of Rural Society" (1988) while pointing to the necessity of enhancing the level of economic activity especially in the rural areas which have been left aside from the mainstreams of economic and social development, stresses the importance of economic diversification, in addition to farming, and recognizes that in the marginalized areas the problem is one of "maintaining a minimum population and minimum business and social activities to protect the fragile environment (the threat of erosion and diversification) and of maintaining the countryside". It is also recognized that agricultural policy alone will not suffice by itself and that broader and more diversified approaches must be adopted. Recognizing the limitation of a policy and the need of economic diversification does not imply any disregard of farming activities; on the contrary farming is called upon to carry out a wider set of functions. Food production (with a stronger emphasis on product quality and environment friendly inputs and techniques) obviously will remain the dominant task of European farmers; a larger quantity of resources (land, labour, capital) likely will be allocated to non-food commodities, if they can be economically produced. Farmers will also be stimulated by normative actions and by incentives to refrain from producing negative externalities (pollution). But they will also be asked, through appropriate forms of compensation, to engage themselves, consciously and purposely, in the production of positive externalities which society regards as important public goods, necessary to re-establishing and maintaining more balanced relationships between man and nature and among human beings.

There are, indeed, several problems to be solved in order to assert a new type of culture and make it operational. The first which comes to mind, and which is far from being cleared yet, is: how much is society willing to pay for the positive externalities produced by farmers (whether as by-products of traditional activities, or as separate contributions specified by contractual arrangements? A second set of related problems concerns the operational definition of what is a positive externality, whether associated to farming or derived from other types of activities; how it can be easily perceived and measured by all parties concered and what remuneration rates should be associated to each form of services. And, finally, there is the problem of selecting the decision making level (and corresponding institutional procedures) more suitable and efficient in handling the relations between public authorities and private initiatives when public goods are concerned.

It would also be of importance to ascertain how much land resources could be involved, and what implоyment and income effects could be obtained by "countryside" policies. The economic side of the proposed outlook is a crucial one.

This lengthy introduction to the Italian report finds its justification in the fact that Italy, in principle, has particular interest in a renewed effort and a fresh approach toward rural development and non-food utilization of present agricultural lands.

On the one hand, a large part of Italy's agricultural territory consists of mountain and hilly areas, remote from the mainstream of economic activity and affected by rural decline and by marginalization effects because depopulation and contraction of farming have been going on for a long time; the threat of desertification and environmental damages is a real one. On the other hand, Italy has a large variety of rural landscapes and climatic conditions, a wealth of ancient settlements and sites of artistic or historical values, spread throughout the country, often not sufficiently known, nor properly cared for or even neglected, as far as maintenance and restoration are concerned. Therefore, a concerted effort towards a greater production of countryside services, and a panoply of development initiatives involving farm families and other components of the rural population could bring Italy large benefits and contribute to the welfare of a larger community.

TRENDS AND PROGRAMMES IN ITALY

1. Italian trade balance in non-food agricultural commodities

Italy has a deficit in the trade balance for all non food agricultural commodities in the period 1985-1987[1]. The main imports in this category are hides, timber products and animal and vegetable fibres that all togehter amount to 86,7 % of the total. Exports consist mainly of hides, timber products and chemical products of agricultural origin. The main part of the deficit (85,6 %) is made by timber, fibres, chemical products and hides.

TABLE 1: Italian foreign trade in renewable raw materials for non-food purposes, 1987

Commodity	Imports billion £	%	Exports billion £	%	Balance billion £	%
Wood	2494	21,91	284	9,22	2210	26,61
Cork	28	0,25	6	0,19	23	0,28
Wood pulp	1490	13,09	32	1,04	1458	17,56
Animal fibres: wool	1379	12,11	83	2,70	1297	15,62
Animal fibres: silk	201	1,77	3	0,10	197	2,37
Other materials of animal origin	43	0,38	24	0,78	19	0,23
Vegetable fibres	725	6,37	16	0,52	710	8,55
Other materials of vegetable origin	11	0,10	3	0,10	8	0,10
Hides	3349	29,42	1996	64,83	1354	16,30
Natural elastomers	203	1,78	3	0,10	200	2,41
Pharmaceutic products	71	0,62	36	1,17	35	0,42
Fats,oils,wax for industrial use	184	1,62	48	1,56	136	1,64
Natural essences	138	1,21	59	1,92	79	0,95
Agricultural chemistry products	388	3,41	163	5,29	225	2,71
Basis for essential oils	32	0,28	2	0,06	30	0,36
Other products for essences	112	0,98	53	1,72	59	0,71
Tanning products or other dyestuff	48	0,42	24	0,78	24	0,29
Animal products for mechanical processing	18	0,16	3	0,10	15	0,18
Vegetable products for mechanical processing	22	0,19	1	0,03	21	0,25
Raw tobacco	257	2,26	129	4,19	128	1,54
Products for animal reproduction	10	0,09	0	0,00	10	0,12
Products for vegetable reproduction	179	1,57	113	3,67	66	0,79
TOTAL	11384	100	3079	100	8305	100

Source: R.Galli, E.Arcuri, A.Martini: Materiali rinnovabili dall'agricoltura, in Agricoltura e Inn

1) From a research conducted by ENEA (National Agency for alternative energy sources)

Animal and vegetable products have about the same weight in imports, but the former prevail (70 %) in exports because of the high incidence of hides and skins. With respect to the period 1981-1983 there has been a rapid increase of the importance of these products because of the growth of trade.

With respect to the degree of processing, imports are equally divided between raw materials and products at first degree of processing, while exports are constitued mainly by semi-manufactured good. As compared with 1981-1983 the weight of raw materials is less and that of processed goods is greater.

Renewable products are mainly used in processing industries, while the incidence of products for vegetable or animal reproduction or energy purposes is very marginal.

2. Experiments and recent trends with field of renewable raw materials for energy and industrial uses

2.1 Historical background

The possibility of industrial utilization of agricultural raw materials has been widely studied and experimented in Italy at the beginning of this century by several research institutes such the Istituto per l'Oltremare di Firenze, the Botanical Gardens of Naples and Palermo. Those studies mainly concerned textile and papyrus plants (Agave, Boehmaria nivea, Calatrops procera, Gossypium e Kenaf), caoutchouc plants like Guayule, plants for the production of tannins (Sommacco, Acacia, Cesalpinia), rubber (Euphorbiaes), oil like Cartamo and Flax, essences. A principal aim of those studies was the identification of spontaneous species in the Italian flora which could be utilized as sources of energy or processed for industrial purposes like Aurum italicum, Iris florentina, Asphodelus microcarpus and Urginea marittima.

First the autarchy policies of the Fascist regime, then the Common agricultural policy, together with problems of scarcity of land resources have led to neglect of this direction of research that today appears quite appealing given the need to reorientate production following the changes in domestic and external demand and in the political scenario of agricultural prices and income support.

Production of raw materials for non-food purposes can be classified in four main groups the importance of which will next be analyzed:

a) timber products;
b) crops that are already cultivated for food purposes;
c) crops which are no longer cultivated;
d) spontaneous species the cultivation of which is under experiment.

2.2 Forest and timber products

Imports of raw timber have always been relevant in the Italian economy since domestic production covers only part of total demand. During the last thirty years, the area covered by forest has increased by more than one sixth, from 5780 thousands hectares in 1958 to 67500 in 1988, with an increase of 25 % and 21 % respectively of high forest species and single coppice and a decrease of 32 % of compounded coppice. Differences between the data shown in the following tables and data shown in the annexted tables, provided by Istat, are mainly due to differences in classification and survey methods.

TABLE 2: Forest area by altitude and by type of ownership (000 ha)

Altitude (m. above sea level)	North	Centre	South	Italy
up to 500	849	966	1248	3063
501-1000	1183	813	1248	3244
1001-1500	867	205	500	1572
over 1500	672	26	98	796
TOTAL	3571	2010	3094	8675
public ownership	1189	508	1240	2945
private ownership	2372	1504	1850	5730

Source: National Inventory of Forests (MAF), 1985

TABLE 3: Forest area by type 1960-1988 (000 ha)

	High forests				Coppice			
Year	coniferous	broadleaf	resinous and broadleaf consociated	total	simple	compound	Mediterranean scrub	Total woodland
1960	1.104,5	1.086,5	148,1	2.339,1	2.337,7	1.149,5	. . .	5.826,3
1970	1.191,6	1.129,7	208,2	2.529,5	2.665,3	967,3	. . .	6.162,1
1980	1.325,7	1.136,6	286,0	2.748,3	2.848,2	766,4	. . .	6.362,9
1981	1.335,9	1.143,0	290,4	2.769,3	2.848,7	766,6	. . .	6.384,6
1982	1.340,1	1.145,1	292,9	2.778,1	2.847,3	768,1	. . .	6.393,5
1983	1.349,0	1.145,0	294,0	2.788,0	2.847,0	768,0	. . .	6.403,0
1984	1.358,2	1.143,1	297,1	2.798,4	2.848,3	766,8	. . .	6.413,5
1985	1.431,7	1.144,1	321,3	2.897,1	2.837,3	785,1	207,6	6.727,1
1986	1.434,6	1.145,9	325,1	2.905,6	2.836,8	785,2	207,6	6.735,2
1987	1.432,6	1.147,7	335,8	2.916,1	2.826,4	779,5	225,9	6.747,9
1988	1.432,8	1.148,1	339,0	2.919,9	2.824,9	780,1	225,5	6.750,4

Source: ISTAT, Annuario delle statistiche forestali

TABLE 4: Forest area by species of tree (000 ha)

	North	Centre	South	Italy
High Forests	1178	231	770	2179
Red Spruce	263	0	1	264
White pine	128	26	75	229
Beech	30	39	155	224
Coniferous	292	13	21	326
Mixed	111	34	72	217
Deciduos	103	26	156	285
Coppice	1148	1368	857	3673
Chestnut	196	108	71	375
Beech	155	83	93	331
Turkey Oak	26	123	60	209
Other Oak	105	261	173	539
Mixed	913	666	342	1921
Non timber production	136	28	125	289
Special types vegetation	662	295	1204	2161
Other	147	87	138	372
TOTAL	3571	2010	3094	8675

Source: National Inventory of Forests (MAF), 1985

In the more recent years forestry policy has given greater attention to soil protection and hydrogeological defence, supporting the conversion of coppice into high forest, mainly coniferous, and the afforestation of areas abandoned by agriculture. On the experimental side, prospectives for a revaluation of marginal hill and mountain lands, once utilized by agriculture or as pasture, are linked to fast rotation arboriculture for industrial purposes and energy production (Ginestra, Robinia, Acacia).

TABLE 5: Production of timber in Italy, 1988-1989
000 cubic meters)

	Coniferous		Broadleaf		Total	
	1988	1989	1988	1989	1988	1989
Timber for industrial use	1,378.0	1,396.1	2,299.5	2,419.4	3,677.5	3,815.5
Firewood	278.4	280.0	3,665.3	3,369.3	3,943.7	3,649.3
Total production	1,656.4	1,676.1	5,964.8	5,788.7	7,621.2	7,464.8
Processing losses inside forests (1)	134.1	121.5	228.6	201.0	362.7	322.5
Timber felled	1.790.5	1,797.6	6,193.4	5,989.7	7,983.9	7,787.3

1 Share of felled timber remaining in the forests
Source: ISTAT, Annuario delle statistiche forestali

2.3 Industrial crops

These are products traditionally used for food purposes but that with minor changes in cultural techniques and varieties could gain new markets (beet, sugar cane, potatoes). This, however is still an issue for experimentation.

2.4 Textile crops

Crops for the production of fibres that were once cultived in Italy and then abbandoned are: cotton, hemp and flax. Cotton under irrigation was cultivated in Italy in the 1940's on an area of 36000 hectares localized in Sicilia, Calabria, Puglia and Sardegna. At the moment there are only 300 ha in Sicily. Italy is the fifth country of importance as importer at world level and the first in Europe. Imports, that have grown by 20 % in the period 1975-85 come mainly from the USA, Egypt and Turkey and amount to almost 260 thousands tons of raw cotton (about $ 600 million). Many textile firms in Italy are actually involved in importing the product.

Hemp was grown on almost 100 thousands hectares in Italy, localized mainly in Emilia, Campania, Marche and Piemonte. This area was reduced by half after the Second World War. In the more recent past it has contracted further to few hundreds hectares because of the competition with synthetic fibres and difficulties of mechanising production. Italy has a deficit in trade in raw hemp, which is imported from China, while it has a credit in trade in yarns and fabrics.

Flax production has had the same trend as hemp because of the competition with cotton at first and later with synthetic fibres. In the '70s cultivated land amounted to almost 5000 ha of which 4000, localized in Basilicata, Puglia and Sicily, for the production of seed. At present there are almost 1000 ha with a production of 1000 tons. Imports have grown in the last ten years by 10 % and the Italian market absorbs almost 10 % of world trade (283 thousands tons per year).

Italian silk production was a very flourishing activity in the past centuries and at the beginning of this century it amounted to 50 thousands tons per year thanks to price stability and public policy. After World War II the reorganization of economic structures and the abandoning of labor-intensive activities, there was a crisis in the silk sector; production amounts now to 100 thousands kg concentrated in Veneto, Friuli, Calabria and Lombardia. Imports have now reached some 4 millions kgs coming mainly from China (95 %).

2.5 New crops

these are spontaneous species, mainly exotic, quite unknown and that are proposed for cultivation as cash crops. They are still in an experimental stage and it is expected that they would be more successful in the South of Italy where climate conditions approximate those of the countries of origin. At present research is conducted with the aim of selecting genetic material and of chosing adequate production techniques. On the other side there is need for research about their potential market value. The species concerned are jojoba (Simmondia chinensis), sommacco (Rhus coriaria) and broom (Spartium junceum) among the perennial crops and sugar sorghum, Kenaf, ricinus, topinambur, cartamo among the annual crops. Cartamo, whose seeds contain an oil used in the production of paints and pharmaceutical products is cultivated over 200 hectares in Sicily.

3. SET ASIDE

TABLE 6: Set aside in Italy: number of farmers ad area involved, 1990 (ha)

REGION	NUMBER OF FARMS	TOTAL FARM LAND	SET-ASIDE LAND	SET-ASIDE LAND PER FARM
Piemonte	487	6332	3424	7.030
Valle d'Aosta				
Lombardia	227	5367	2041	8.991
P.A. Bolzano				
P.A. Trento				
Veneto	131	2436	956	7.297
Friuli V.Giulia	178	3031	1205	6.769
Liguria				
Emilia R.	757	14368	7606	10.047
Toscana	2098	90328	38263	18.237
Umbria	546	16922	9089	16.646
Marche	883	13657	7347	8.320
Lazio	542	19615	10991	20.278
Abruzzo	274	3820	2112	7.708
Molise	152	2515	1358	8.934
Campania	122	1919	1141	9.352
Puglia	2237	53613	29080	12.999
Basilicata	3444	69019	38493	11.176
Calabria	440	6760	5288	12.018
Sicilia	6171	105965	72211	11.701
Sardegna	1692	62230	35731	21.117
TOTAL	20381	477897	266336	13.067

Source: SISTEMA INFORMATIVO AGRICOLO NAZIONALE (S.I.A.N.)

TABLE 7: Utilization of set aside land, 1990 (*)

GION	SET ASIDE LAND	FALLOW				AFFORESTATION		NON AGRICULTURAL USES		LENTILS ETC.		PASTURE	
		PERMANENT		ROTATION									
	ha	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%
emonte	3423	1923	56,2	238	7,0	1112	32,5	54	1,6			96	2,8
lle d'Aosta													
mbardia	2041	950	46,5	96	4,7	800	39,2	99	4,9			96	4,7
A. Bolzano													
A. Trento													
neto	957	324	33,9	98	10,2	352	36,8	14	1,5	88	9,2	81	8,5
iuli V.Giulia	1205	577	47,9	71	5,9	538	44,6	8	0,7			11	0,9
guria													
ilia R.	7606	5365	70,5	322	4,2	866	11,4	282	3,7	11	0,1	760	10,0
scana	38263	3201	8,4	21591	56,4	1619	4,2	200	0,5	86	0,2	11566	30,2
bria	9088	6278	69,1	1020	11,2	334	3,7	103	1,1	31	0,3	1322	14,5
rche	7348	5672	77,2	212	2,9	460	6,3	37	0,5	36	0,5	931	12,7
zio	10991	6218	56,6	1729	15,7	218	2,0	166	1,5	109	1,0	2551	23,2
ruzzo	2111	1426	67,6	281	13,3	317	15,0	18	0,9			69	3,3
lise	1358	1012	74,5	341	25,1							5	0,4
mpania	1140	659	57,8	168	14,7	130	11,4	28	2,5	2	0,2	153	13,4
glia	29080	19332	66,5	7292	25,1	270	0,9	318	1,1	489	1,7	1379	4,7
silicata	38494	24763	64,3	11635	30,2	183	0,5	95	0,2	323	0,8	1495	3,9
labria	5287	3847	72,8	156	3,0	295	5,6	20	0,4	44	0,8	925	17,5
cilia	72212	37840	52,4	14172	19,6	1016	1,4	199	0,3	853	1,2	18132	25,1
rdegna	35732	15603	43,7	4204	11,8	1384	3,9	82	0,3	35	0,1	14424	40,4
TAL	266336	134990	50,7	63626	23,9	9894	3,7	1723	0,6	2107	0,8	53996	20,3

) Percentages refer to regional total

urce: SISTEMA INFORMATIVO AGRICOLO NAZIONALE (S.I.A.N).

TABLE 8: Farms and set aside land by production orientation, 1990

REGION	CEREALS		OTHER GROUPS		HERBIVOROUS		GRANIVOROUS		MIXED FARMS		OTHERS	
	No.	ha	No.	ha	No.	ha	No.	ha	N.	ha	No.	ha
Piemonte	181	1539	106	613	10	41	3	54	14	123	173	1053
Valle d'Aosta												
Lombardia	80	741	68	560	4	21	4	47	6	51	65	621
P.A. Bolzano												
P.A. Trento												
Veneto	46	298	38	363	9	107	5	37			33	150
Friuli V.Giulia	60	323	77	535	2	9	2	7	1	3	36	328
Liguria												
Emilia R.	124	1183	363	3660	25	455	6	21	22	257	217	2031
Toscana	630	11551	507	7980	273	6651	4	146	147	3915	537	8020
Umbria	199	2420	168	2765	36	683	2	15	30	1113	111	2093
Marche	280	2316	420	3323	38	631	4	54	29	449	112	575
Lazio	176	3859	141	2809	53	1411			35	876	137	2036
Abruzzo	58	436	118	994	7	40	2	54	17	223	72	365
Molise	70	701	60	386	1	31			5	118	16	122
Campania	26	261	51	522	2	91			6	26	37	241
Puglia	926	12978	427	5555	42	1114	3	41	37	730	802	8662
Basilicata	2110	24820	660	7143	40	564	2	18	88	2077	544	3872
Calabria	76	1031	139	1353	16	370			30	736	179	1797
Sicilia	2484	27067	1527	15894	562	10600			246	3961	1.352	14691
Sardegna	262	3815	253	4657	736	19077			157	3536	284	4647
TOTAL	7788	95339	5123	59112	1.856	41896	37	494	870	18194	4.707	51304

Source: SISTEMA INFORMATIVO AGRICOLO NAZIONALE (S.I.A.N.)

TABLE 9: Number of farms in set aside by size, 1990

REGION	< 10 HA		10 < 20 HA		20 < 50 HA		50 < 100 HA		> 100 HA	
	No.	ha	No.	ha	No.	ha	No.	ha	No.	ha
Piemonte	263	1434	114	1621	72	2160	25	1823	13	2111
Valle d'Aosta										
Lombardia	105	538	41	589	46	1377	21	1495	14	4268
P.A. Bolzano										
P.A. Trento										
Veneto	84	367	12	166	19	635	10	821	6	1116
Friuli V.Giulia	115	510	25	370	22	684	11	809	5	1564
Liguria										
Emilia Romagna	247	1332	208	3019	176	5472	71	5169	55	11731
Toscana	381	2226	392	5706	544	17428	338	23998	443	127895
Umbria	145	778	124	1779	119	3799	72	5116	86	25118
Marche	401	2180	208	3034	170	5445	64	4394	40	6899
Lazio	167	824	104	1543	132	4174	65	4545	74	19376
Abruzzo	139	721	70	1020	49	1609	8	544	8	1924
Molise	81	377	29	430	33	1024	4	254	5	1581
Campania	78	399	13	173	15	459	8	528	8	1355
Puglia	893	4127	412	5837	492	15815	254	17724	186	33406
Basilicata	1578	7512	678	9687	670	21206	308	21549	210	36786
Calabria	220	1038	76	1126	85	2704	37	2691	22	4419
Sicilia	2886	13597	1239	17693	1377	43393	464	31287	205	36875
Sardegna	278	1506	255	3832	534	18095	408	28881	217	42649
TOTAL	8061	39466	4000	57625	4555	145479	2168	151628	1597	359073

SISTEMA INFORMATIVO AGRICOLO NAZIONALE (S.I.A.N.)

TABLE 10: Number of farms by percentage of set aside land

REGION	20 %		20 < 30 %		30 < 100 %		100 %	
	No.	ha	No.	ha	No.	ha	No.	ha
Piemonte	34	195	65	392	291	2002	97	835
Valle d'Aosta								
Lombardia	30	172	43	468	87	918	67	482
Bolzano								
Trento								
Veneto	33	269	15	130	48	435	35	121
Friuli V.Giulia	10	59	28	278	92	607	48	262
Liguria								
Emilia Romagna	51	240	84	844	449	5011	173	1511
Toscana	171	1846	308	6758	1.353	24345	266	5314
Umbria	30	373	47	889	325	5657	144	2170
Marche	73	380	111	826	499	4425	200	1716
Lazio	68	847	38	920	258	6559	178	2665
Abruzzo	32	137	21	179	141	1254	80	542
Molise	4	28	15	130	88	924	45	276
Campania	18	53	13	64	60	810	31	214
Puglia	261	2024	291	3710	966	14956	719	8390
Basilicata	351	1973	373	3676	1.625	22104	1.095	10740
Calabria	73	686	15	213	186	2473	166	1916
Sicilia	699	4843	247	2547	3.131	44069	2.094	20752
Sardegna	109	1943	159	2578	995	22964	429	8247
TOTAL	2047	16068	1873	24602	10594	159513	5867	66153

Source: SISTEMA INFORMATIVO AGRICOLO NAZIONALE - S.I.A.N.

Italy, together with Germany and United Kingdom, is one of the countries where the EEC set aside programme has been widely applied. It has assumed the role of a compensative measure, in viewof the restrictive price policy that can create financial difficulties to farms which, on the other hand, are able to contribute to environmental conservation and to a small reduction in output. In Italy, the Ministry of Agriculture has identified several preferential areas where aid for afforestation can be added to that for set aside. These areas are natural parks and reserves, lands around lakes and along rivers, coasts, wet areas, private shooting and nature reserves and less favoured areas as defined by EEC legislation.

In 1990, 226,336 hectares have been set aside, distribuited in 20831 farms localized mainly in Sicilia, Toscana Basilicata, Sardegna e Puglia. With respect to the destination of this land, about 5 % is permanently set aside, 24 % is subjected to rotation and about 20 % is for pasture and extensive grazing. Only 3,71 % (10000 ha) is devoted to afforestation and 0,64 % (1723 ha) non agricultural purposes. It is interesting to notice that about 5867 farms (27 % of total) have withdrawn 100 % of farm land production and 10594 farms (more than 50 %) set aside between 30 and 100 % of farm land.

TABLE 11: Number of farmers involved in set aside programme by type of tenure

REGION	TOTAL	ONWERS	TENANTS	OTHERS
Piemonte	487	422	28	37
Valle d'Aosta				
Lombardia	227	192	19	16
P.A. Bolzano				
P.A. Trento				
Veneto	131	104	9	18
Friuli V.Giulia	178	150	5	23
Liguria				
Emilia Romagna	757	644	33	80
Toscana	2098	1805	102	191
Umbria	546	460	18	68
Marche	883	788	25	70
Lazio	542	441	19	82
Abruzzo	274	243	6	25
Molise	152	140	5	7
Campania	122	102	5	15
Puglia	2237	1893	121	223
Basilicata	3444	2875	275	294
Calabria	440	351	32	57
Sicilia	6171	5125	404	642
Sardegna	1692	1590	67	35
TOTAL	20381	17325	1,173	1883

Source: SISTEMA INFORMATIVO AGRICOLO NAZIONALE (S.I.A.N)

4. CONSERVATION AND PROTECTION OF NATURE

Total protected areas in Italy amount to 22.262 km² distribuited in 94 regional parks (14.064 km²), 11 national parks - of which 8 are only been instituted but not yet realized (6.163 km²), 459 nature reserves (2.617 km²) and 46 wet land sites of international importance. In addition, there are 100 km² of protected areas run by "green" organization or universities. Globally protected areas amount to 7,4 % of national territory. The Ministry of Environment estimates that this percentage should increase to 10 %.

TABLE 12: Protected areas*: percentage on national territory

	N°	1984 km²	%	N°	1991** km²	%
Nature reserves	252	1444	0,47	459	2617	0.8
National parks	5	2685	0,89	11	6163	2.0
Wet lands	40	490	0,16	46	551	0.2
Regional parks	42	5019	1,66	94	14061	4.7
TOTAL***	339	9638	3,18	610	22267	7.4

* data refer both to existing and in itinere areas
** data refer to 1991, 30th june
*** total does not correspond to algebric sum as some areas are protected both at national and regional level
Source: Minstry of Environment, Registro delle Aree Protette, Roma 1991

Italy has no national law on protected areas yet. This has caused much uncertainty on the financial and management side.

Analysing in more detail the several kinds of protected areas in Italy:

1) **wet lands**: these are areas of international interest as habitat of sea birds. The Ramsar Convention has been adopted in Italy with the Presidential Decree no. 44813 of 13/3/1976. In Italy there are 41 wet lands (492000 ha) where it is possible to pursue productive activities on the condition that no damage is caused to the ecological characteristics and no modification to the state of the sites. Italy has joined an International Conference on Mediterraneum protection promoted by UNEP (UN Environmental

Program) held in 1975 at Barcelona where an Action Plan for Mediterraneum was approved. With the Law n.127 of 5/3/1985 Italy agreed to adopt all the measures that are needed to protect the natural resources and the culture of the Mediterranean areas.

2) **National parks:** five national parks have been instituted between 1922 and 1968 (Abruzzo, Gran Paradiso, Stelvio, Circeo, Calabria) and three in 1988 (Pollini, Dolomiti Bellunesi and Monti Sibillini) plus the sea park of the Gulf of Orosei. In the very near future four other parks (Delta del Po, Arcipelageo Toscano, Foreste Casentinesi e Aspromonte) should be instituted for other 3000km² and a further seven (Alpi Marittime, Tarvisio, Vesuvio, Gennargentu, Alburni, Cervati-gellison, Salerno) for 3800 km².

From the following table is possible to notice how different are the situations in the different parks as regards employment and the distribution between public and private property.

TABLE 13: National parks: situation in 1988

	Gran Paradiso	Abruzzo	Circeo	Stelvio	Calabria
localisation	Alps	Appeninum	Coast	Alps	Appeninum
year of institution	1922	1923	1934	1935	1968
management	self management	self management	MAF	MAF	MAF
ha	70000	40000	8400	136620	15435
employees	68	50	82	127	112
property public privat		 95 % 5 %	 48 % 52 %	 87 % 13 %	 84 % 16 %

Source: Ministry of Environment

TABLE 14: Protected areas in Italy, 1990

Region	National parks (a)	National reserves	Wet lands	Regional parks	Regional reserves	Other protected areas	Protected areas (hectares) National	Protected areas (hectares) Regional	Protected areas (hectares) Total(b)	% protected areas on total regional area
	No.									
Valle d'Aosta	1	-	-	1	-	-	37000	3500	40500	12.41
Piemonte	1	2	-	17	19	3	36383	114534	150917	5.94
Lombardia	1	1	6	18	64	17	65985	418593	480417	20.14
Alto Adige	1	-	-	7	-	110	53447	114768	168215	22.73
Trentino	1	-	1	2	3	18	19386	82472	101858	16.38
Veneto	-	18	1	3	-	1	21631	34200	55690	3.03
Friuli V.Giulia	-	3	2	(c)	(c)	(c)	2072	(c)	2072	0.26
Liguria	-	1	-	5	2	2	16	43263	43279	7.99
Emilia Romagna	-	17	10	10	2	-	30515	121149	128937	5.83
Toscana	1	28	3	3	-	1	119832	91880	211712	9.21
Marche	1	2	-	1	-	-	58117	6000	64117	6.62
Umbria	1	-	1	(c)	(d)	(d)	19157	(d)	19157	2.26
Lazio	2	7	5	12	10	5	16385	90375	106760	6.21
Abruzzo	1	14	-	1	7	2	48596	57238	105834	9.8
Molise	1	3	-	-	-	-	1640	-	1640	0.37
Campania	-	4	-	1	-	1	1978	520	2498	0.18
Puglia	-	16	3	-	-	1	9846	424	10270	0.53
Basilicata	-	8	-	1	7	-	961	81577	82538	8.34
Calabria	1	16	1	1	2	1	31938	(e)	31938	2.12
Sicilia	-	3	2	2	19	-	6056	110846	116902	4.49
Sardegna	-	1	8	-	-	2	14147	3316	17463	0.73
ITALIA	7	145	43	84	136	153	595088	1374655	1942714	6.50

(a): Total number regards parks that are already been realized (5) and parks that have been institued but not realized
(b): Total protected area does not correspond to the sum of partial data as
some areas are protected both at national and regional level
(c): in 65,550 ha there are protection regulations
(d): 8 regional parks for 92,700 ha are being institued
(e): not avalaible
Source: Banca dati delle aree naturali protette in Italia, situazione al novembre 1990. CNR,a cura di I. Napoleone, S. Palladino, M. Pischedda

3) **Nature reserves:** they amount to 2617 km² distribuited between 157 reserves and 302 regional reserves. Another 20 areas will be soon instituted. These reserves have the main objective of pursuing total protection of ecosystems and scientific research. Only in this sense human intervention is admitted.

4) **Game reserves:** These farms have been constitued with the aim of environmental conservation and of breeding of game. They are subject to a very restricitve regulation. Their activity consists mainly of repopulation game. They are distribuited mainly in the Centre and in the North (Toscana, Piemonte, Veneto).

TABLE 15: Game reserves 1988

	Hunting farms		Fauna Protection and refuge		Repopulation farms	
Regione	No.	ha	No.	ha	No.	ha
Piemonte	134	157871	213	95828	53	29342
Valle d'Aosta	--	--	23	88828	--	--
Lombardia	101	60777	158	108134	170	109643
Trentino Alto Adige	8	12510	5	10149	--	--
Veneto	111	63713	43	20285	116	65564
Friuli V.G.	--	--	8	4025	1	1318
Liguria	--	--	73	29234	40	21662
Emilia R.	91	55427	96	53828	530	327545
Toscana	211	149151	9	5323	226	173499
Umbria	36	22516	33	16819	48	38727
Marche	38	30480	15	12565	94	78127
Lazio	83	104039	37	41796	32	30480
Molise	--	--	3	4780	--	--
Abruzzo						
Campania	15	10511	18	30775	55	106408
Puglia	19	16097	52	53973	31	46664
Basilicata	32	177286	35	9572	--	--
Calabria	1	380	6	3474	3	2932
Sicilia	17	9815	11	5799	4	16856
Sardegna	--	--	41	67070	69	66919
TOTAL	904	890900	899	680036	1605	1220661

Source: ISTAT, Statistiche Ambientali, 1991

5. AGROTOURISM

Agrotourism began to develop in Italy in the '60s in Regions traditionally more devoted to tourism and with particular landscape features as in Trentino alto Adige and Tuscany. In the following years it has developed throughout the country and has been officially recognized and regulated with the National Law n.730, 1985 "Regulation of Agrotourism". By this law agrotourism is seen as a means of encouraging the population to remain in rural areas, to favour environmental protection, to promote typical products and to stimulate urban-country relationships. The national Law delegates to the Administrative Regions the function of organizing professional training and of stimulating this activity. Before this law, 13 Regions already had their own regulation in order to finance agrotourism. Only Sicily does not yet have its own law. The main problems considered by these regulations are the limitation of capacity, the sale of food and beverages, professional training, financial support. Environmental protection does not always appear as an objective of regulation. Financial support is not very strong if compared with the incentives to agricultural activity, being only 1 % of the latter. Greater incidence appears in the regions where the productive structure of agriculture is weaker as Valle d'Aosta, Liguria and Sardegna or in areas like the Province of Bozen (South Tirol) where agrotourism is well developed.

First official data on agrotourism appear in the General Census of Agriculture made in the year 1982. It appears that 14672 farms have hosted tourists and that half of those farms is situated in mountain areas. Regions where the agrotourist activity is more developed are Trentino Alto Adige, Tuscany, Emilia Romagna and Veneto. Farms belong mainly to the class between 2 and 5 ha, with the exception of Emilia Romagna, Umbria, Molise and Basilicata where the class between 5 and 10 ha prevails.

Instead, agrotourist Associations estimate that almost 6800 farms are involved with a total of 75000 places and an average of 11 places per farm. The farms appear distribuited for 22 % in the mountain areas and for the 45 % in the hills. 10 % of agrotourism is practised in the area of sea resorts and 15 % near ski resorts. About 10 % give the possibility of practising horse riding, 8 % camping and 20 % provides food and beverages. 6,3 million visitors per year are estimated of which 35 % are foreigners.

TABLE 16: Regional expenditure for agrotourism

REGIONS	EXPENDITURE			CHARACTERISTICS OF EXPENDITURE		
	YEAR	MILIONS LIRE	AS % OF PUBLIC EXPENDITURE IN AGRICULTURE	EXPENDITURE FOR AGRICULTURAL EMPLOYEE 000 lire	EXPENDITURE FOR AGROTOURIST FARMER 000 lire	AS % OF AGRICULTURAL VALUE OF PRODUCTION
Friuli V.Giulia	89	300	0.7	9.7	3375	0.03
Calabria	88	1400	0.8	9.7	17,941	0.08
Piemonte	89	200	0.1	1.2	1,146	0.01
Valle d'Aosta	84-88	1749	2.1	75.6	10,792	0.65
Lombardia	79-82	2400	0.8	7.6	9,600	0.01
Bolzano	89	500	1.3	13.1	129	0.09
Trento		R.CEE 797/85				
Veneto	86-88	2500	0.7	5.5	1,161	0.02
Liguria	89	1000	2.2	23.5	17,035	0.13
Emilia Romagna	89-90	5000	1.0	7.6	8,170	0.02
Toscana		R.CEE 797/85				
Umbria	87-88	950	0.5	11.0	4,071	0.03
Marche	87-88	1400	1.0	7.7	11,570	0.04
Lazio	88	600	0.4	5.2	10,836	0.02
Abruzzi	84-87	4295	1.0	12.9	15,392	0.08
Molise	80-88	855	0.2	2.8	1,653	0.02
Puglia	85-88	8500	1.0	69.4	26,756	0.05
Basilicata	87-88	2850	1.4	22.8	19,209	0.20
Campania	84-87	5970	0.6	4.5	13,623	0.03
Sicilia						
Sardegna	86-88	11800	2.3	44.7	33,323	0.29
TOT.MEDIA	79-89	51769	1.0	18.6	11,432	0.10

Source: Gregori M. - Roiatti F. La legislazione regionale nel settore agrituristico. Un primo bilancio, Genio Rurale n. 3, 1990

NON-FOOD UTILIZATION OF AGRICULTURAL LAND IN SWEDEN

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1. INTRODUCTION

The Swedish agricultural land, which had its largest extent during the 1920s, consists of arable land and pasture. According to the census of agriculture in 1927 there were 3.6 mill. hectares arable land and 1.3 mill. hectar pasture. Both arable land and pasture especially have then been gradually reduced. At present there are about 2.8 mill. hectares arable land and 0.3 mill. hectares pasture in Sweden.

The main reduction of agricultural land has taken place in forest dominated regions while the arable land in flat country is more and more intensively used.

Most of the agricultural land which has been withdrawn from the production of foodstuff has been afforestated either through the planting of needle trees or through spontaneous growth.

Despite the reduction of land more foodstuff has been produced in Sweden during the 1980s than could be consumed within the country. The surplus production of grain and of some dairy products has been especially large.

At the end of the 1980 the Swedish consumers and farmers had to finance overproduction to an amont of 2 000-3 000 MSEK yearly.

2. THE NEW FOOD POLICY

Up to now the Swedish agricultural regulatory system has been characterized by a high level of border protection, administered internal price levels and export subsidies. In April 1990 the Government submitted a Bill to Parliament proposing a radical shift in agricultural policy. The proposed new principles were then adopted by the Parliament in June 1990.

The reform will start on July 1st 1991 and will be completed after a five-year period of adjustment of production and transition to the conditions of a deregulated market.

The new food policy is based on the principle that agriculture should be subject to the same conditions as other sectors of the economy. The farmers should only be paid for goods and services for which there is a demand. This implies elimination of both the administered internal prices and the market interventions as well as the export subsidies.

After the five-year period, starting in July 1991, the only permanent reminants of government activities directed to agriculture will be targeted measures to obtain certain objectives like e.g.
- environmental protection and land conservation
- education and research
  regional balance and selective targeted income support to farmers in less favoured areas (northern Sweden)
- start help for young farmers
- advisory services
- border protection.

During the transitional period of five years the farmers will be stimulated by direct payments to plant crops without import levies and energy crops. Investment will also be made in educational and advisory schemes. The reform will necessitate considerable adjustments, not only as regards production, but also in respect to the farmers entrepreneurial roles.

Governmental budgetary funds will cover the costs for measures necessary for transition and adjustment. The cost is estimated at about 14 000 MSEK during the five-year period. To this will be added money to stimulate production and consumption of bio energy.

3. EFFECTS OF THE NEW FOOD POLICY ON LAND USE

The new food policy states that Sweden will still have border protection for foodstuff but within this frame it will be a free market. As the production of most agricultural products is larger than the domestic consumption the prices to the farmers will be reduced and consequently also the production. It means that the agricultural resources (land, labour, capital etc.) have to be diminished. The reduction of grain and oilseed production can partly be effected through decreased intensity. The main part of the reduction has, however, to be done by cutting down the arable land for grain and oilseed for agricultural purpose with at least 400 000 ha.

The reduction of milk production will be about 100 000 cows and this in turn diminishes the demand of land. The total effect on land use of the new food policy in different parts of the country depends on regional and natural conditions and is difficult to predict.

In Parliament's decision it is stated that the measures for transition and adjustment provide good conditions for changing the use of about 500 000 hectares arable land, that is about 20 % of all arable land in Sweden.

4. MEASURES FOR ADJUSTMENT AND TRANSITION CONCERNING LAND USE

The policy reform means that the internal market control relating to grains will be abolished from July 1st 1991. A transitional redemption system will be in effect until July 1st 1994. During this period the redemption prices for grains will gradually be reduced from 1.15 SEK/kg in 1991/92 to 0.90 SEK/kg in 1993/94.

For oilseeds a market regime will be kept up to 1995/96.

For transitional measures concerning land use three kinds of support have beeen decided on, as follows:
- income support
- adjustment grants
- plantation grants.

For every individual farm the use of arable land in 1990 forms the basis for these three programmes. The basis consists of the area for price regulated crops (wheat, rye, barley, oilseeds, peas, potatoes, sugarbeets and beans) and the area which was part of the earlier set-aside scheme. About 70 000 farmers have basic areas and can take part in the transition schemes for land use. The total basic area is about 1,9 mill. hectares or about 2/3 of the total arable land in Sweden (2,8 mill. hectares).

If ownership or tenantship has changed after July 14th 1990 the right to receive support will be transfered to the new farmer.

The environmental goal of the new food policy includes preservation and development of a flourishing and varied rural landscape and the reduction of the adverse environmental effects.

About 250 MSEK are assured to be allocated yearly to a new programme for and open and varied agricultural landscape. Farmers will receive financial support for landscape conservation activities and for preservation of locations of major natural or cultural interest.

The obligation to cultivate land under the Management of Agricultural Land Act is now abolished. Formerly the farmer needed a permission to withdraw land from agricultural production. Instead, farmers will now be required to report their intention to do so to the County Administrative Board 8 months in advance. If the area concerned is of special interest for nature or culture the board has to negotiate with the farmer about support for landscape conservation activities instead of withdrawal from production.

In a Bill to Parliament of April 1991 the Government has also proposed the implementation of a new programme for ethanol with state support.

5. INCOME SUPPORT

In order to prevent producers' incomes to fall to an unacceptable level an area based support is implemented. The support is intended to compensate for falling prices on price regulated grain products during a transitional period.

The income support will be paid during the period 1990-1993. The support for 1990 is paid to all producers who are registered in the farm register. It is automatically paid, without any application. The size of the support depends on region where the farm is located, with larger support in regions with high yields and vice versa.

Amounts of support will be successively reduced: In 1990 - 1 100 SEK/hectare, in 1991 - 900 SEK/hectare and in 1992 - 700 SEK/hectare in average.

6. ADJUSTMENT GRANT

A farmer who is entitled to income support can after application change whole or part of his basic area for income support to an area for adjustment grants. The objective of the adjustment grants is to stimulate a quick and permanent adjustment of the arable acreage from production of foodstuff to other forms of production. The grants will be diversified depending on region. The average is 9 000 SEK/hectare for entering the programme in 1991, 6 000 SEK/hectare for entering in 1992 and 4 000 SEK/hectare for entering in 1993.

Adjustment grants can be received by all entitled farmers for such arable land that will be changed through active measures during the transitional period in a permanent way from production of food stuffs to other forms of production. A changed use of arable land from food production to permanent, extensively grazed land can also be regarded as an adjustment measure. In order to stimulate introduction of new crops, crops which do not compete with existing crops (nisch crops) can be approved of as and adjustment measure.

An adjustment measure can have a marked character of permanence e.g. afforestation. In other cases the farmer has to prove the permanence through different kinds of investments. Cultivation of energy and industrial crops has to be proved by delivery agreement.

In his application for adjustment grants a farmer does not need to tell which adjustment alternative he intends to realize. Instead he has the opportunity to find a solution which benefits his special farm. All measures have to be effected by the farmer and have to be approved of by the County Administration Board in time before the end of the transition period (June 30th 1996). From the date of application until the date of completing the adjustment measures the farmer is not allowed to use the actual area (so called waiting period).

If an adjustment measure is not approved of during the transition period the farmer has to pay back all the grants he has got. If special conditions are at hand the farmer can get permission to accomplish the measure after June 30th 1996 instead of paying back all the money. This permission will, however, be given very restictedly.

7. <u>PLANTATION GRANT</u>

Plantation grants will be paid for the laying out of new wetland or for planting of deciduous forest of energy forest an arable acreage. The total costs will amount to 500 MSEK. The grant is paid as a supplement to the adjustment grant. The plantation grant can be considered as money for covering the additional costs for measures, which are of special interest for the environment and stimulate energy foresting.

The plantation grant will be paid during 1991 - 1995 as follows:
- planting of deciduous forest and energy forest 10 000 SEK/ hectare
- supplement for nemoral-broadleaved forest 4 000 SEK/hectare
- supplement for fencing 4 000 SEK/hectare.

Support to the laying out of new wetland will be paid according to estimated costs. To objects less than 2 hectares, support will be paid with a maximum of 20 000 SEK and for others a maximum of 10 000 SEK per hectare. Plantation grants can be paid only after application and the total limit - 500 MSEK - has already been reached. The farmer gets the money, when the measure is effected and approved of.

8. ADJUSTMENT ALTERNATIVES

As a consequence of the new food policy the production of foodstuffs has to be reduced and adjusted to the demand within Sweden.

The new policy will probably lead to lower producer prices and in turn to a more extensive use of the land. This effect is not enough for a balance between production and consumption within the country. The land use has either to be even more extensive or a certain amount of land has to be withdrawn from the production of foodstuff.

The following examples will fill the conditions for permanent adjustment according to the rules within the adjustment grant scheme:
- afforestation
- planting of energy forest
- laying out of new wetland
- cultivation of energy and industrial crops on contract
- cultivation of nisch crops
- constructions for recreational purposes
- laying out of extensive pasture.

For redundant land the most frequent alternatives will be afforestation, planting of energy forest, grain production for ethanol production and laying out extensive pasture.

Afforestation and planting of energy forest in clash with strong natural and cultural interests cannot be accepted as an adjustment measure. The farmer has then to modify his plan or to choose another adjustment alternative. Especially the planting of needle trees can be disadvantageous for the landscape, while deciduous trees in general are regarded as attractive.

Before the farmers can have e.g. grain-, grass-, oilseed- and nisch crops for energy and industrial purposes approved of as adjustment measures, they have to present a delivery agreement with a consumer, who represents such a serious and lasting demand that it is made probable that the agreement will be renewed.

According to the rules about the laying out of arable land to extensively used pasture the farmers on such adjustment areas are not allowed to use fertilizers or pesticides. These areas have to be pastured only by animals for meat production or by horses. Milk cows or recruitments for milk production are not accepted. The extensive pasture land has only to be used for pasture, not for hay or silage. For approval one of following conditions also has to be complied with:

- meat production has to be a new line of production on the farm
- existing meat production has to be expanded with at least 50 %
- the total basic area of the farm will be used as extensive pasture.

In order to strengthen the permanence of the measure, only animals owned by the farmers themselves are allowed to graze. Investments in suitable buildings and fences must be effected.

Construction works for golf links and other recreation enterprises will in some cases be good alternatives to agricultural use of the land. Such investment can be approved of as an adjustment measure if the following conditions are at hand:

- the farmer is economically responsible for the project
- the project will increase the demand of labour on the farm
- the project will in the future be run as a part of the farm enterprise.

After the end of the transition period in 1996 participating farmer, who has got the adjustment measures approved of is free to choose whatever land use he wants.

9. ENERGY POLICY IN RESPECT TO BIO FUELS

Swedish energy policy aims at the replacement of imported non renewable energy sources by domestic renewable energy sources. Among the alternatives available, energy from bio mass is of great importance.

Parliament's new food policy states that one of the main alternatives top foodstuff production is the production of crops for energy and industrial purposes. The policy also presumes that energy forests will require considerable areas of land.

During the last years an increased use of bio fuel has been stimulated in Sweden by an active tax policy, an oil substitute scheme and the support of research and development schemes. The tax on carbon dioxide in fossil fuels from January 1st 1991 is aimed at making bio fuels more competitive on the market. This new tax is equivalent to 0.25 SEK per kg polluted carbon dioxide.

In a Bill submitted to Parliament in February 1991 the Government proposes as follows:

- a support scheme for setting up new bio fuel cumbustioned plants for combined heat and power production as well as improving some already in existence. For a period of five years an amount of 1 000 MSEK is proposed;
- a support scheme for the production of ethanol;
- a commission with the aim of analysing the commercial conditions for bio energy in the future and to propose schemes to make bio fuels more competitive. The task has to be accomplished before July 1st 1992.

In order to enable production of ethanol within the scheme for adjustment grant the Government suggested in the Bill that adjustment grants can be paid directly to a company for the production of ethanol instead of to the farmer if the company has a delivery agreement of grain for ethanol production with the farmer. The money that the company thus gets is intended for setting up full-scale ethanol plants.

Before getting any money a company has to present delivery agreements with farmers entitled to adjustment grants. These farmers, of course, have to follow all the rules for getting adjustment grants.

The money given to the ethanol companies will correspond to the adjustment grant which all farmers with a contract would have got. The total support of ethanol production is not allowed to exceed about 900 MSEK (= 100 000 hectares). A company owned by the Farmers' Union has already begun preparations for such a scheme. Thus, farmers have been given opportunities to make provisional contracts with this company.

10. ENERGY AND INDUSTRIAL CROPS AS AN ALTERNATIVE TO FOOD PRODUCTION

10.1 Background

The market for energy carriers consists of submarkets for heat, engine fuels and electricity. All these submarkets can be supplied with energy produced from bio mass grown on arable land. The various kinds of energy carriers of interest for energy production in agriculture are in the short run ethanol, solid fuels, methane and vegetable oil. In a longer perspective other gaseous energy carriers and methanol may be of interest. Besides petroleum oil can be replaced by bio mass in the production of chemicals.

Suitable raw products for solid fuels can be obtained by using arable land for the growth of:
- fast-growing species of trees (energy forest)
- high-yielding fibre-rich species of grass (energy grass)
- grain and oilseed crops for combustion.

10.2 Energy forest

Today energy forests are considered to be one of the most interesting alternatives when it comes to substituting coal, gas and oil. For over 15 years an energy forest development project is being administered by the Swedish University of Agricultural Sciences. The project is based on the fact that some species and clones of willow have a very high growth potential in their young stages. There is only a very small number of existing species and clones that have this high growth potential. A very important task for the research work is therefore the testing and improving of plant materials. Of the same importance is the testing of resistance against fungi and insects. In south and middle Sweden carefully tested clones of willow can produce 10-12 tons of dry matter (DM) per hectare and year on arable land with comparatively good supply of water and nutrient. There are also some promising development schemes working on more efficient harvest machines. In regions where both production and marketing conditions for energy forest are good, energy forest is competitive to grain production. Through further developments within the fields of cultivation techniques, harvesting and handling there seem to be good possibilities to press the production costs.

10.3 Energy grass

Among the grasses that may be suitable as fuel, timoth (Phleum pratense) and reed cannary grass (Phalaris arundinacea) are the most interesting. These grasses are expected to yield - with one cut per season in July or August - an average of about 8 or 10 tons of DM per hectare. Production of grass for combustion differs technically only marginally from production of grass for forage purposes.

The most suitable time for harvesting of grass for combustion, with regard taken to the size of yield and weather conditions, is from mid July to early August throughout the entire country. Some years bad weather can make field drying impossible expecially in northern Sweden. Experimental activities are therefore planned to develop a technique for harvesting reed cannary grass in spring the year after the growing period. Thus the farmers in northern Sweden could use the whole growing period and hopefully get a higher yield with better quality.

The market for energy grass is yet limited. Energy grass can be harvested with the same equipment as hay. Field experiment will within a few years show, if energy grass can be grown competetively compared with energy forests. The costs for producing grain and oilseed crops for direct combustion ought to be about the same as for energy grass. Straw as a by-product to grain production can under certain circumstances be of importance in competitiveness with other fuels.

10.4 Ethanol and biogas

In a short perspective bio products that could be used in ethanol production are mainly grain, sugar beets and potatoes. In a long perspective even cellulose-rich plant material can be used, e.g., straw and energy forest. The most promising crop appears to be winter wheat, which might give yields of 6-9 tons DM per hectare with a suitable choice of variety and an apropriate cultivation technique. In addition, there is the yield of straw which gives about the same amount. By-products to ethanol are feeding stuff and carbon dioxide for industrial use. Ethanol is a very interesting alternative to food production in Sweden and therefore the Government has proposed in a Bill to Parliament a special support scheme for ethanol as already mentioned.

In producing biogas, grass, lucerne, tops of artichokes and both tops and roots of sugar beet or fodder beet can be suitable. Yields of 10-17 tons of DM can be expected in the future. Since 1982 experiments with digestion of these plant have been undertaken on a laboratory scale. At the University of Karlstad there is a study started on two-phase anaerobic digestion of silage. Experiences from digestion of plant material on a large scale are not to be found in Sweden.

10.5 Vegetable oils

Crops for vegetable oils that would suit Swedish conditions are oilseed crops, such as rape and turnip rape. Good farm technology is expected to give yields of 2.5-3.5 tons DM of seed. Considering the value of the feed stuff by-products the net raw producing cost will be reduced by about 50 %.

The Swedish company, Karlshamns AB, started research work in 1974 to develop an alternative to mineral oil products produced from e.g. rapeseed oil. The main reasons were environmental but there was also the fact that the price relations between mineral and vegetable oils had changed favourably in 1973. The first products introduced on the market were different oils and emulsions for the metal working industry. In mid 1980s sawchain oil for tree cutting was produced and in 1989 hydraulic oil for tractors and machinery. A lot of other products have also been introduced. These products are the first new developments in the world and have been introduced on the market under normal commercial conditions.

10.6 Market conditions

Consumers of bio fuels are mainly communes, industrial enterprises, residential districts and some private persons. Bio fuels are used for heating and to a small extent for production of electricity. The consumers have a lot of different types of plants for the combustion of bio mass. Extensive activities have now started in order to develop improved technique and equipments. These activities are expected to make considerable progress and result in better competetiveness for bio energy in relation to fossil fuels. The governmental proposal to support the setting up and improvement of certain plants is already mentioned.

Apart from the price and quality a safe and lasting delivery is vital for a consumer of energy. Good storing and transport systems are also of great importance. Every commune in Sweden has forecasts and plans for the future demand and supply of energy. A part of this planning economic considerations are based on the possible production of different kinds of bio energy in the district during the planning period. A close cooperation between the commune and the farmers' organisations is of the greatest importance for a successive increase of the use of bio energy produced on such arable land, that is not requested for food production.

Market initiatives of the farmers in cooperation have also been taken, one example is a group of farmers planning to build a bio energy cumbustion plant. The energy produced will be delivered to a communal energy company for heating of a group of houses in the neighbourhood.

11. FARMERS INTEREST OF ADJUSTMENT MEASURE

The farmers have shown a great interest in finding alternative utilization of such arable land that is not needed for food production and to take advantage economically of the different governmental financed supports. In 1991 about 25 % of the Swedish farmers have applied for adjustment grants corresponding to 400 000 hectares of arable land. That means an average of 18 hectares per farm. About 14 % of all arable land in Sweden as a whole is effected by the scheme. The programmes are most frequently supported by farmers in central Sweden, where about 25 % of the arable land now is participating. There are also further possibilities to take part in the programme on the conditions early mentioned.

About 7 000 farmers have also applied for plantation grant in addition to adjustment grant. The arable land concerned is 62 000 hectares. The available amount of 500 MSEK is only sufficient for 60 % of the area applied for.

Provisional agreements for the special ethanol programme are now being made corresponding to 31 000 hectares.

The farmers who in one way or another are taking part in the programmes for transition have got a five-years period to accomplish the different measures. The National Board of Agriculture is responsible for the administration of the programme. The Board has to report each year to the Government how the adjustment process is progressing.

NON-FOOD USE OF AGRICULTURAL LAND IN DENMARK: CURRENT SITUATION AND FUTURE NEEDS

B. Frandsen, Copenhagen and *Ch. Kjøller*, Rønne

This paper gives a short introduction to Danish agriculture. What is the actual situation, and what are the reasons why Danish farmers have become increasingly interested in the non-food use of agricultural land. It furthermore gives an overview over some Danish non-food initiatives, and indications on the preconditions for non-food use of agricultural land in Denmark are given.

CURRENT SITUATION

The total area of Denmark is 4,3 mill. hectares. 2,8 mill. hectares are agricultural land. From 1970-74 to 1990, the area under cereals and cash crops increased by 131.000 hectares to 2,1 mill. hectares. At the same time the importance of winter crops have increased.

In accordance with environmental legislation, an increasing fraction of the agriculture area is under so-called green crops, which may prevent leach of nitrogen in autumn and winter.

Crop production in Denmark is shown in Table 1. In 1990 we had a record harvest in Denmark of some 9,8 mill. tons compared to only 6,8 mill. tons on average in the 1970/74 period. The increase is especially due to an increase in the wheat production. During the same period there has also been an increase in the production of pulses, rape seed, and quite recently potatoes.

During the last couple of years, Danish farmers have been met with decreasing prices on most of their products. Especially on the crop products. The prospects for the coming years are not better. The likely results of the GATT agreements, and the need for adjustments in the Common Agricultural Policy within the EEC, mean further price declines and demands to reduce the production.

Furthermore, the EEC rules on set-aside, the Danish environmental rules, demands to forest raising et cetera, mean that about 300.000 out of the 2,1 mill. hectares may be removed from ordinary production.

TABLE 1: Crop production

Production, 1,000 tons	1970-74	1987	1988	1989	1990*
Wheat	565	2,285	2,081	3,224	4,100
Rye	149	513	366	487	563
Barley	5,448	4,292	5,419	4,959	5,026
Oats and mixed grain	682	95	202	125	126
Cereals total	6,844	7,184	8,068	8,795	9,815
Pulses	40	519	508	467	556
Straw	4,077	3,319	3,318	3,955	-
Rape seed	64	556	504	655	818
Potatoes	828	957	1,249	1,238	1,450
Beets for sugar production	2,254	2,632	3,379	3,309	3,500
Fodder sugar beets	9,830	5,336	7,012	6,909	

Source: Danmarks Statistik

For the individual farmer it would be ideal to use some of the land for non-food purposes, and thereby create new outlets or find new crops to grow.

PROGRAMMES FOR SET-ASIDE, EXTENSIFICATION AND CONVERSION

The EEC rules on set-aside, extensification and conversion was not carried out in Denmark until the first of November 1990. It is therefore to early to say anything about the consequences of the programmes. But if additional set-aside measures should be decided on the EEC it is important that they are accompanied by a more attractive arrangement on non-food use of agricultural raw materials. The following rules are in force.

Set-aside

Farmers have to engage for five years in the set-aside arrangement and the area must be at least 20 % of the potential area. The area must either be aforrested, used for grazing, lain fallow or used for non agricultural purposes. The compensation paid is about 1500 dkr/hectare on average for areas lain fallow, 60 % of the compensation is paid if the area is used for grazing.

Extensification

The rules are carried out in connection with the Danish rules on organic farming. If a farmer changes to organic farming he can recieve a premium of 3800 dkr/hectare for a 3 year period.

Conversion

Farmers can get a premium of about 7-8000 dkr/hectare if they afforest. In environmental sensitive areas farmers can get a premium of 900dkr/hectare if the area is changed to grazing.

DANISH NON-FOOD INITIATIVES, CURRENT EXPERIENCES AND PROBLEMS TO BE SOLVED

There are several possibilities for non-food production. For instance, what are the possibilities of using agricultural raw materials to produce
- liquid fuel
- solid fuel
- biogas
- pharmaceuticals
- chemicals
- degradable plastics
- paper
- building materials.

In the chemical industry, it is expected that traditional and alternative agriculturebased raw materials, primarily starch and cellulose will be able to substitute many raw materials from the petrochemical industry. A key question is, when and under what conditions the methods will be technically or biologically possible and economically profitable.

To the farmers, non-food use of agricultural land is, of course, most interesting if it can make a positive contribution to their income.

We are in a midstream in Denmark at the moment. We are convinced that there are possibilities in the production of non-food crops. On the other hand, we have not decided what are the most promising crops or uses. A lot of experimentation is done, hopefully this will give an answer to some of the questions.

In the following different Danish non-food initiatives are described.

FLAX

During and immediately after the Second World War there was a large production of fiber flax in Denmark, and several scutching mills were found. The flax was mostly used for clothing. However, in the 60'es and 70'es the production stopped.

During the last years there have been several initiatives in Denmark concerning growing and manufacturing of flax. Both on oil, flax and fiber flax.

With the green paper from the EEC Commission from 1985, there was an increased interest in alternative productions and uses. As a consequence, the Danish Flaxgrowers Association was established in 1987. At the same time Danish Flax Industry was established. In 1988 the manufacturing of flax was started.

The area used for flax growing is still very small, only 300-400 hectares, but several projects and discussions on how to grow and manufacture flax have started. It seems that flax can be grown and manufactured without problems. But there are still problems to be solved before a large scale productions can be started. Some of the key-questions which may be asked are:

- Under which circumstances can flax be a competitive supplement to long fibred wood pulp/cellulose.
- What are the optimal growing methods.
- How can the best quality and the highest yield of flax be achieved.

Furthermore there are problems with the price setting and the sale security to the farmer. Danish grown flax cannot compete with import from countries outside the EEC.

Many of the activities in the area are rather uncoordinated. The Danish Agricultural Advisory Centre has started to coordinate the different Danish activities in the area. It is also trying to establish contact and cooperation with the pilot project EURO-LIN within the EEC.

ELEPHANT GRASS (MISCANTHUS)

Two uses from elephant grass are being considered in Denmark: Elephant grass as raw material for fuel or as raw material for cellulose. The heating value is high, 2-2 ½ tons dry matter equals 1 ton fuel. Furthermore, the content of ash is lower than in straw, and elephant grass is free from sulphur and polluting matter.

The content of cellulose is over 50 per cent. It seems that there can be produced a very high quality of cellulose. It is therefore very suitable as material for paper and as building materials.

A test area with elephant grass has been established in collaboration with Fredericia cellulose Factory, and since 1983 growing methods are tested at the Danish Research Service for Plant and Soil Science. Test results show that a satisfactory yield and income is achieved only on fertile soil.

From a growing point of view, the biggest problem at the moment is reproduction. Further important tasks will be to consider:

- Methods and systems for lowering the costs of establishment and increasing the growing-certainty.
- Development of reproduction machines and of methods for reproduction.
- Reproduction ability under different growing conditions.
- Testing of new types of Miscanthus.

WILLOW AND POPLAR

Willow and poplar are suitable as fuel and cellulose. Their fibres are short. Both willow and poplar can be grown on marginal land with a satisfactory yield. Sludge can be used as manure with good results. Furthermore they can be used in connexion with sewage. Test results show that there can be produced 15 tons dry matter per hectare.

Harvesting methods are developing. The area grown with willow and poplar is very small at the moment. Experiments have just started and therefore experience is limited.

Willow and poplar have a high content of bark, which is a problem if they are used for cellulose. Therefore a debarking process must be developed. Different methods have been tested. For instance softening and boiling. But the results are not satisfactory.

STRAW

As a carrier for crop, most of the straw is regarded as waste. But it could be used in the cellulose industry or as fuel.

CELLULOSE

In 1989 there was a production of semichemical straw pulp. Now all bleached straw celluloses are manufactured in Denmark at the Fredericia celluloses manufacturing Factory. The semichemical straw pulp was competing with recycled paper. The competition was so hard that the production of straw pulp was closed down.

Research and development are desirable to answer some of the keyquestions. Is it possible to improve the uniformity and drainge qualities of the straw cellulose? Is it possible to develop bleaching methods without chlorines.

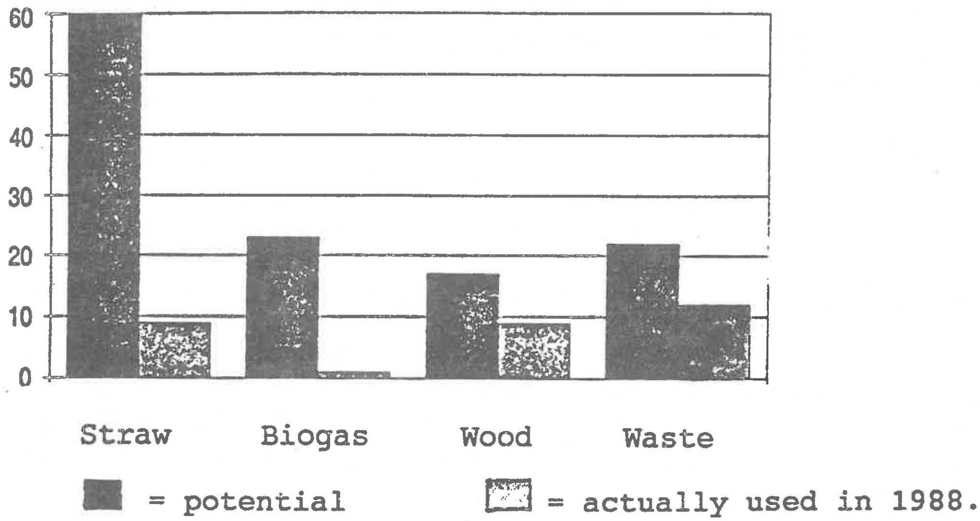
FUEL

from straw etc. can also be seen in an environmental view. If the straw is not used it ends up in the ground, where it contributes to pollution, because the biomass will release the same amount of carbon dioxide as if it was used for energy purposes. From an environmental point of view, there could be a lot of common sense in biomass for energy purposes.

It is estimated that the various agricultural raw materials could deliver about 20 per cent of the total Danish energy consumption. In other words with straw alone it would be possible to heat more than 100.000 houses.

As a consequence Danish Agriculture is putting a lot of political pressure on the government to place straw on equal termins with natural gas. Fuel based on straw is not competitive with coal at the moment. But if it was placed on equal terms it could compete with natural gas.

TABLE 2: Raw material available for energy purposes. PJ/year



Many farms have established strawfurnaces. Here the most important problem is the poor combustion. As a consequense of the low burning temperature there are relatively high amounts of unburned gasses left in the smoke. These gasses represent both an energy loss and an environmental problem.

Within the last 10 years there have been built several district heating plants based on straw. We could use a lot more, but it is a precondition for further development that the decisionmakers promise some kind of security on the stability of the economic preconditions.

<u>GASSIFICATION</u>

is another possibility. This process has the advantage that it is possible to use the established distribution channels of natural gas. Furthermore it is possible to store the gas. A lot of research are needed before the process can be used commercialized.

<u>BIOGAS</u>

During the last couple of years, there has been a considerable technological development with respect to large biogas plants.

As at now the plants can produce a satisfactory amount of gas, especially because some biological waste is mixed in. Biogas plants seem promising. If biogas is exempted from levies paid on fossile fuel it is possible to produce energy from this source competitively.

BIOETHANOL

Production of bioethanol from cereal or sugar are also considered in Denmark. But no actual manufacturing has started.

Even though the price relations between the cost of bioethanol and fossile fuel have been diminishing, it is still necessary with a national or EEC subsidy, either as a direct subsidy or as a subsidy on the price on bioethanol. We have calculated that the price of wheat must be 47,50 kr./100 kg wheat which means that it is necessary with a subsidy on 87 kr./hkg. based on current prices.

THE WHOLE-CROP BIOREFINERY PROJECT

The european collaborative linkage of agriculture and industry "ECLAIR" has approved a demonstration project in the field of whole crop biorefinery process.

A pilot plant is being built on the island of Bornholm. It is the first pilot plant of this kind in Europe, and the purpose is to test the possibilities of seperating the crop into fibre, oil, protein, starch and cellulose. There are two steps in the process. First the plants are divided into their botanic components. Thereafter they are divided into their chemical components.

The plants are first separated mechanically. Thereafter a biochemical/mechanically separation divides the plants in their chemical components. During the process there will be different products such as food, fuel and products for the cellulose industry.

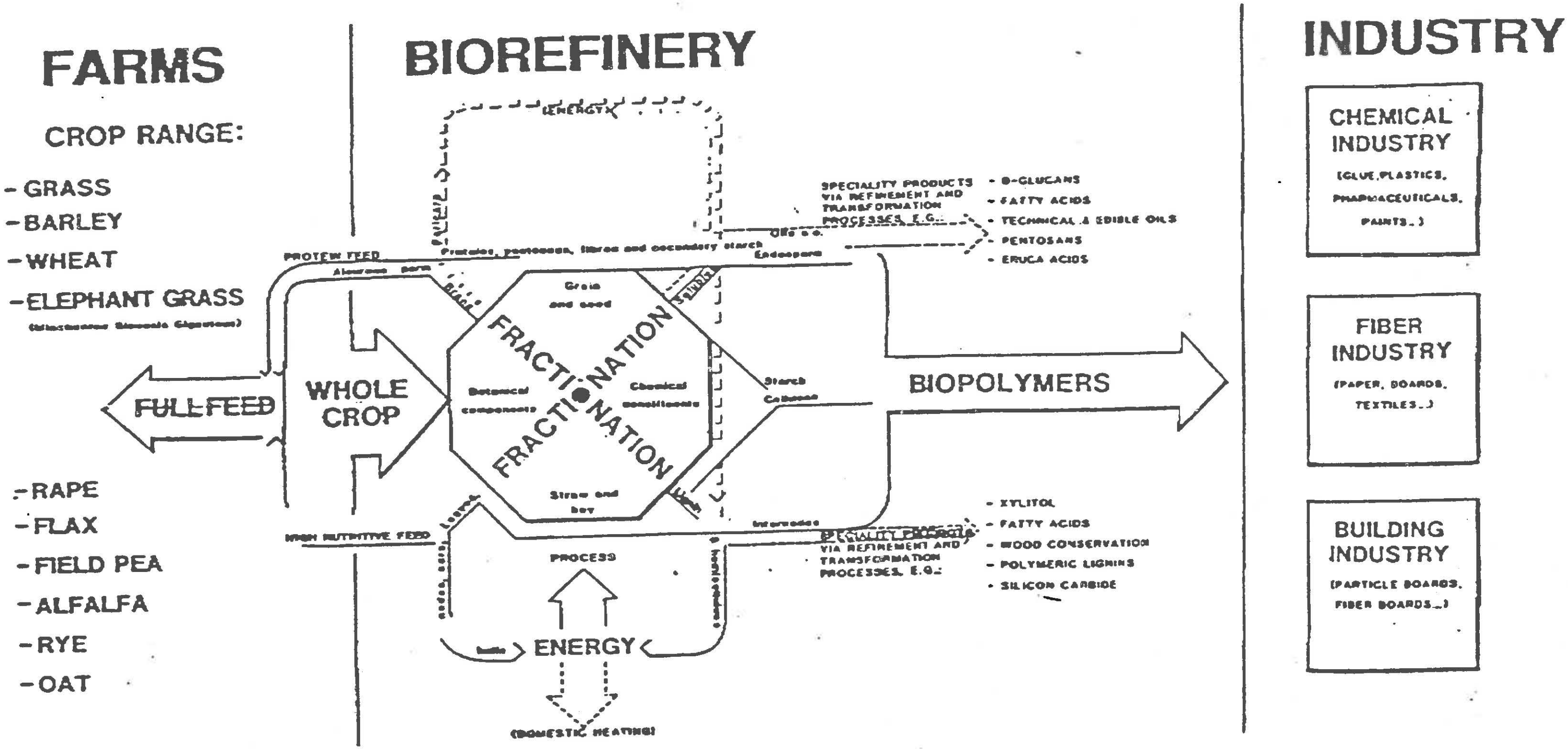
There are participants from Germany, Greece, United Kingdom and Denmark. The project is divided into 7 parts.

1. Selection and development of suitable plant species.
2. Intermediate storage and seperation and drying of whole crops.

3. Integrated up-grading of wheat and barley to starch and feed ingredients.
4. Production and analysis of fibre factions from straw and biomass.
5. Enzymatic extraction of oil, protein and starch.
6. Integration of the fractionation techniques.
7. System analysis and economic assessment of the integrated biorefinery process.

If the project is succesfully it will without doubt contribute to a incereased non-food use, and a full scale plant will probably be built in Jutland.

FIGURE 1: The Biorefinery Production System



ALTERNATIVE NUTZUNG VON FLÄCHEN: SITUATION IN DER SCHWEIZ

H.W. Popp, Bern

I. AUSGANGSLAGE, PROBLEMSTELLUNG

Die Diskussion um die Frage der alternativen Nutzung von landwirtschaftlichem Kulturland für andere Zwecke als die Nahrungsmittelproduktion hat in der Schweiz vergleichsweise spät und erst in jüngster Zeit ernsthaft eingesetzt. Der Boden ist in unserem Lande knapp, die Bevölkerungsdichte hoch; auf einen Einwohner der Schweiz entfallen nur rund 18 Aren landwirtschaftlicher Nutzfläche (EG das Doppelte, USA das 10fache). Zudem ist das Waldareal gesetzlich geschützt und darf nicht vermindert werden (tatsächlich nimmt es zu).

Wenn heute über Alternativen in der landwirtschaftlichen Produktion intensiv nachgedacht wird, so in erster Linie wegen der wachsenden Tendenz zur Überproduktion im allgemeinen bzw. des starken Anstieges des Selbstversorgungsgrades beim Getreide. Die Getreideanbaufläche wurde in den letzten 20 Jahren um rund 15 % ausgedehnt und die Produktivität hat noch stärker zugenommen. Aus agrarpolitischer Sicht werden als positive Nebenwirkungen der alternativen Nutzung landwirtschaftlicher Flächen die Energie-Gewinnung (Verminderung der Ausland- und Atomenergieabhängigkeit) sowie günstige Umwelteffekte (Verminderung des Treibhauseffektes und Förderung der natürlichen Kreisläufe) genannt.

II. DIE STRATEGIE DER STEUERUNG DES LANDWIRTSCHAFTLICHEN ANGEBOTES

Die Schweiz unternimmt seit Jahren große Anstrengungen, um der Tendenz zur Überproduktion zu begegnen. Unsere Strategie der Produktionslenkung läßt sich wie folgt zusammenfassen:

1. Steuerung über den Preis soweit möglich, d.h. über
   - Produktpreise, Direktzahlungen (z.B. Anbauprämien) und
   - Faktorpreise, z.B. Verteuerung der importierten Futtermittel.
2. Einkommenssicherung vermehrt über nichtproduktbezogene Direktzahlungen statt über die Preise.
   Abgeltung positiver Externalitäten - Multifunktionalität.

3. Angebotsbegrenzung durch Beschränkung der Preisgarantie auf eine im voraus bestimmte Menge je Betrieb in jenen Sektoren, wo dies nötig und administrativ machbar ist (Milch, Zuckerrüben, Raps).

4. Beschränkung der Futtermittelimporte.

5. Direkte staatliche Eingriffe, wie z.B.:
   - Höchstbestände und Stallbaubewilligungspflicht in der Tierhaltung
   - Rebbaukataster
   - Vorschriften zur Begrenzung der Produktionsintensität (z.B. max. GVE/ha).

6. Selbsthilfemaßnahmen der Produzenten (Vertragsproduktion und finanzielle Beteiligung an der Produkteverwertung).

7. Weitere flankierende Maßnahmen, wie z.B.:
   - zur Bremsung der zunehmenden Produktionsintensität
   - Flächen-Stillegungen
   - Förderung von Alternativen in der Produktion
   - andere Flächenumwidmungen
   - Beiträge für sog. Ökoflächen (Biotope und dgl.) und für gezielte Extensivierungsmaßnahmen.
   - Pluriaktivität.

8. Schließlich gehört ein angemessener Einfuhrschutz unabdingbar zur schweizerischen Agrarpolitik (vgl. Übersicht 1 im Anhang).

III. FLANKIERENDE MAßNAHMEN, INSBESONDERE DIE ALTERNATIVE KULTURLANDNUTZUNG

In Ergänzung zu den obenerwähnten klassischen Mitteln der Angebotssteuerung sind in neuerer Zeit - in Anbetracht der Dringlichkeit des Problems - eine Reihe weiterer sog. "flankierender Maßnahmen" ergriffen worden oder in Diskussion.

1. *Maßnahmen zur Extensivierung bzw. zur Bremsung der zunehmenden Produktionsintensität*

1.1 Ausbau von Forschung, Bildung und Beratung, insbesondere der Düngungs- und Umweltberatung.
1.2 Lenkungsabgaben auf N- und Phosphordüngern (Vorschlag der Bundesregierung).

1.3 Förderung besonders umweltschonender und weniger intensiver Produktionsmethoden wie z.B. "Integrierte Produktion" und "biologischer Landbau" u.a. mit Ausgleichsbeiträgen; siehe dazu Gesetzesentwurf Art. 31b Lw Gesetz im Anhang.
1.4 Ausgleichsbeiträge für Biotope, ökologische Ausgleichsflächen, extensive Grünlandnutzung und "Extenso-Getreide" (Gesetzesvorlage in der parlamentarischen Beratung).
1.5 Produktionsvorschriften, wie z.B. die Flächenbindung der Viehhaltung (Hofdüngerausbringung von max. 3 DGVE/ha).

2. *Flächen-Umwidmung*

Gezielte, i.d.R. durch raumplanerische Maßnahmen unterstützte Umwidmung von landwirtschaftlichem Kulturland für
- Erholungszwecke und Freizeitnutzung (z.B. Golfplätze),
- Wohnzwecke und
- die Aufforstung.

3. *Flächen-Stillegung (Set-Aside)*

Zur Zeit wird vom Parlament eine Vorlage beraten, die Ausgleichsbeiträge für die Brachlegung von Ackerland (sog. Grünbrache) auf freiwilliger Basis vorsieht.

4. *Alternative Kulturen (Non-Food)*

Zum Studium dieser Fragen und Möglichkeiten wurde in der Schweiz eine Arbeitsgruppe unter der Leitung des Bundesamtes für Landwirtschaft, zusammengesetzt aus Vertretern des Schweizerischen Bauernverbandes, der Fettindustrie und der Chemischen Industrie sowie weiteren interessierten Bundesämtern und Forschungsanstalten eingesetzt. Aufgabe der Arbeitsgruppe war die Formulierung der Gegenstände und Prioritäten eines Forschungs- und Entwicklungsprogrammes Nachwachsende Rohstoffe. Sie hat ihren "Bericht über die technischen und wirtschaftlichen Möglichkeiten zur Nutzung Nachwachsender Rohstoffe in der Schweiz" im Dezember 1990 abgeschlossen und veröffentlicht. Die Arbeitsgruppe kam u.a. zum Schluß, daß die Bereitstellung erneuerbarer Ressourcen, insbesondere für die Verwendung als Energieträger, auch aus umwelt- und energiepolitischen Gründen zu fördern ist, und daß kurzfristig ein teilweiser Ersatz von Dieselöl durch Methylester auf der Basis von Raps (RME) technisch realisierbar ist. Als mittelfristigen schweizerischen Beitrag zur internationalen Forschung auf dem Gebiete der Nachwachsenden Rohstoffe schlägt die Arbeitsgruppe ein Projekt "Energie-Gras" vor. Darin soll die Produktion von Gras auf den bestehenden Grünflächen der Schweiz und dessen Verwendung als Energieträger untersucht werden. Auch die Produktion von schnellwachsenden Hölzern soll in das Projekt einbezogen werden.

Näheres über dieses Programm ist aus dem Beitrag von Herrn E. MEISTER, wissenschaftlicher Mitarbeiter der Eidg. Forschungsanstalt für Pflanzenbau (FAP), Zürich-Reckenholz, und Mitglied der erwähnten Arbeitsgruppe zu entnehmen.

Die diesbezüglichen Vorschläge sind in der Schweiz allerdings noch sehr umstritten. Eindeutig verneint wird die Wirtschaftlichkeit; die Energiepreise müßten um ein Mehrfaches steigen, bis diese gegeben wäre. Umstritten sind auch deren Energiebilanz und die ökologischen Auswirkungen (siehe dazu die drei Stellungnahmen von I. MARINCEK, M. INGOLD und des WWF im Anhang).

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UEBERSICHT 1: DAS AGRARPOLITISCHE INSTRUMENTARIUM DER SCHWEIZ

Grundlagenverbesserung und Strukturpolitik	Preis- und Absatzsicherung: Einfuhrschutz, Inlandverwertung, Export, (Ernährungssicherung)		Direktzahlungen (DZ) (direkte Einkommenszuschüsse)
	An der Grenze	Im Inland	produktbezogene DZ
• Berufsbildung und Beratung • Landw. Forschungsanstalten • Landw. Meliorationswesen a) Subventionen b) Investitionsdarlehen • Förderung von Tierzucht und Pflanzenbau • Strukturlenkung in der Fleisch- + Eierproduktion (Bestandesobergrenzen und Stallbaubewilligungspflicht) • Bodenrechtliche Massnahmen • Raumplanung • Oekologische Massnahmen	Importsteuerung (-schutz) • Preisliche Instrumente - Zölle - Zollzuschläge - Preiszuschläge - Andere Grenzabgaben • Mengenmässige Instrumente - Leistungssystem - Dreiphasensystem - Einfuhrkontingentierung - Einfuhrmonopole - Importverbote Exportmassnahmen • Ausfuhrbeiträge (vor allem Zuchtvieh sowie landwirtschaftliche Verarbeitungsprodukte) • Indirekte Exportbeiträge (Promotion)	Garantiepreise verbunden mit staatlicher Uebernahmepflicht • für begrenzte Menge je Betrieb (Milch, Zuckerrüben, Raps) • für begrenzte Gesamtmenge (z. B. Brotgetreide) Richtpreise gekoppelt mit Ueberschussverwertungs- bzw. Marktabräumungsaktionen (z. B. Fleisch) Inlandverwertung • Uebernahmepflicht • Produktverbilligung, z. B. Butter, Käse, Brotgetreide, Zucker, Rapsöl • Qualitätskontrollen • Preis- und Margenkontrollen Vertragsproduktion Lagerhaltung	• Anbauprämien: Getreide, Kartoffeln • Kuhhalterbeiträge (für solche ohne Milchablieferung) • Ausmerzbeiträge für Zucht- und Schlachtvieh (insbesondere Berggebiet) • Milch-Siloverbotszulage und Qualitätsprämien übrige DZ 1. Regionale Ausgleichsmassn. • Kostenbeiträge an Viehhalter • Betriebsbeiträge an Viehhalter • Flächenbeiträge für Hang- und Steillagen • Sömmerungsbeiträge • Anbauprämien-Zuschläge 2. Tierhalterbeiträge für kleine + mittlere Betriebe 3. für Oekoflächen 4. Kinderzulagen an Kleinbauern und Angestellte

Anhang II

LANDWIRTSCHAFTSGESETZ

Entwurf
vom 21.1.1991

Aenderung vom

Die Bundesversammlung der schweizerischen Eidgenossenschaft,

nach Einsicht in eine Botschaft des Bundesrates vom ....[1]
beschliesst:

I

Das Landwirtschaftsgesetz[2] wird wie folgt geändert:

Artikel 31a (neu)

F. Direktzahlungen
I. Ergänzende Direktzahlungen

[1]Der Bundesrat kann zur Einkommenssicherung im Sinne von Artikel 29 ergänzend Direktzahlungen ausrichten. Er berücksichtigt dabei die Unterschiede in Ertragskraft und Einkommen, die auf die Agrarstruktur und die natürlichen Produktionsverhältnisse zurückzuführen sind.

[2]Die Direktzahlungen werden nach geeigneten Kriterien wie Fläche, Betrieb, Zahl der Haushalte, der Arbeitskräfte oder der Vieheinheiten bemessen. Der Bundesrat legt die Kriterien fest. Er kann die Direktzahlungen abstufen sowie Höchst- und Mindestbeträge festlegen.

1) BBl 1990
2) SR 910.1

3Die Direktzahlungen werden mit Bedingungen und Auflagen verknüpft. Diese sollen insbesondere:

a. den Bedürfnissen der bäuerlichen Familienbetriebe Rechnung tragen;
b. die überbetriebliche Zusammenarbeit und das unternehmerische Verhalten der Produzenten fördern;
c. eine umweltschonende und tiergerechte Produktion unterstützen.

Artikel 31b (neu)

II. Ökologische Ausgleichsbeiträge

1Der Bund kann Produktions- und Bewirtschaftungsformen, die besonders umweltschonend und tiergerecht sind, mit ökologischen Ausgleichsbeiträgen fördern.

2Die ökologischen Ausgleichsbeiträge werden mit Bedingungen und Auflagen verknüpft. Der Bundesrat legt diese fest.

3Die Kantone überprüfen, ob die Produzenten die Bedingungen und Auflagen einhalten. Sie können diese Aufgaben anerkannten Organisationen übertragen. Das Departement regelt die Anerkennung der Organisationen.

4Der Bund kann die anerkannten Organisationen für die Tätigkeiten nach diesem Artikel mit Beiträgen unterstützen.

II

1Dieses Gesetz untersteht dem fakultativen Referendum.
2Der Bundesrat bestimmt das Inkrafttreten.

Ist Raps-Diesel eine Schnaps-Idee?

Tänikon: Ermutigende Ergebnisse

Ab Juni oder Juli sollen fünf Busse der Verkehrsbetriebe Zürich (VBZ) für ein Jahr versuchsweise mit aus Rapsöl hergestelltem Biodiesel fahren. Dieser Praxistest folgt Prüfungsversuchen, welche die Empa in Dübendorf durchgeführt hat und die in der eidgenössischen Forschungsanstalt Tänikon der Schweizerischen Studiengesellschaft für Motorbetriebsstoffe vorgestellt wurden.

Tänikon. (sda) Tests der Eidgnössischen Materialprüfungsanstalt (Empa) Dübendorf, die letzte Woche in Tänikon präsentiert wurden, zeigen, dass der mit naturbelassenem Rapsöl betriebene Elsbett-Motor einen ruhigen, leisen Lauf hat. Sein Wirkungsgrad und sein Verbrauch entsprechen einem herkömmlichen Dieselmotor. Bei schlechten Rauchwerten stuft die Forschungsanstalt die Emissionen im Abgastest nach üblicher ECE-Norm als erstaunlich gut ein.

Ermutigende Ergebnisse liegen auch für den Einsatz von RME-Biodiesel vor. Er wurde zwei Jahre lang mit drei Traktoren getestet. Bei den Abgasen fiel nur der drei bis 28 Prozent höhere Stickoxidwert negativ auf. Zu beachten ist bei diesem Treibstoff auch, dass im Winter das Motorenöl öfter gewechselt werden muss.

Die Forschungsanstalt schliesst aus diesen Ergebnissen, dass die existierenden Dieselmotoren noch besser an den neuen Treibstoff angepasst werden müssten. Die ersten provisorischen Tests mit Busmotoren bei der Empa bestätigen dieses Bild.

Wegen der allgemein günstigen Abgaswerte der mit Rapsöl oder Rapsmethylester betriebenen Motoren bietet sich der Einsatz dieses Treibstoffes vor allem für Grossverbraucher in den Agglomerationen wie öffentliche Busbetriebe an. Die Forscher sehen auch Fahrzeuge in einer empfindlichen Umwelt wie Pistenfahrzeuge, Schiffe oder Baumaschinen in der Nähe von Grundwasservorkommen als Verbraucher.

Weniger günstig sieht bisher die finanzielle Seite aus: Deutscher Rapsmethylester kostet momentan 1.40 Franken pro Liter. Das Schweizer Produkt kommt bisher noch auf 4.35 Franken pro Liter. Selbst im günstigsten Fall, wenn man beispielsweise die wegfallenden Anbauprämien für das nach dem Rapsanbau weniger produzierte Getreide einbezieht, bleibt das Schweizer Produkt noch etwa 3.70 Franken teuer.

Positiv beurteilt aber die Forschungsanstalt die Gesamtbilanz, weil nicht nur Treibstoff erzeugt, sondern auch die Futtermittel verwertet werden könnten. Dazu kommen Umweltvorteile, die sich nicht ohne weiteres beziffern lassen, wie beispielsweise die Tatsache, dass die Rapskulturen im Winter die Felder bedecken und damit die Nitratauswaschung des Bodens verhindern.

WWF: Negative Öko-Bilanz

Das Biodiesel-Projekt des Bundesamts für Landwirtschaft stösst bei der Umweltschutzorganisation WWF auf Ablehnung. Die auch vom Departement Ogi als umweltfreundliche inländische Energieproduktion bezeichnete Förderung von Rapsmethylester als Dieselölersatz halte einer kritischen ökologischen Prüfung nicht stand, stellt eine im Auftrag des WWF Schweiz durchgeführte Studie fest.

Bern. (sda) Noch in diesem Jahr sollen die Studien zur Errichtung einer Biodiesel-Anlage in der Schweiz vorangetrieben und aus Rapsöl gewonnener Treibstoff an einem Busmotor getestet werden. Nach Ansicht einer Arbeitsgruppe, der neben dem Bundesamt auch der Schweizerische Bauernverband angehört, stellt Rapsmethylester (RME) ein beachtliches Energiepotential dar, weshalb Bundesrat Adolf Ogi bereits Anfang Jahr grünes Licht für entsprechende Studien gegeben hat.

Der WWF Schweiz seinerseits liess vom Büro für Umweltanalytik Carbotech AG in Basel eine beurteilende Untersuchung des RME-Projekts durchführen. Die Studie, die am Dienstag an einer Pressekonferenz in Bern vorgestellt wurde, bescheinigt dem RME-Projekt insgesamt eine negative Ökobilanz. Es sei die simple Fortsetzung einer landwirtschaftlichen Produktionsart, die verschmutze, die Natur zerstöre und Energie verschwende, erklärte Philippe Roch, Geschäftsführer des WWF Schweiz.

Laut Urs Meier, Projektleiter Landwirtschaft beim WWF, fällt insbesondere die Energiebilanz beim Rapsanbau im Vergleich zu alternativen Nutzungsmöglichkeiten in der Landwirtschaft (extensive Weizenproduktion und Wiesen) negativ aus. Während beim Rapsmethylester ein Energie-Aufwand/Ertrag-Verhältnis von 1 zu 1,9 resultiert, erzielt die Weizenproduktion ein entsprechendes Verhältnis von 1 zu 3, die Wiesen sogar von 1 zu 8,75.

Auch bei der CO_2-Bilanz halte das Projekt nicht, was versprochen werde, betonte Meier. Durch das RME-Szenario könne nur gerade 0,16 Prozent der Kohlendioxid-Emissionen (CO_2) eingespart werden, die in der Schweiz jährlich aus der Verbrennung fossiler Treibstoffe entstehen. Allein mit diesem «Erfolg» sei die gesamthaft unökologische Produktion nicht zu legitimieren, erklärte Meier. Schliesslich sind laut dem Bericht der Carbotech auch die wirtschaftlichen Auswirkungen der RME-Produktion negativ. Die zur RME-Produktion notwendigen Bundessubventionen von total 100 Millionen Franken seien zweieinhalbmal höher als der Subventionsbedarf der herkömmlichen Raps-Speiseölgewinnung und mehr als siebenmal höher als die Beitragszahlungen für die inländische Brotgetreideproduktion.

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Anhang IV

BUNDESAMT FÜR LANDWIRTSCHAFT
FAO-Sekretariat

30.5.1991 Mc/ra

Notiz an Dr. H. Popp

Ueberlegungen zum Bericht Kurath über die Möglichkeiten zur Nutzung nachwachsender Rohstoffe im Energiebereich (im Hinblick auf das FAO/ECE-Kolloquium in Graz)

1. Energetische Ueberlegungen

Siehe zu diesem Punkt die Ausführungen von M. Ingold in der Beilage. Nach Abzug aller Verluste ist bei Energiepflanzen eine Energieausbeute von lediglich 0,4 bis 1,2 % zu erwarten.

Im Vergleich dazu bieten photovoltaische Anlagen einen viel besseren Wirkungsgrad (10-30 %). Der Schwachpunkt der Photovoltaik ist ihr zur Zeit noch sehr hoher Preis.

Die schweizerische Landwirtschaft weist insgesamt eine leicht negative Energiebilanz auf (siehe Ingold), vor allem wegen des Vorherrschens der tierischen Produktion. Im Pflanzenbereich ist die Energiebilanz positiv (Faktor 3 bis 4). Im Energiepflanzenbereich lässt sich diese Bilanz womöglich noch steigern. Um dies zu bewerkstelligen müssen den Energiepflanzen gute Böden in tiefen Lagen zugewiesen werden. In höheren Lagen (kälter, kürzere Vegetationsperiode) gehen die Erträge schnell zurück. Dort kommt nur eine sehr extensive Nutzung in Frage (Holz. Gras).

Umgekehrt sieht es bei der Photovoltaik aus. Je höher. desto besser, da das Sonnenlicht weniger gefiltert wird, und Wolken resp. Nebelmeere sich weniger oft dazwischenstellen. Die Photovoltaik funktioniert zudem auch bei Temperaturen unter dem Gefrierpunkt. eine Nutzung ist über das ganze Jahr möglich.

Fazit zu Punkt 1: wenn es darum geht. marginales Land energetisch zu nutzen. ist die Photovoltaik den Energiepflanzen in Punkto Energieeffizienz deutlich überlegen.

2. Wirtschaftliche Ueberlegungen

Die Wirtschaftlichkeitsberechnung für Rapsmethylester im Kurath-Bericht spricht eine deutliche Sprache. Kosten von über 5 Fr./Liter für einen Treibstoff mit 7 % tieferem Energiegehalt als Dieseltreibstoff, welcher an der Grenze zu einem Preis von etwa 30 Rp/l zu haben ist, sind schlichtweg ökonomischer Unsinn. Die berechnete Reduktion der Negativdifferenz dank anfallender Minderausgaben des Bundes entspricht einer buchhalterischen, nicht aber einer ökonomischen Logik, es wird sozusagen Sünde gegen Sünde verrechnet.

Diesen hohen Kosten steht, wie bereits ausgeführt, nur ein sehr geringer energetischer Nutzen gegenüber. Die Relation Grenzkosten/Grenznutzen sieht beim Energiesparen viel interessanter aus.

Im Gegensatz zum eindimensional energetischen Ansatz der oben erwähnten Photovoltaik kann die Landwirtschaft indes neben dem reinen Erntewert unter dem Stichwort der Multifunktionalität anderen Nutzen erwirtschaften (Ernährungssicherheit, Landschafts- und Ressourcenpflege, ländliche Besiedlung sowie kulturelle wie gesellschaftliche Werte, deren Nutzen angesichts der in den Städten auftretenden sozialen Kosten unter dem Gesichtspunkt von "opportunity benefits" zu betrachten wären). Die ökonomische Bewertung dieser Nutzenerbringung ist schwierig, da es um gesellschaftspolitische "choices" geht, entsprechend ist die Beurteilung schwierig, welche Kosten in diesem Zusammenhang tragbar und rechtfertigbar sind. Man kann aber argumentieren, dass im finanziellen Gesamtrahmen einer gegebenen und akzeptierten Belastung von Steuerzahler und Konsumenten Verlagerungen von gesellschaftspolitischen Prioritätensetzungen (z.B. zugunsten von Landschaftspflege und Umweltschutzleistungen durch die Landwirtschaft) durch den Souverän entsprechende Reallokationen der finanziellen Mittel rechtfertigen.

3. Komparative Vorteile

Im Kurath-Papier sind noch keine wirtschaftlichen Berechnungen zur Nutzung von Energie-Gras zu finden. Diese Lücke sollte geschlossen werden.

Da die komparativen Vorteile der schweizerischen Landwirtschaft eindeutig im Bereich der auf Weide- und Graswirtschaft abgestützten viehwirtschaftlichen Produktion liegen, sollte sich unser Land vor allem für die Erforschung der Variante "Energiegras" einsetzen. Dies auch im Sinne einer europäischen Arbeitsteilung (Deutschland befasst sich mit Raps, Oesterreich mit Energieholz, Frankreich mit Zucker etc.).

4. Strukturfragen

Die Förderung landwirtschaftlicher Energie- und Rohstoffkulturen steht vor allem als (beschäftigungsintensivere) Alternative zu Flächenstillegungen oder Extensivierungen im Gespräch. Durch die Erschliessung einer solchen zusätzlichen Absatzmöglichkeit kann der Druck zum Strukturwandel gemildert werden, sowohl im EG-Raum, wie auch im Kreise künftiger EG-Bewerber. Damit bietet dieser Ansatz neben seiner langfristigen Perspektive (Beitrag zur "sustainability" der Energiewirtschaft) auch eine solche mittelfristiger Art: wenn es zum EG-Beiritt kommt, kann dank diesem zusätzlichen Absatzfenster die in relativ kurzer Zeit zu bewältigende harte Strukturanpassung etwas gemildert werden.

5. Fazit

Wenn Energie das Hauptziel ist, ist die Förderung von Energiepflanzen als falscher Ansatz einzustufen.

Wenn dagegen die Multifunktionalität der Landwirtschaft im Vordergrund steht, dann sollte schweizerischerseits der Energiegras-Ansatz verfolgt werden, wobei sich die Frage stellt, welche Intensität der Energiegrasbewirtschaftung zu wählen ist.

Wenn die Marktentlastung (z.B. im Milchbereich) im Vordergrund steht, dann kommt dieser Kultur eine Substitutionsvolle zu, entsprechend ist auf relativ hohe Intensität in guten Lagen zu setzen.

Wenn es darum geht, zusätzliche Absatzmöglichkeiten zu schaffen (Komplementärrolle), dann sollte die Energiegrasforschung sich auf marginales Land (Alp- und Juraweiden) konzentrieren, entsprechend wäre eine extensive, viel Land beanspruchende (und landschaftspflegerische) Bewirtschaftungsform anzustreben. Meines Erachtens sollte letzterer Weg favorisiert werden.

I. Marincek

I. Marincek

Beilage erwähnt

STATION FÉDÉRALE DE RECHERCHES AGRONOMIQUES DE CHANGINS (RAC)

STAZIONE FEDERALE DI RICERCHE AGRONOMICHE
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Reg. Nr.
BLW 27. Juli 1989
geht an: | z. K. | z. St. | z. E.

Nyon, le 26 juillet 1989

Monsieur I. MARINCEK
Secrétariat FAO
Office fédéral de l'agriculture
Mattenhofstr. 5

3003 BERNE

Réf. v/
n/ MI/sk
(à rappeler dans la réponse)

Objet:

Cher Monsieur,

Comme convenu, je vous envoie, annexées, les quelques explications que vous m'aviez demandées en son temps. Si vous avez quelques problèmes d'interprétation ou si vous désirez des renseignements supplémentaires, téléphonez-moi ....., mais pas avant le 15 août.

Veuillez agréer, cher Monsieur, mes salutations les meilleures.

M. Ingold
Adjoint scientifique de la direction

Annexes ment.

EFFICACITE DE LA PHOTOSYNTHESE

Le rendement net de la photosynthèse peut être défini comme la quantité d'énergie accumulée dans la biomasse exprimée en % de la quantité totale d'énergie reçue pendant l'année.

Les données qui suivent sont des ordres de grandeur. Elles s'appliquent à des cultures (ou végétations naturelles) qui ne sont pas soumises à des situations de stress (sécheresse, maladies, températures excessives vers le bas ou le haut, etc.).

Le rendement photosynthétique est influencé par les facteurs suivants:

1. Température: Le système ne fonctionne qu'à partir d'une certaine température (+1 à +2° pour le blé, +8 à +10° pour le maïs et le soya). Le rendement baisse aussi lorsque la température dépasse 30°.

2. Surface d'assimilation: Le couvert végétal n'assimile pleinement que lorsqu'il recouvre entièrement le sol et que les feuilles et tiges sont encore fonctionnelles (blé: avril à mi-juillet; maïs: juin à septembre).

   Il résulte de ces deux conditions qu'une culture (dans nos régions) ne peut valoriser que 50 à 55% du rayonnement total annuel.

3. La photosynthèse proprement dite fonctionne suivant trois systèmes appelés C3, C4 et CAM. La plupart des plantes des régions tempérées fonctionnent suivant le système C3. Les plantes d'origine tropicale ou subtropicales fonctionnent en C4 dont le rendement est meilleur. C'est le cas du maïs. De plus, le mécanisme de la photosynthèse ne valorise l'énergie qu'elle reçoit que dans une partie du spectre lumineux.

4. Respiration: Pendant la nuit, les plantes respirent et consomment une partie des assimilats synthétisés pendant le jour. La perte est de l'ordre de 30 à 40%.

5. Le harvest index est le rapport entre la quantité de produit récoltée (tubercules de pommes de terre, grains de céréales) et la biomasse totale (y compris racines, tiges, feuilles, etc.). Le produit récolté constitue, suivant les espèces, entre 40 et 50% de la biomasse totale.

Tenant compte de toutes ces pertes, le rendement final est très bas. On retrouve dans la biomasse totale 1 à 2% de l'énergie reçue pendant une année. Tenant compte du harvest index, le produit récolté représente de 0,4 à 1,2% de l'énergie totale reçue.

Ces chiffres sont valables pour les zones tempérées. En climat subtropical (souvent avec des plantes C4), le résultat est meilleur. Il est moins bon en climat aride (sans irrigation) du fait que l'eau devient le facteur limitant. Il faut enfin noter que le rendement des forèts n'est pas meilleur.

Littérature

J.P. COOPER: Photosynthesis and productivity in different environments. Cambridge University Press, 1973.

LE RAPPORT INPUT / OUTPOUT ENERGETIQUE

Le total des intrants énergétiques pour l'agriculture suisse était en 1976 de 18'000 Tj (Terajoules). Il se répartit comme suit:

engrais	26%
pesticides	3%
animaux de trait	19%
carburants lubrifiants	30%
machines (construction et entretien)	10%
électricité	7%
travail humain	5%

Pour la même année, l'équivalent énergétique de la production agricole était de 16'200 Tj.

Pour chaque joule produite, on a donc engagé 1,1 joules. Ce rapport, à première vue défavorable, vient de ce que la plus grande partie de la production est d'origine animale et que l'animal, avant de produire, doit d'abord couvrir sa "ration d'entretien".

En production végétale, le rapport est bien meilleur. Pour un input de 1 joule, on obtient une énergie alimentaire récoltée de 3 à 4 joules, suivant les cultures. Il est entendu que ce rapport concerne le produit brut (pommes de terre, blé, etc.) et ne tient pas compte de l'input énergétique nécessité par la transformation ultérieure.

Notons que le rapport input/output de 1,1 en 1976 était en 1939 de 1,4! car, à cette époque, la traction animale absorbait trois fois plus d'énergie alors que l'output était inférieur de 30%.

Littérature

R. SUTER: Studie über den Energie-Input und -Output in der schweizerischen Landwirtschaft. In Energie und Landwirtschaft, Duttweiler Institut Rüschlikon, 1978.

A. VEZ: Energie et agriculture. Revue suisse Agric. 8 (3), 58-60, 1976.

PERSPECTIVES ON THE USE OF AGRICULTURAL LAND FOR NON-FOOD PURPOSES IN SWITZERLAND

E. Meister, Zürich

1. LAND USE TODAY

The area of Switzerland is 4,1 mill. hectares. The agriculturally used area (AUA) accounts for one forth only, equal portions being unproductive, forest and extensive mountainous grassland, respectively. The AUA (1,1 mill. ha) is mostly grassland. Open arable land (OAL) accounts for only 325 000 hectares and is, on a per capita basis (0.05 ha/inhabitant), much lower than in any EC-country. The OAL is utilized as follows (in 1000 ha): bread cereals, 106; feed cereals, 119; grain maize, 30; silage maize, 39; potatoes, 19; beets, 15; oil rape, 17; field vegetables, 8; other crops, 1.

At present, only a negligible portion of the land is used for non-food production (niches). Legislation is under way to set land aside (fallow crops) and to promote less intensiv land use (integrated farming; extensive small grain production; extensive, floristically rich meadows), and to produce non-food crops.

2. BIOFUEL PROJECTS

The development and implementation of renewable energy sources is part of the Swiss energy policy. Added impetus has been given by the moratorium on new nuclear power plants (popular vote) and by public pressure to reduce air pollution and CO_2-emission. Public funds can be made available for research and pilot studies. More extensive support will need approval by the parliament.

On the initiative of the farmers union and on behalf of the Federal Offices of Energy and of Agriculture, a "Report on Use of Renewable Resources for Energy Purposes" was published in 1990 by a working group, in which several federal offices, various industries and agencies, the farmers union, and the agricultural research stations were represented.

The report proposes:

- the production of bio-diesel from seed rape and
- a research program on energy-grass and field cultivated wood.

2.1 Bio-diesel from rape oil methyl ester (RME)

A bio-diesel project is under way. It is supported by the Federal Offices of Energy and of Agriculture. Preliminary studies with engines, comparing diesel low in sulfur (0.05 %) with bio-diesel, showed favourable results for the latter. Engine characteristics were similar, but exhaust gases contained less soot (Bosch smoke units), sulfur dioxide and carbon monoxide. Comparisons were made with and without particle filters or diesel catalysts. Results are not published yet.

In July a one-year field trial will start with 5 city buses in Zürich. Bio-diesel will be imported. Exhaust composition and engine characteristics will be regularly monitored. Since all buses on one city line will be running on biodiesel, public acceptance as well as possible technical difficulties should become apparent.

An engineering company is to conduct a feasibility study for an industrial scale esterification factory (technology, logistics and economics). In case of positive results from these studies, a dicision on whether bio-diesel production will be realized in Switzerland is expected for 1992.

2.2 Research project on energy-grass and field cultivated wood

Switzerland is basically a grassland, with no alternatives in many regions. A joint effort will therefore be made, on behalf of the Federal Office of Energy, to use herbaceous and woody materials as fuel. Priority is to be given to biomass from natural meadows, leys, catch crops and field cultivated wood. Other locally available organic materials will also be considered in the study.

Agricultural production will be based on low input systems, with a positive eco- and energy balance. Second priority is to be given to intensively produced energy crops. These, however, will be investigated for comparison purposes.

The conversion process under consideration are, for

wet materials (grass, silage):
anaerobic digestion, using the biogas either directly in gas burners for heating, or
in electric generators for co-generation of electricity and heat.
dry materials (hay, straw, wood):
direct combustion for heat production, or
pyrolysis using the gas directly for heat or for co-generation.

Private and federal research institutions have to submit research proposal during 1991. Depending on their approuval and on the available financial resources, the joint projects (pilot studies) are expected to begin in 1992. A report is planned for 1996 with recommendations for implementation as to:

- the type and amount of biomass production
- the required characteristics of the raw materials (substitutions)
- the production technique and energy utilization
- the logistics for an efficient energy production
- utilization of byproducts (nutrient recycling)
- ecological aspects of the biomass and energy production systems
- efficiency and economics of energy production from biomass
- new legislation.

A cantonal pilot project (Basel) investigating ethanol production from fibrous biomass has already begun. The project is being carried out by Zellplan GmbH, Munich. Ethanol will be produced by fermentation following acid hydrolysis of the biomass.

3. RAW MATERIALS FOR INDUSTRIAL USE

Most of the agricultural raw materials used by the Swiss industry is presently imported. This corresponds to an acreage of about 50 000 ha or 1/6 of the arable land of Switzerland. About 200 000 hectoliters of ethanol, 80 000 tons of starch and 30 000 tons of fat and oil are used anually for pharmaceutica, cosmetica, detergents, paper- and chemical products. Production of degradable bioplast products is increasing. Promising new products are one-way, disposable dishes.

The promotion of agricultural crops for other uses than food and energy is under investigation by a working group fo the Swiss Federal Cereal Administration. Scientific and financial resources will be combined from the private and public sector. Priorities for pilot projects are:
1st starch, 2nd sugar, 3rd fiber and 4th oil and fat.

4. PROJECTIONS FOR RENEWABLE RESOURCES

- Rape oil production for bio-diesel could start in 1993 the earliest. Projections are, that the acreage fo rape, presently 17 000 ha, could be doubled without any negative effects (disease and pest problems).

- About 1/8 of the forage produced today (1 mill. t dry matter) could be used for local energy-production. The energy production potential is of the same magnitude as that of the forests today. Implementation depends on available technologies and the price of other energy sources.

- It is reasonable to assume that the demand for industrial products from renewable resources will increase in Switzerland.

- It should not be overlooked, that fertile agricultural soils are a valuable resource for future production of food, energy and industrial goods.

ENGLISH SUMMARIES

EUROPEAN AGRICULTURE AS A SUPPLIER OF RAW MATERIALS AND ENERGY TO INDUSTRY

S. Lanner, Strasbourg

The paper - building in part on the conclusions of the Assembly's Conference "European Agriculture as an Industrial Supplier - A Way Out of the Crisis?" held in Munich in September 1988 - calls on Council of Europe member states to develop an overall plan permitting agriculture to become an important supplier of renewable raw materials to industry, as well as of energy, both for its own needs and for those of society as a whole. Such a reorientation (which should not detract from agriculture's main function of providing food) is necessary, the paper argues, in order to ensure the future of farming and rural society and to preserve the environment. It is also far preferable to present policies of over-production, quota restrictions, and land abandonment. In brief, if land which is now used to produce food we cannot eat, instead could be employed to grow energy crops and raw materials for the chemical, pharmaceutical, packaging, textile and other industries, then both farmers and consumers would be better off.

The above will, however, require political courage, vision and long-term financial commitment on the part of policy-makers, who have to bring farmers, industry and research institutions together in a stable partnership in order to develop new plants, products and processes, as well as create the infrastructure needed for the transport and processing of renewable energy. Among the paper's more detailed recommendations one notes the call for obligatory use of biodegradable, agriculturally produced plastic materials, and the admixture of between 3 % and 5 % of bioethanol to petrol. The various interested parties are only waiting for a clear commitment by society, the paper concludes: "Now it is up to us politicians to seize the opportunity and change things for the better."

GERMAN POLICY ON RENEWABLE RAW MATERIALS

H. Meyer zu Drewer and *R. Seehuber*, Bonn

The production and use of agricultural and forest products for and in the non-food sector - briefly called renewable raw materials - has a long tradition. In many industrial sectors the agricultural raw materials were replaced by products from coal- and petro-chemistry. In view of the changed raw material situation - agricultural surpluses, supply and price fluctuations for oil - increased attention is being paid to renewable raw materials not least because of their possible contribution to environmental protection.

The Common Agricultural Policy of the EC in particular provides the framework for renewable raw materials. The market regime for fats ensures that industrial consumers get the oilseeds at world market prices which are produced within the EC. The difference between the target price fixed by the EC and the world market price is refunded to them. Under the EC sugar and starch regulation the producers of some products from sugar, starches of maize, wheat, potatoes and rice receive a production restitution. Hence in the industrial sector world market prices apply to agricultural raw materials. A regulation will enter into force in 1991 under which a special aid is granted for the cultivation of cereals for non-food purposes on part of the land retired.

The regulations in force, however, are not adequate to make renewable raw materials sufficiently competitive.

Renewable raw materials, an important part of which is imported, account for about 10 % of the raw materials used in German chemical industry. Domestic raw materials - in particular starch and rape-seed oil - are being produced on about 170,000 ha or 2.3 % of the farmland. The energy sector is not developed owing to the unfavourable competitive situation.

Individual national measures aim to improve the competitive position of renewable raw materials. The financial expenditure on R & D demonstration projects is to increase to about DM 75 million in 1991. The Electricity Supply Act allows a better renumeration for the supply of electric current from renewable energy sources, including biomass. In addition, the federal government has initiated the examination of possibilities of adding bioethanol and biodiesel to fossil fuels under a CO_2 reduction programme.

In view of the current low price level for fossil raw materials renewable raw materials are no sufficient alternative for the farmer. They need substantial support which can be reduced only after improved general conditions.

SELECTION OF AGRICULTURAL LAND TO BE USED FOR NON-AGRICULTURAL PURPOSES : A POSSIBLE METHODOLOGY BASED ON ECONOMIC CRITERIA

S. Somogyi, N. Novkovič, M. Jovanovič, K. Kajari, V. Rodič,
Novi Sad

At the global level, 70 per cent of the increase in food production is determined by intensification of production and only 30 per cent by capacities growth. Improvements in combining the fixed factor (fields) and the variable ones (fertilizers, cultivation, etc.) more efficiently influence the increase in food production. Therefore, under conditions of a self-sufficiency oriented state or region, a logical question is whether to use all the arable land or to insist on a better combination of first quality soils with the variable factors of production, while leaving the poor quality ones out of use and conserving them.

In Yugoslavia, there is a need for further increase in food production. However, a lot of questions arise relating to the problem of arable land use and the intensification of production. This paper offers a model for an analytical approach to this problem.

NON-FOOD UTILIZATION OF AGRICULTURAL LAND IN FINLAND

R.M. Niemi, Helsinki

Apart from measures to reduce the arable area, the finding of alternative uses for surplus fields is of prime importance to the future of agriculture. This decade will be a period of adaptation for agriculture. The reduction of agricultural production and the pressure from GATT to reduce the important protection on agricultural products will face the rural community with increasingly difficult changes. Traditional agriculture, especially milk, eggs and grain, will account for a smaller proportion of farmers' income in the next few years. There is room for growth in forestry, organic farming, special production processes and other small rural businesses.

New plants and plant varieties are continuously under development, and results and changes can be expected in the near future. Flax, protein plants, aromatic and other herbs, and organic farming will probably prove to be new sources of income. However, their significance in reducing the amount of surplus field area is slight. Instead, the use of industrial and motor fuel ethanol presents interesting opportunities for putting fields to new use. It is estimated that as much as 150,000 ha of field is needed to produce the proposed volume of ethanol. There are problems with the price level, the concomitant export subsidies, and the marketing of the protein fodder produced as a by-product of ethanol production.

In forestry, there are opportunities for expansion in delivery cutting. The orientation towards forestry and afforestation should be developed to increase farmers' interest in deriving their main income from forestry.

The use of fields for landscaping is an alternative to be considered in the future. As environmental protection and management in rural areas develop, agriculture could serve other sectors by maintaining important landscape and environment features, such as farms, uncultivated fields and other cultural entities. This is important for tourism, the maintenance could also bring some extra income.

THE PROSPECTS OF THE NEW TYPES OF NON-FOOD USES OF AGRICULTURAL LAND

I. Vainio-Mattila, Helsinki

The main solutions to reduce area in active cultivation have been temporary in nature. Only afforestation, giving up cultivation in the connection of certain retirement schemes and using land for housing or road construction are more or less permanent alternatives. It is certainly advisable to seek solutions, whereby no land is left idle and can easily be returned to agriculture. Active land use to non-food production should reduce the necessity of government intervention. If this requirement is fulfilled, it is possible to keep more farms alive and rural villages vital.

SHORT ROTATION FORESTRY IN AUSTRIA AS A FORM OF NON-FOOD USE OF AGRICULTURAL LAND

G. Pelzmann, Graz

In our agrarian policy, the agreement exists that the increasing agricultural overproduction has to be stopped and cut back. On the other hand, our consumption of energy uses up reserves and causes irreversible ecological problems. Short rotation forestry gives a possibility for an alternative non-food utilisation of agricultural land and reduces both problems. This paper presents the state of the initial situation, the relative importance, production techniques, the profitability, the market situation and ecological aspects of energy forestry in Austria.

At an estimated mean current increment in a period of 30 years of 8 tons dry-matter per hectar and year, 2.7 per cent of the current Austrian primary energy consumption could be substituted on 200.000 hectares surplus area. We have enough knowledge on production techniques of short rotation forestry. Problems exist regarding harvest machines and the drying of fresh chipped wood. At the moment an interesting study about drying under anaerobic conditions is being done. If the outcome will be successful, this will be a big step towards reducing harvesting costs and work.

In the last few years, the development of heating systems and stoves towards higher efficiency and lower emission rates has made good progress. National economics and ecology also point to short rotation forestry. But under today's conditions, the energy forestry production is not profitable for farmers. The key to solve this problem is agrarian policy. Energy production from biomass has to get more priority against fossil energy sources.

We need a tax on oil, gas and coal and no longer a substitution of external costs of this "fossil" energy forms, moreover regulations of using electricity for heating and higher subsidies to establish more energy forests and to build more biomass heating stations. This will guarantee a fair price of chipwood and the profitability of short rotation forestry for farmers.

USE OF AGRICULTURAL LAND FOR NON-FOOD PURPOSES

A.B. Soskiev, Moscow

The Soviet Union has exceptionally large land resources, notably for agricultural and food production. There are 2.1 hectares of agricultural land per head of population. The total areas of agricultural land is diminishing in absolute terms, having contracted by 4.0 million hectares in 1970-1989. Over that period the per capita area of agricultural land declined from 2.5 to 2.1 hectares and that of arable land from 0.93 to 0,79 hectares.

The USSR possesses sufficient land resources not only to provide the country's population with food in accordance with scientifically based standards of consumption, but also to export food.

However, the appropriation of agricultural land to build industrial plants and hydroengineering structures, for mining (without proper recultivation of the land afterwards) and urban development is making it harder to resolve the food problem in the country, particularly in some regions. Allocating fertile land for these and other purposes is not justified in economic and social terms. This applies especially to regions which are less well-endowed with cultivable land, such as Soviet Central Asia, the Northern Caucasus and Transcaucasia.

The situation has been sharply exacerbated, moreover, by the accident at the Chernobyl nuclear power plant, which resulted in the discharge of considerable quantities of radioactive substances. The amount of land with contamination levels of 5 Ci/km^2 or more totals 2.8 million hectares. That total is considerably larger if areas with levels of 1 to 5 Ci/km^2 are included. Some agricultural land has been taken out of use and forest utilization has been discontinued in certain forested areas.

The programmes for dealing with the after-effects of the Chernobyl accident call for measures above all to safeguard public health and make sure that agro-industry complies with the requirements for growing environmentally clean produce.

Surveys to detect and quantify radioactive contamination are being continued in the Russian Federation, the Ukrainian SSR and the Byelorussian SSR. There is, however, a need to survey new territories including the Belgorod, Lipetsk, Voronezh and Tambov regions of the RSFSR, the Vinnitsa and Rovno regions of the Ukraine and part of the Minsk region in Byelorussia.

The inhabitants of dozens, if not hundreds, of settlements affected by radioactive contamination are likely to be relocated. This means that further substantial areas of fertile land will cease to be used for agricultural purposes.

UTILIZATION OF AGRICULTURAL AREAS FOR NON-FOOD PURPOSES IN HUNGARY

L. Csete and L. Dorgai, Budapest

The role of agriculture in Hungary has a higher importance than in European countries with a developed industry. Agricultural and food products present 20-23 per cent of the country's total exports, and apart from agriculture only tourist traffic is able to create foreign currency earnings. 12 per cent of the active wage earners are employed in direct agricultural production, 4 per cent in food industry and about 6 per cent by the non-agricultural activities carried out by large-scale farms (commercial, service, industrial and other activities). Contrary to other eastern European former "socialist" countries, a permanent oversupply situation has developed on food markets since a number of years. However, the surplus has been removed up to recent times by foreign trade and other interventions. Under such circumstances, the utilization of agricultural areas for non-food purposes has arisen until now only occasionally for experimental and research purposes.

The situation totally changed at the end of 1990 and in 1991, when unsaleable quantities accumulated with the producers of food products.

The authors' study touches upon the following subjects:

- reduction of areas utilized for agriculture;
- afforestation;
- hunting, game husbandry;
- production of medical herb;
- tourism including rural tourism;
- promotion of non-agricultural activities on agricultural farms.

USE OF AGRICULTURAL LAND FOR NON-FOOD PURPOSES IN THE NETHERLANDS

J.Th.C. de Jong, G.G. van Leeuwen, H.R. Oosterveld and J. de Vos, The Hague

a) The problem defined
   The production capacity of the agricultural land within the EC is too big for the traditional market situation and is getting bigger every year. The Netherlands as a member sta-

te is part of these developments. A possibility to make use of this surplus production capacity is to grow crops for the industral raw material market. Possible alternatives to use this production capacity surplus are set-aside schemes and the use of land for non-agricultural purposes such as nature, outdoor recreation and forestry.

b) Farmed area in the Netherlands
The total area of cultivated land in the Netherlands is some 2,000,000 ha, that is 1.6 % of the EC total. A characteristic feature of the Dutch situation is a shortage of land for housing, recreation, industry, nature etc. This has led to shifts in the use of land and as a consequence to higher land prices. Since 1950 the total area of cultivated land has fallen with 10 %.

c) Renewable raw materials and energy
Many of the crops grown in the Netherlands are suitable as renewable raw materials for industrial purposes. The main crops are potatoes, cereals, oilseed rape and flax. The total acreage fo these crops for non-food purposes has fallen over the past 15 years with 25 % to 73,000 ha.

The government, trade and industry have looked for new crops and new applications. In the long run the production and processing of these crops must be possible without the help of government support.

Agricultural and marketing research in this field is supported by government grants. The government is also willing to aid research carried out by the trade and industry sector.
Large scale applications can only be expected after about ten years.

Arable crops as a source of energy cannot yet compete with fossile fuels. Whether or not the addition of vegetable additives to fossile fuels is profitable depends on market forces and possibly more stringent environmental norms. Further developments will have to be anticipated.

d) Set-aside schemes
For set-aside schemes the Netherlands pay the highest possible grants: 700 ECU (Dfl. 1,854.-). The fall in prices of arable crops has made these schemes quite attractive

for farmers. So far applications have been made for over 14,000 ha to be set aside. That is about 4 % of the total areas which qualifies for the scheme.

e) Nature
Agricultural cultivated landscape in the Netherlands comprise natural values of outstanding quality. These natural values are threatened by modern agricultural farming methods. A scheme exists under which it is possible for farmers who adapt their farming methods to receive government grants to offset possible loss of earnings. The grant may vary from Dfl. 270.- to Dfl. 1500.- per ha per year. The scheme applies to 100,000 ha of arable land. For areas of 50,000 ha management plans have been finalised and for 13,000 ha areas management agreements between government and individual farmers have been entered into.

Areas of more than 100,000 ha comprise natural values which are not longer managable for the individual farmer. These lands can be sold to the government by the individual farmer on a voluntary basis. At present 8,500 ha have been made into nature reserves.

f) Landscape
The government has designated 66 areas where farmers can enter into an agreement with the government for the upkeep of characteristic elements of the landscape present on their farm. Such elements are hedges, shelter belts, pools, ponds and individual trees. Depending on the kind and number fo these elements the grant may vary from Dfl. 500.- to Dfl. 2,500.- per farm per year.
The scheme is satisfactory.

g) Outdoor recreation
The use of arable land for large-scale activities such as golfing is exceptional in the Netherlands. What is more common is that farmers provide camping facilities (with a maximum of 10 places) and sell farm products to day-trippers and tourists to add to their income. Such activities have the best chance of success in areas which attract tourists. In some of these areas outdoor recreation substantially adds to the farmer's income.
More than 1,100 farmers are registered as so-called camping farmers.

h) Forestry
The Netherlands cannot meet its own timber demand. That is why there are grants available for farmers to plant fast-growing timber on agricultural land. The grant is a block grant of Dfl. 3,000.- After 20 years the trees may be felled and the land used for agriculture. The grant is for plots of 15,000 ha. Since prices for arable crops have fallen the amount of ha of fast-growing timber has increased to over 3,000 ha.

i) Interaction between the different forms of land use
There is keen competition between the alternative forms of land use. Due to their dense population the Netherlands have a shortage of land and as a result land prices are high. The price of land has a negative impact on the necessary expansion in the agricultural sector.

At present it is not possible to indicate how the Dutch land market will develop. It is however a fact that from a national point of view supply and demand of land are balanced.

AFFORESTATION AS AN ALTERNATIVE OF NON-FOOD USE OF AGRICULTURAL LAND

E. Unteregger, Graz

Afforestation of agricultural land has a long tradition in Austria and is supported by the public. It is regulated by laws and may be a possibility for extensive land use if the user realizes some special concomitants.

In this report, the historical development of new afforestation, the public and individual interests, legal requirements, support by the public, economic aspects and reasons for afforesting agricultural land are described briefly.

THE USE OF AGRICULTURAL LAND FOR NON-FOOD PURPOSES IN AUSTRIA

H. Pirringer, Vienna

The progress in technology and in plant growing, and the improvement in the production techniques have led to a considerable increase in productivity. As a result, we have not only fully covered the requirements in principal food products, but we have reached an immense overproduction too. One of the main problems of Austrian agriculture is how to reduce the overproduction, because it is becoming more and more difficult to find new outlets. In the coming years it will become an urgent necessity to substitute about 200,000 to 300,000 hectares of cornland.

In the face of this background, in the field of arable production, growing renewable raw materials for the production of basic substances for the non-food and energy sectors becomes more and more interesting. Austria, for example, has tried since 1988 to increase the growing of flax by carefully directed support measures. To date about, 500 hectares of fibre flax are under cultivation. Furthermore, bioenergy projects have been initiated. Following positive results in research work concerning the usage of RME (rape methyl ester) as a substitute for diesel fuel, a commercial plant with a capacity of 12,000 t RME per year and several small plants with capacities of 500 to 2,000 tons per year were erected. One large plant and several small plants are in the planning stage. The production of biomass from fast growing species of wood (cultivation of energy wood) at the moment covers an area of about 600 hectares. A project, which has been discussed for many years, concerns the addition of bioethanol to carburettor fuel, which will now be operational. The plant for the production of 100,000 tons of ethanol will start operation in 1993. A really promising segment of the market, as another alternative to traditional agricultural production, is the usage of plant oils and fats as fundamental substances for the petrochemical and lubricant industry. Here, economic efficiency is more easily reached than in the field of fuel production. The demand for raw materials out of plants containing sugar and starch is also increasing, especially concerning starch for the technical field.

The subsidies are aiming at laying cultivated agricultural areas fallow for a certain period. In 1990, the area of green fallow land covered 14,660 hectares. By the building of sport (golf, riding) and recreational zones, some food production areas could be removed from cultivation.

CONTRIBUTION OF AGRARIAN STRUCTURAL LAND REORGANIZATION TOWARDS PROVIDING AND DEVELOPING LAND FOR NON-FOOD PURPOSES AND TOWARDS RESOLVING LAND USE CONFLICTS

K.-F. Thöne, Bonn

Within the framework of land consolidation procedures, about 13,000 ha alone were made available from 1985 - 1989 and thus taken out of agricultural production. Nature conservation and landscape management measures, followed by town planning measures and supra-local traffic projects, are the priority areas for the promotion of public interests in land reorganization procedures.

Land consolidation is also gaining momentum at the European level in the implementation of extensification programmes whose extent and thus also impact on land use will be extended substantially in the course of agricultural reform. Land consolidation planning measures take account of the programmes if extensification is only of a temporary nature. It becomes an effective instrument of implementation if property and use of the land have to be reorganized on a durable basis in accordance with the requirements of the programmes and if one intends to implement an integral development concept together with other objectives. Land consolidation safeguards the bases of life of peasant agriculture and contributes to solving conflicts in the case of opposing requirements of use by agriculture, nature conservation and environmental protection and infrastructure.

Land consolidation is necessary everywhere, where the reorganization of rural property is a prerequisite for the development of land use of individual farms as well as of the whole land consolidation area. Land consolidation is thus not at the end of a development; it is always at its beginning.

A PRODUCTIVE UTILIZATION OF ECOLOGICALLY FRAGILE AREAS FOR THE GROWING OF NON-FOOD PRODUCTS

E. Otolinski and *W. Musiał,* Krakow

The rebuilding of the economic structure of Poland, the introduction of a market economy and a liberal import policy have brought about a rise of a relative surplus of food products. There is now the possibility for an alternative utilization of the poorest soils situated in difficult ground conditions. First of all, the opportunity has arisen for the utilization of the regions ecologically imperil. In Poland, it is the Upper Silesia District which is the most industrialized and at the same time the most ecologically degraded region. A contamination of these areas by dusty and gassy rainfalls and, in particular, by heavy metals, exercises a compulsion for the elimination of them from agricultural use. The former structure of farm production is being proposed to be gradually transformed into the direction of non-food use. Farm grounds in urban zones mostly degraded ecologically should be converted into woodland, parks, floriculture, nurseries and gardening, too. Green areas should be transformed into osier plantations. Rural zones, less degraded, should change their function into a non-food one, that is horticultural non-food production, as well as the growing of rape appropriated for technical oils, fibrous plants, etc. In a zone with diminished indirect contamination by rainfall but with substantial soil and ground-water pollution, non-food production and also seminal and industrial plant production would be preferred. The rebuilding of the farm land structure is a costly operation which should be covered mainly by the regional funds of ecological reconstruction. Agricultural producers should have their economic losses mitigated by financial compensations in the form of an ecological pension.

RAPESEED OIL AS AN ALTERNATIVE FUEL

P. Martykán, Prague

Vegetable oils are gaining more importance as alternative fuels and environmentally friendly lubricating and hydraulic oils. Their advantages include first of all the ease of biological decomposition, a negligible SO2 content. Recycling of CO_2 is produced by the combustion process in the engine, through plant assimilated organic C and O_2.

In the present paper some data about current winter rape production are shown and a short survey of its possible future utilization for alternative purposes. The study is based largely on Austrian and German know-how, especially for the production of rape methylester under ČSFR conditions. Some technical parameters and results of preliminary cost-price calculations are also given.

INFORMATION ABOUT THE STATE AND THE FUTURE DEVELOPMENT OF AGRICULTURE LAND USE FOR NON-FOOD PURPOSES IN CZECHOSLOVAKIA

M. Svatoš, Prague

The extent of the agriculture land usage has not been too large up till now and it has been based on the traditional structure of agricultural produce in Czechoslovakia. This fact has been connected with the selfsuficiency of the food of mild zones under the conditions of centrally planned economy which has been the main aim of Czechoslovak agriculture development. The crucial share of agricultural land usage for non-food purposes has been connected with the acquiring of renewable sources of raw materials and with the adjustment of the farming system which partly referred to the human and environmental factors including the protection of nature. This concerns more than 50 percent of agricultural land.

The present difficult period of transition of Czechoslovak economy towards market economy is characterized by the project of privatization, price liberation and macroeconomic regulation. The strong restrictive policy connected with the decrease in the demand having purchasing power makes the considerable surplus of agricultural production (15-25 %) and results in the necessity of substantial changes in the structure of agricultural produce and in the usage of agricultural land.

The production of non-food biological matter will create the necessary part of the new strategy of the solution of agricultural production surplus in the near future and the part of positive effect on environmental situation. The future alternative usage of agricultural land for the production of biological matter for energetic purposes and for the industrial usage will be strongly connected with the development of the rape production (from present 3 % to approximately 10 % of crop areas) and besides with the production of flax. The extent of tobacco production, medical plants, horticulture products and so on will not make a great share of agricultural land (approximately 0,1 %). The substantial enlargement of land for leisure time activities is expected in a short time. There are also official projects for the considerable support of unconvential agriculture. With regared to the decrease in subsidies to agriculture there have been zones of so called marginal land areas which represent a limitation to the social and economic development of the whole regions.

The fundamental assumption of the implementation of these intensions of the land usage for non-food purposes is to make general agricultural programme in a short time and to emphasize long-run and preferential aims and related instruments.

THE USE OF AGRICULTURAL LAND FOR NON-FOOD PURPOSES IN ITALY

G. Barbero and *A. Zezza*, Rome

The first part of the paper presents an analysis of the motivations supporting an increasing interest in agricultural land diversion towards non-food uses. Two basic viewpoints are briefly illustrated. The first one is a direct consequence of the "crisis of traditional agricultural policy", both in terms of surplus accumulation and budget costs as well as of environmental damages associated to highly intensive production remain, however, within an "agricultural ideology" (and "food culture"). The second one, on the other hand, adopts a social or holistic approach, which stresses the "growing demand for land and countryside services" in developed societies characterized by high population densities, high per-capita income and further threats of environmental deterioration and increasing regional disparities. This second cultural approach is likely to offer a better framework for the recognition of positive externalities as public goods and for direct income payments associated with the production of countryside services.

Part II recalls Italy's large foreign trade balance in renewable commodities and illustrates the present state of policies, programmes and achievements with regard to non-food uses of agricultural lands. Emphasis is placed on four main items: (a) woodland and wood products, other species suitable for a variety of uses; (b) application of EEC set aside programmes; (c) protected areas of various kind; (d) agrotourism.

Forest area has been expanding considerably in the last decades; its importance for purposes of conservation and water menagement has also been increasingly recognized, due to the special features of the Italian territory. In addition to poplar, other species suitable for fast rotation are being considered. Experiments have been conducted to develop or adapt to local conditions other cultivations for industrial uses in textile, energy, oil, essence production. At present, the most promising one appears to be grain sorghum, especially in the South.

The EEC set-aside programme of 1990 has involved over 20,000 farms (with an average of 13 ha per farm) and a total area of 266,000 hectares; farms are located mainly in Central and Southern Italy. Prevalent destinations have been permanent fallow, fallow with rotation and extensive pasture.

Total protected areas in Italy amount to about 2,200,000 hectares (7,4 % of the national territory) and consists of national and regional parks, nature reserves and wet lands of international importance. Another 10,000 hectares are run by "green" organization or universities. Further developments are expected and the Ministry of Environment estimates that globally protected areas should expand to about 10 % of national territory. In addition there are almost 3,500 game reserves covering an area of about 2,500,000 hectares.

Development of agrotourism in Italy dates back to thes '60s, under the leadership of two regions (Trentino-Alto Adige and Toscana) traditionally devoted to tourism and with attractive landscape features. Several regions are now involved and specific regional legislations have been enacted. However, financial support for this is still very modest if compared with the incentives to agricultural activity; the support is relatively higher in the regions with a weak agricultural base.

NON-FOOD UTILIZATION OF AGRICULTURAL LAND IN SWEDEN

E. Brasch, Jönköping

In April 1990 the Swedish government submitted a Bill to Parliament proposing a radical shift in agricultural policy. The proposed new principles were then adopted by the Parliament in June 1990. The reform will start on July 1st 1991 and will be completed of a deregulated market. This implies elimination of both the administered internal prices and the market interventions as well as the export subsidies.

During the transitional period of five years the farmers will be stimulated by direct payments to a quick and permanent adjustment from the production of food stuffs to other forms of production on redundand arable land. Investments also will be made in educational and advisory schemes. The parliament has stated that the measures for transition and adjustment provide good conditions for getting a changed utilization for about 500,000 hectares arable land. That is about 20 % of all arable land in Sweden. Farmers who cultivated price regulated crops in 1990 have in 1991 the opportunity to apply for adjustment grants (average 9,000 SEK/hectare). Such grants can be received for land which through active measures during the transitional period are changed in a permanent way from production of food stuffs to other forms of production. Farmers can also enter the programme in 1992 (6,000 SEK/hectare) and in 1993 (4,000 SEK/hectare).

The following examples will fill the conditions for permanent adjustments according to the rules within the adjustment grant scheme: Afforestation, planting of energy forest, laying out of new wetland, cultivation of energy and industrial crops on contract, cultivation of nisch crops, constructions for recreational purposes and laying out of extensive pasture. Planting of trees and planting of energy forest, extensive pasture and grain for ethanol production is likely to be the most frequent choosen alternatives.

In his application for adjustment grants a farmer does not need tell which adjustment alternative he intends to realize. Instead he has been given time and opportunity to find a solution which benefits his farm. All adjustment measures have to be effected by the farmer and approved of by the Country Administration Board in time before the end of the transition period (June 30th 1996).

Plantation grants will be paid for the laying out of new wetland, for planting of deciduous forest or energy forest. The grant is paid as a supplement to the adjustment grant. The total costs may not increase 500 MSEK.

The farmers have shown great interest in taking advantage of the economic support that the government offers. About 25 % of the Swedish farmers have in 1991 applied for adjustment grants corresponding to 400,000 hectares of arable land (14 % of the total Swedish arable land). In addition, provisional agreements for the special ethanol programme have been made for 31,000 hectares.

The farmers who are participating in the programmes now have got five years to accomplish the different measures. This fact will stimulate farmers to develop and choose alternatives which are competitive to grain production for food stuff.

RÉSUMÉS FRANÇAIS

L'AGRICULTURE EUROPÉENNE SOURCE D'APPROVISIONNEMENT DE L'INDUSTRIE EN MATIÈRES PREMIÈRES ET EN ÉNERGIE

S. Lanner, Strasbourg

Le document, qui reprend en partie les conclusions de la Conférence de l'Assemblée sur "L'agriculture européenne source d'approvisionnement de l'industrie: une solution à la crise?", qui s'était tenue à Munich en septembre 1988, demande aux Etats membres du Conseil de l'Europe d'élaborer un plan d'ensemble qui ferait de l'agriculture une grande source d'approvisionnement de l'industrie en matières premières renouvelables, mais aussi en énergie, aussi bien pour ses propres besoins que pour ceux de la société tout entière. Cette réorientation, qui ne devrait pas détourner l'agriculture de sa fonction première, c'est-à-dire produire des aliments, est considérée par l'auteur comme nécessaire à la survie de l'agriculture et des populations rurales et à la protection de l'environnement. De plus, elle est de loin préférable aux politiques actuelles en matière de surproduction, à savoir la restriction des contingents et l'abandon des terres agricoles. Pour résumer, si les terres actuellement utilisées pour produire des aliments que nous ne pouvons manger servaient à produire des cultures et des matières premières énergétiques pour les industries chimique, pharmaceutique, textile, de l'emballage et autres, les agriculteurs et les consommateurs auraient tout à y gagner.

Pour réussir cette réorientation, les responsables politiques devront faire preuve de courage et de lucidité et prévoir des engagements de dépenses à long terme pour réunir dans une concertation durable agriculteurs, industriels et chercheurs, afin de créer de nouvelles usines, de nouveaux produits et de nouveaux procédés, mais aussi l'infrastructure nécessaire au transport et à la transformation de matières premières renouvelables. Entre autres recommandations, l'auteur préconise l'utilisation obligatoire de matières plastiques biodégradables d'origine agricole et l'addition de 3 à 5 % de bioéthanol dans l'essence. Ainsi que le conclut le document, les diverses parties en présence n'attendent plus qu'un engagement ferme de la société: "C'est à nous, politiciens, qu'il appartient de saisir cette chance et de changer les choses en mieux".

POLITIQUE ALLEMANDE DES MATIERES PREMIERES RENOUVELABLES

H. Meyer zu Drewer et *R. Seehuber*, Bonn

Il y a longtemps que l'Allemagne produit et utilise des produits agricoles et forestiers à des fins non alimentaires, c'est-à-dire des matières premières renouvelables. Dans de nombreux secteurs industriels, les matières premières agricoles ont été remplacées par des produits tirés du charbon ou du pétrole. L'évolution de la situation des matières premières - excédents agricoles, fluctuations de l'offre et du prix du pétrole - a suscité un regain d'intérêt pour les matières premières renouvelables, surtout en raison de la contribution que leur utilisation pourrait apporter à la protection de l'environnement.

La politique applicable aux matières premières renouvelables se situe dans le cadre de la politique agricole commune de la Communauté économique européenne. Le régime mis en place sur le marché des matières grasses permet aux industriels d'obtenir les oléagineux produits dans la Communauté aux cours mondiaux. La différence entre le prix indicatif fixé par la Communauté et le cours mondial leur est remboursée. En vertu de la réglementation de la Communauté en matière de sucre et d'amidon, les producteurs de certains produits à base de sucre et d'amidon, de mais, de blé, de pommes de terre ou de riz reçoivent une restitution à l'exportation. Les cours mondiaux du secteur industriel s'appliquent donc aux matières premières agricoles. En 1991 doit entrer en vigueur une nouvelle réglementation qui prévoit l'octroi d'une subvention aux céréales cultivées à des fins non alimentaires sur une partie d'anciennes terres agricoles.

Et pourtant, la réglementation en vigueur ne suffit pas à rendre les matières premières renouvelables suffisamment concurrentielles.

Les matières premières renouvelables, importées en grande partie, représentent environ 10 % de l'ensemble des matières premières utilisées par l'industrie chimique allemande. La production intérieure de matières premières - notamment l'amidon et l'huile de colza - occupe quelque 170.000 hectares, soit 2,3 % des terres agricoles. Les cultures énergétiques sont insuffisamment développées en raison de leur manque de compétitivité.

L'Allemagne s'efforce d'améliorer la compétitivité des matières premières renouvelables grâce à des mesures ponctuelles. En 1991, quelque 75 millions de DM devraient être consacrés à des projets de démonstration de recherche-développement. La loi sur la distribution de l'électricité prévoit que le courant électrique produit à partir de matières premières renouvelables, notamment de biomasse, peut être vendu plus cher. De plus, le gouvernement fédéral a entrepris une étude sur l'adjonction éventuelle de bioéthanol et de biogazole dans les carburants, dans le cadre d'un programme de réduction du CO_2.

Actuellement, les matières premières fossiles sont trop bon marché pour que les agriculteurs aient intérêt à se reconvertir dans la production des matières renouvelables, qui devront être subventionnées aussi longtemps que la conjoncture ne sera pas meilleure.

SELECTION DES TERRES AGRICOLES DESTINEES A ETRE AFFECTEES A DES USAGES NON AGRICOLES: PROPOSITION D'UNE METHODE FONDEE SUR DES CRITERES ECONOMIQUES

S. Somogyi, N. Novkovič, M. Jovanovič, K. Kajari, V. Rodič,
Novi Sad

Au niveau mondial, l'augmentation de la production alimentaire est attribuable à environ 70 % à l'intensification de la production et à environ 30 % seulement à l'accroissement de la capacité de production. Cette augmentation tient aussi à un meilleur rapport dans l'utilisation des facteurs fixes (terres) et des facteurs variables (engrais, travail, etc.). Dans le cas d'un pays ou d'une région dont l'objectif est l'autosuffisance, il est donc logique de se demander s'il faut mettre en culture toutes les terres arables ou plutôt mieux exploiter les facteurs de production variables sur les sols de qualité supérieure tout en laissant les sols de qualité médiocre inutilisés et en les préservant.

En Yougoslavie, il est nécessaire d'augmenter encore la production alimentaire. Toutefois, un grand nombre de questions se posent concernant l'utilisation des terres arables et l'intensification de la production. Les auteurs du document proposent un modèle d'approche analytique.

UTILISATION DE TERRES AGRICOLES A DES FINS NON ALIMENTAIRES EN FINLANDE

R. M. Niemi, Helsinki

Indépendamment des mesures visant à réduire les superficies cultivées, il est capital pour l'avenir de l'agriculture de trouver des affectations nouvelles aux champs mis hors culture. Les années 90 seront une décennie d'adaptation pour l'agriculture. Avec la diminution de la production agricole et les pressions exercées par le GATT sur les Etats pour les inciter à réduire la forte protection dont les produits agricoles bénéficient, le monde rural devra faire face à des changements de plus en plus difficiles à suivre. D'ici quelques années, la part de l'agriculture traditionnelle, et tout particulièrement la production de lait, d'oeufs et de céréales, dans le revenu des exploitants sera plus faible. Il existe en revanche des possibilités de développement dans la foresterie, l'agriculture biologique, certains procédés de production spécifiques et d'autres petites branches d'activités rurales.

Des plantes et des variétés nouvelles sont constamment mises au point, ce qui ne peut manquer d'entraîner des changements dans un avenir proche. Les cultures de lin, de végétaux protéagineux, de plantes aromatiques et médicinales, ainsi que l'agriculture biologique constitueront probablement de nouvelles sources de revenu. Mais leur influence sur la réduction des surfaces agricoles excédentaires est faible. En revanche, l'utilisation de l'éthanol par l'industrie et comme carburant offre des possibilités intéressantes d'emploi nouveau des terres agricoles. On estime que 150.000 ha sont nécessaires pour produire le volume d'éthanol envisagé. Les prix, les subventions à l'exportation et la commercialisation des fourrages protéagineux, obtenus comme sous-produits, posent des problèmes.

En foresterie, les coupes commerciales peuvent encore être développées. Il faudrait privilégier la foresterie et le boisement afin d'inciter davantage les exploitants agricoles à tirer l'essentiel de leurs revenus de la foresterie.

La possibilité d'utiliser les terres agricoles pour modeler le paysage est à envisager. Avec le développement de la protection de la gestion de l'environnement dans les campagnes, l'agriculture pourrait être utile à d'autres secteurs, en contribuant à préserver des éléments importants du paysage et de l'environnement, comme les exploitations agricoles, les champs non cultivés et d'autres composantes du patrimoine naturel. Cette préservation est importante pour le tourisme et pourrait en outre rapporter quelque revenu supplémentaire.

PERSPECTIVES DES NOUVEAUX MODES D'UTILISATION DES TERRES AGRICOLES A DES FINS NON ALIMENTAIRES

*I. **Vainio-Mattila**,* Helsinki

Les principaux moyens en vue de réduire les superficies cultivées ont eu jusqu'ici un caractère provisoire. Les seuls moyens plus ou moins définitifs sont le boisement, l'abandon des cultures dans le cadre de certains plans de retrait et l'utilisation des terres pour la construction de logements ou de routes. La solution idéale serait de ne laisser aucune terre à l'abandon et de pouvoir rendre aisément à l'agriculture celles qui sont occupées. L'affectation des terres à une production non alimentaire devrait rendre l'intervention du gouvernement sur les marchés agricoles moins nécessaire et assurerait le maintien en activité d'un plus grand nombre d'exploitations et la survie d'un plus grand nombre de villages.

L'EXPLOITATION FORESTIERE A COURTE REVOLUTION EN AUTRICHE, MODE D'UTILISATION DES TERRES AGRICOLES A DES FINS NON ALIMENTAIRES

*G. **Pelzmann**,* Graz

Les responsables de la politique agraire de l'Autriche s'accordent à penser qu'il faut arrêter et inverser la tendance à la surproduction agricole, qui ne cesse de s'aggraver. Par ailleurs, la consommation d'énergie fossile épuise les réserves et entraîne des dommages écologiques irréversibles. L'exploitation forestière à courte révolution permet une utilisation nouvelle des terres agricoles à des fins non alimentaires offrant ainsi une solution partielle à ces deux problèmes. L'auteur du document évoque la situation actuelle, l'importance relative, les techniques d'exploitation, la rentabilité, la situation du marché et les aspects écologiques de la foresterie pour la production d'énergie en Autriche.

Avec un accroissement courant moyen estimé à 8 tonnes de matière sèche par hectare et par an, sur une période de 30 ans, il suffirait de boiser 200.000 hectares supplementaires pour assurer 2,7 % de la consommation actuelle d'énergie primaire de l'Autriche. Les techniques d'exploitation des plantations à courte révolution sont suffisamment connues. Des problèmes se posent pour ce qui est des machines de récolte et du séchage des plaquettes de bois vert. Une étude intéressante sur le séchage dans des conditions anaérobiques est en cours. Si les résultats sont probants, cette méthode contribuera grandement à réduire les coûts et les travaux de récolte.

Au cours des quelques dernières années, la mise au point de systèmes et d'installations de chauffage plus efficaces et moins polluants a bien progressé. L'exploitation forestière à courte révolution a également la faveur des économistes et des écologistes. Toutefois, dans les conditions actuelles, la foresterie pour la production d'énergie n'est pas rentable pour l'exploitant. La solution à ce problème dépend de la politique agraire. Il faut donner à la production d'énergie tirée de la biomasse une plus large place, face à l'énergie tirée des combustibles fossiles.

Nous devons taxer le pétrole, le gaz et le charbon au lieu de financer les externalités de ces formes d'énergie fossile; nous devons en outre réglementer l'usage de l'électricité pour le chauffage et augmenter les subventions nécessaires à l'extension des plantations énergétiques et à la construction de nouvelles installations de chauffage utilisant la biomasse, ce qui garantira la vente à juste prix des plaquettes de bois, et assurera la rentabilité de l'exploitation forestière à courte révolution.

UTILISATION DES TERRES AGRICOLES A DES FINS NON ALIMENTAIRES

A. B. ***Soskiev,*** Moscou

L'Union soviétique dispose de terres exceptionnellement vastes servant notamment à la culture de denrées alimentaires. Il y a 2,1 ha de terres agricoles par habitant. De 1970 à 1989, on a constaté une réduction définitive de la superficie des terres agricoles, qui a été de 4,0 millions d'hectares. La superficie des terres agricoles par habitant est ainsi passée de 2,5 ha à 2,1 ha et la surface des terres labourées de 0,93 à 0,79 ha.

L'URSS dispose de terres agricoles suffisantes non seulement pour satisfaire les besoins de sa population en denrées alimentaires, conformément à des normes scientifiques de consommation, mais aussi pour permettre leur exportation.

Toutefois, l'affectation des terres agricoles à des fins liées à la construction d'entreprises industrielles, d'installations hydrauliques, d'entreprises minières (sans la remise en état obligatoire ultérieure des terres) et l'extension des villes compliquent le problème de l'alimentation du pays, notamment dans certaines régions. L'affectation de terres fertiles à des utilisations autres que l'agriculture n'est justifiée ni socialement ni économiquement. Cela concerne en particulier les régions où ces terres sont rares telles que l'Asie centrale, le nord du Caucase et la Transcaucasie.

En outre la situation s'est brusquement détériorée après l'accident survenu à la centrale nucléaire de Tchernobyl, qui a provoqué l'émission d'une quantité considérable de matières radioactives. La zone où la pollution atteint 5 curies et plus couvre 2,8 millions d'hectares. Si l'on tient compte aussi des terres où la pollution est de 1 à 5 curies, la superficie concernée est bien plus considérable. Une partie des terres agricoles n'est plus exploitée et l'utilisation des produits forestiers a cessé dans certaines zones boisées.

Les programmes de lutte contre les conséquences de l'accident de Tchernobyl prévoient avant tout des mesures de protection de la santé de la population et une adaptation de la production agricole à l'élaboration de produits écologiquement propres.

Les recherches se poursuivent pour déceler et préciser la pollution radioactive sur les territoires de la Russie, de l'Ukraine et de la Biélorussie. Il faut aussi étendre ces recherches à de nouveaux territoires, en particulier à ceux de Belgorod, de Lipetsk, de Voronej et de Tambov en Russie, à ceux de Vinnitsa et de Rovno en Ukraine, à une partie de la région de Minsk en Biélorussie, etc.

Les habitants de dizaines ou même de centaines d'agglomérations affectées par la pollution radioactive doivent être transférés en d'autres endroits. Cela veut dire que de nouvelles superficies importantes de terres fertiles seront enlevées à l'agriculture.

UTILISATION DES ZONES AGRICOLES A DES FINS NON ALIMENTAIRES EN HONGRIE

L. Csete et L. Dorgai, Budapest

L'agriculture joue un plus grand rôle en Hongrie que dans les pays européens industrialisés. Les produits agricoles et alimentaires, qui représentent 20 à 23 % des exportations totales du pays sont, avec le tourisme, la seule source de devises. Douze pour cent des salariés travaillent dans la production agricole directe, 4 % dans l'industrie alimentaire et environ 6 % dans de grandes exploitations agricoles reconverties dans des activités commerciales, industrielles, de services et autres. A la différence de ce qui se passe dans les autres pays anciennement socialistes de l'Europe de l'Est, les marchés alimentaires de la Hongrie sont saturés en permanence depuis plusieurs années, mais depuis quelque temps les excédents sont épongés par les exportations et grâce à diverses interventions. C'est la raison pour laquelle jusqu'à présent les zones agricoles n'ont été utilisées à des fins non alimentaires que de façon sporadique, aux fins d'expériences ou de recherches.

La situation s'est totalement modifiée à la fin 1990 et en 1991, quand les producteurs de denrées alimentaires se sont retrouvés avec d'énormes stocks d'invendus.

Le rapport aborde les sujets suivants:

- réduction des superficies agricoles;
- boisement;
- chasse et élevage de gibier;
- production de plantes médicinales;
- tourisme, et notamment tourisme rural;
- promotion d'activités extra-agricoles dans les exploitations agricoles.

UTILISATION DE TERRES AGRICOLES A DES FINS NON ALIMENTAIRES AUX PAYS-BAS

J. Th. C. de Jong, G. G. van Leeuwen, H. R. Oosterveld et J. de Vos, La Haye

a) Définition du problème
   La capacité de production des terres agricoles dans l'ensemble de la Communauté économique européenne excède la capacité d'absorption des marchés traditionnels et augmente

d'année en année. En tant que membre de la Communauté, les Pays-Bas, n'échappent pas à la règle. Pour utiliser cette capacité excédentaire, on peut cultiver des végétaux destinés aux marchés des matières premières industrielles et on peut également appliquer des plans de mise hors culture et utiliser des terres à des fins non agricoles: préservation d'espaces naturels, loisirs de plein air et foresterie par exemple.

b) Superficie cultivée aux Pays-Bas
La superficie totale des terres cultivées est d'environ 2 millions d'hectares, soit 1,6 % du total de la Communauté économique européenne. La situation des Pays-Bas est caractérisée par une insuffisance des terrains destinés à la construction de logements, aux activités récréatives, à l'industrie, à la préservation de la nature, etc. ce qui a eu pour conséquence de modifier l'occupation des sols, et partant, de faire monter les prix des terrains. Depuis 1950, la surface totale des terres cultivées a diminué de 10 %.

c) Matières premières renouvelables et énergie
Nombre de végétaux cultivés aux Pays-Bas peuvent servir de matières premières renouvelables pour l'industrie. Il s'agit essentiellement de la pomme de terre, des céréales, du colza et du lin. Les cultures de ces végétaux à des fins non alimentaires occupent une superficie totale de 73.000 hectares, ce qui représente une contraction de 25 % au cours des 15 dernières années.

Les pouvoirs publics et les intérêts commerciaux et industriels ont recherché de nouvelles cultures et de nouvelles applications. A long terme, il devrait être possible de cultiver et de transformer ces plantes sans subvention du gouvernement.

La recherche agronomique et les études de marché dans ce domaine sont subventionnées par l'Etat, qui est également disposé à soutenir les recherches entreprises par le secteur commercial et industriel et qui en outre accorde aux exploitants agricoles des subventions pour mettre en pratique les résultats des recherches.

On ne peut pas escompter d'applications massives avant 10 ans.

En tant que sources d'énergie, les plantes cultivées ne peuvent pas encore rivaliser avec les combustibles fossiles. La rentabilité de l'adjonction de matières végétales aux combustibles fossiles dépend du jeu du marché et peut-être de l'adoption de normes plus rigoureuses en matière de protection de l'environnement. De nouveaux progrès sont à espérer.

d) Plans de mise hors culture
Le Gouvernement néerlandais verse aux exploitants qui acceptent de mettre des terres hors culture des indemnités extrêmement élevées: 700 ECU (1.854 florins). La chute des prix des produits agricoles a incité les exploitants à mettre certaines terres hors culture. A ce jour, plus de 14.000 hectares de terres ont été mis hors culture, soit environ 4 % de la superfie totale visée par le plan.

e) Espaces naturels
Certains paysages cultivés présentent des éléments naturels remarquables, qui sont menacés par les techniques agricoles modernes. Pour compenser les éventuels manques à gagner les exploitants qui adaptent leurs méthodes de culture reçoivent des subventions de l'Etat dont le montant peut aller de 270 à 1.500 florins par hectare et par an. Ce plan concerne 100.000 hectares de terres arables. Des plans d'aménagement ont été conçus pour un total de 50.000 hectares et des accords d'aménagement ont été passés entre le gouvernement et les exploitants pour une superficie totale de 13.000 hectares.

Plus de 100.000 hectares de terres présentant des éléments naturels remarquables ne sont plus exploitables par les agriculteurs. Les exploitants concernés peuvent décider de vendre leurs parcelles à l'Etat. A ce jour, 8.500 hectares ont été convertis en réserves naturelles.

f) Paysage
Le gouvernement a déterminé 66 zones comportant des éléments qui doivent être préservés; les exploitants agricoles intéressés peuvent passer un accord avec le gouvernement pour la préservation de ces éléments. Il s'agit de haies, de brise-vent, d'étangs, de mares et

d'arbres. Selon la nature et le nombre des éléments présents sur la propriété, la subvention va de 500 à 2.500 florins par exploitation et par an.

Le plan donne des résultats satisfaisants.

g) Loisirs de plein air
L'utilisation de terres arables pour des activités qui exigent beaucoup d'espace, comme le golf, est exceptionnelle aux Pays-Bas. Le camping à la ferme (avec un maximum de 10 places) est plus courant, de même que la vente de produits de la ferme aux promeneurs et aux touristes, ce qui apporte un complément de revenu. Les activités de ce genre ont les meilleures chances de succès dans les régions touristiques. Dans certains cas, elles augmentent nettement le revenu de l'exploitant.

Plus de 1.100 exploitants agricoles sont inscrits au registre des exploitants de camping.

h) Foresterie
Les Pays-Bas ne peuvent pas satisfaire la demande intérieure de bois. C'est pourquoi les exploitants qui plantent des essences à croissance rapide sur des terres agricoles reçoivent des subventions. Il s'agit de subventions forfaitaires de 3.000 florins par hectare. Au bout de 20 ans, les exploitants peuvent abattre les arbres et reconvertir la terre à des fins agricoles. Les subventions portent au total sur 15.000 hectares. Les prix des produits agricoles ayant baissé, les superficies plantées en essences à croissance rapide se sont étendues et représentent aujourd'hui plus de 3.000 hectares.

i) Interaction entre les différentes formes d'utilisation des terres
La concurrence entre les différentes formes d'utilisation des terres est rude. Les Pays-Bas, densément peuplés, manquent de terre et la hausse des prix des terrains qui en résulte est préjudiciable à la nécessaire expansion du secteur agricole.

A l'heure actuelle, il n'est pas possible de savoir dans quel sens le marché foncier va évoluer. Sur le plan national, l'offre et la demande de terre restent néanmoins équilibrées.

EXEMPLE D'UTILISATION DES TERRES AGRICOLES A DES FINS NON ALIMENTAIRES: LE REBOISEMENT

E. Unteregger, Graz

En Autriche, le reboisement de terres agricoles est une pratique très ancienne qui a la faveur du public. Il est réglementé par des lois qui autorisent une exploitation extensive, à condition que l'exploitant prenne des mesures d'accompagnement.

Le rapport contient un exposé succinct sur l'historique de la reprise du reboisement de terres agricoles, l'intérêt qu'il suscite dans le secteur public et dans le secteur privé, la législation y relative en vigueur, le soutien que lui apporte le public, ainsi que sur les aspects économiques et les raisons justifiant ce reboisement.

UTILISATION DES TERRES AGRICOLES A DES FINS TOURISTIQUES, SPORTIVES ET DE LOISIRS

J. F. Boudy, Paris:

Les activités touristiques, sportives et de loisirs ont un poteniel de développement important dans les années a venir. Aussi, peut-on se demander si elles peuvent constituer une voie possible de reconversion des terres agricoles.

L'analyse des activités de cette nature qui sont consommatrices d'espaces met en relief les constatations suivantes:

- le camping à la ferme: il représente une solution valable pour amorcer une reconverion, car il n'exige pas de gros investissements et peut donc constituer une activité annexe. Mais en raison de la très faible dimension des installations, il ne peut jouer aucun rôle dans la réorientation vers des usages non alimentaires des terres agricoles.

- les fermes équestres: elles ont de bonnes perspectives de développement. Néanmoins, on ne peut espérer les multiplier en grand nombre, et c'est pourquoi leur impact sur la reconversioon de terres agricoles ne dépassera pas quelques milliers d'hectares dans les années futures.

- les activitées de découverte de la nature les fermes pédagogiques et les fermes-zoos ne peuvent s'implanter qu'à proximité des agglomérations. L'importance de la clientèle qui leur est nécessaire pour fonctionner fait qu'il ne pourra s'agir que d'opérations ponctuelles.

- la chasse et la pêche: la reconversion de terres agricoles vers des activités de chasse et de pêche prend des formes particulièrs:
  + mise en eau de parcelles pour créer des étanges ouverts à la fréquentation touristique.
  + mise en place de cultures destinées à nourrir le gibier sauvage.

  Dans les deux cas, cette reconversion est liée à la création de produits touristiques (séjours de chasse ou de pêche).

  La clientèle potentielle pour ces produits est importante, mais le montage des projets réclame beaucoup de professionnalisme, et leur localisation ne peut se faire n'importe où.

  La dimension des projets de reconversion cynégétique en fait une opération intéressante du point de vue de la "consommation" d'espaces, mais lourde à monter.

  Il est difficile, faute d'expérience suffisante, de chiffrer la contribution de ce type de projets à la reconversion de terres agricoles.

- le golf: sous sa forme classique, le golf est une activité necessitant des investissements lourds et délicate à lancer pour des agriculteurs. Globalement, on estime que sa contribution à la reconversion de terres agricoles ne dépassera pas 50.000 hectares en 10 ans. Les golf rustiques constituent une formule plus adaptée, mais qui en France en est encore au stade expérimental.

L'enseignement majeur à tirer de ces analyses est qu'en tant que mode de reconversion de terres agricoles, les activités touristiques, sportives et de loisirs n'auront qu'un impact extrêmement marginal. En revanche, elles offrent des perspectives de diversification pour les exploitants: c'est donc plus une modalité de reconversion de la main d'oeuvre agricole. A cet égard, elles peuvent apporter une contribution directe, limitée certes mais utile, à la revitalisation des zones rurales en voie de désertification, et indirecte à l'équilibre des marchés agricoles.

UTILISATION DE TERRES AGRICOLES EN SUEDE A DES FINS NON-ALIMENTAIRES

E. Brasch, Jönköping

En avril 1990, le gouvernement suédois a présenté au parlement un projet de loi prévoyant une réorientation radicale de la politique agricole. Les principes nouveaux ont été adoptés par le parlement en juin 1990. la réforme sera engagée le 1er juillet 1991 et doit être achevée au terme d'une péeriode de cinq ans de réajustement de la production et d'adapatation aux conditions d'un marché déréglementé. Cette transformation mettra fin à l'administration des prix internes, aux interventions sur le marché, et à la subvention sur les exportations.

Au cours de cette période transitoire de cinq ans, les agriculteurs seront incités, par des versements directs, à procéder à un passage rapide et permanent de la production de denrées alimentaires à celle d'autres produits sur les terres labourables excédentaires dont ils disposent. Des investissements seront également engagés dans des projets éducationnels et consultatifs. Le parlement estime que les mesures de transition et de réajustement prévues présenteront un cadre approprié pour le changement d'utilisation de quelque 500.000 hectares de terres labourables. Il s'agit là de 20 % environ des terres labourables du pays. Les agriculteurs qui en 1990 pratiquaient des cultures soumises à la réglementation des prix ont en 1991 la possibilité de faire une demande d'aide de réaménagement (au taux moyen de 9.000 couronnes suédoises par hectare). Ces aides seront accordées pour financer la transformation, par des mesures actives à entreprendre au cours de la période de transition, de terres précédemment affectées à des cultures vivrières en terres qui seront utilisées de manière permanente pour d'autres types de production. Les agricultueurs pourront participer au programme en 1992 (6.000 couronnes suédoises/ha) et en 1993 (4.000 couronnes suédoises/ha).

Les exemples suivants remplissent les conditions de réajustement prévues par le programme de subventions: afforestation, plantation de forêts énergétiques, aménagement de marécages, cultures sous contrat de plantes énergétiques et industrielles, cultures spécialisées, transformations à des fins de détente, et aménagement de patûrages extensifs. La plantation d'arbres et la création de forêts productrices d'énergie, l'aménagement de pâturages extensifs et la culture de céréales pour la production d'éthanol seront probablement les alternatives les plus souvent choisies.

En demandant d'obtenir une aide de réaménagement, l'agriculteur ne sera pas tenu d'indiquer l'alternative qu'Industrielénder entend mettre en oeuvre. Il lui sera au contraire donné le temps et l'occasion de trouver la solution qui convient le mieux à son type d'exploitation. Toutes les mesures de réaménagement devront être menées à bien par l'agriculteur et approuvées par l'administration régionale en temps utile avant la fin de la période de transition (30 juin 1996).

Des aides à la plantation seront accordées pour la création de nouveaux marécages, la plantation de forêts à feuilles caduques ou de forêts pour l'énergie. Ces aides s'ajoutent aux aides de réaménagement et seront plafonnées à 500 millions de couronnes suédoises.

Les agriculteurs se sont montrés très intéressés à tirer parti de ce soutien économique officiel. Environ 25 % des agriculteurs suédois ont en 1991 présenté des demandes d'aide de réaménagement portant sur 400.000 hectares de terres labourables (14 % du total suédois). Des accords provisoires ont éegalement été conclus pour 31.000 hectares destinés à la production d'éthanol.

Les agriculteurs participant aux programmes ont désormais cinq ans pour mener ceux-ci à bien. Cette circonstance stimulera les agriculteurs dans le choix et le développement d'alternatives compétitives par rapport à la production céréalière alimentaire.

Русские резюме

ЕВРОПЕЙСКОЕ СЕЛЬСКОЕ ХОЗЯЙСТВО КАК ПОСТАВЩИК СЫРЬЕВЫХ МАТЕРИАЛОВ И ЭНЕРГИИ ДЛЯ ПРОМЫШЛЕННОСТИ

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РЕЗЮМЕ

В этом докладе, в основу которого частично положены выводы состоявшейся в Мюнхене в сентябре 1988 года Конференции Ассамблеи "Европейское сельское хозяйство как поставщик промышленности - выход из кризиса?", содержится призыв к государствам - членам Совета Европы разработать всеобъемлющий план, позволяющий сельскому хозяйству стать крупным поставщиком промышленности возобновляемых сырьевых материалов, а также энергии в целях удовлетворения как своих собственных потребностей, так и потребностей общества в целом. Как говорится в докладе, такая переориентация (которая не должна отвлекать сельское хозяйство от выполнения своей основной функции - производства продовольствия) необходима для обеспечения будущего фермеров и сельских жителей, а также для сохранения окружающей среды. Кроме того, весьма целесообразно разработать политику в вопросах перепроизводства, квотных ограничений и забрасывания земель. Короче говоря, если в настоящее время земля используется для производства продовольствия, которое мы съесть не сможем, то на этой земле можно было бы выращивать энергетические культуры и сырьевые материалы для химической, фармацевтической, упаковочной, текстильной и других отраслей промышленности, отчего выиграли бы и фермеры и потребители.

Это, однако, потребует политической смелости, проницательности и долгосрочных финансовых обязательств со стороны директивных органов, которые должны объединить усилия фермеров, промышленности и научно-исследовательских учреждений на условиях стабильного партнерства в целях внедрения новых видов растений, продукции и процессов, а также создания необходимой инфраструктуры для транспортировки и обработки возобновляемых культур. Среди содержащихся в докладе более подробных рекомендаций можно отметить предложение об обязательном использовании биоразлагающихся, производимых в сельском хозяйстве пластмасс, а также о добавлении к бензину 3-5% биоэтанола. Поскольку различные заинтересованные стороны ожидают лишь четко выраженной позиции общества, в докладе делается следующий вывод: "Теперь нам, политикам, предстоит воспользоваться данной возможностью и изменить положение к лучшему".

ПОЛИТИКА ГЕРМАНИИ В ОБЛАСТИ ВОЗОБНОВЛЯЕМЫХ СЫРЬЕВЫХ МАТЕРИАЛОВ

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Резюме

Производство и использование сельскохозяйственной и лесной продукции для непродовольственного сектора, кратко именуемой "возобновляемые сырьевые материалы", и в этом секторе имеет давнюю историю. Во многих отраслях промышленности сельскохозяйственные сырьевые материалы были заменены продукцией, производимой в угольной и нефтехимической промышленности. С учетом изменяющейся ситуации, относящейся к сырьевым материалам, - перепроизводство сельскохозяйственной продукции, колебания уровня поставок нефти и цен на нее - все более пристальное внимание уделяется возобновляемым сырьевым материалам, не в последнюю очередь в связи с тем, что они предоставляют возможности для содействия охране окружающей среды.

В проводимой ЕС общей сельскохозяйственной политике предусматриваются, в частности, общие схемы для возобновляемых сырьевых материалов. Рыночный режим для жиров предусматривает, что промышленные потребители покупают масличные культуры, производимые в рамках ЕС, по мировым рыночным ценам. Затем им компенсируется разница между плановыми ценами, установленными ЕС, и мировыми рыночными ценами. В соответствии с нормативными положениями ЕС, касающимися сахара и крахмала, производителям некоторых видов продукции из сахара, кукурузного крахмала, пшеницы, картофеля и риса возмещаются производственные затраты. Поэтому в промышленности применяются мировые рыночные цены для сельскохозяйственных сырьевых материалов. В 1991 году вступит в силу положение, в соответствии с которым будет оказываться специальная финансовая помощь за выращивание зерновых культур в целях, не связанных с производством продовольствия, на части площадей, выведенных из сельскохозяйственного производства.

Однако действующие нормативные положения не обеспечивают достаточную конкурентоспособность возобновляемых сырьевых материалов.

Возобновляемые сырьевые материалы, значительная часть которых импортируется, составляют около 10% общего объема сырьевых материалов, используемых в химической промышленности Германии. Сырьевые материалы, в особенности крахмал и рапсовое масло, производятся в стране на площади около 170 000 га, что составляет 2,3% от общей площади сельскохозяйственных угодий. Энергетический сектор не получает развития в связи с невысокой конкурентоспособностью сырьевых материалов.

Отдельные национальные меры направлены на повышение конкурентоспособности возобновляемых сырьевых материалов. В 1991 году денежные расходы на проведение демонстрационных проектов в области НИОКР должны возрасти до примерно 75 млн. марок ФРГ. Закон об электроснабжении предусматривает более высокие выплаты за поставку электроэнергии, выработанной на основе возобновляемых источников энергии, включая биомассу. Кроме того, федеральное

правительство приступило к изучению возможностей добавления биоэтанола и биологического дизельного топлива в ископаемое топливо в рамках программы сокращения выбросов CO_2.

С учетом существующих в настоящее время низких цен на ископаемые сырьевые материалы возобновляемые сырьевые материалы не являются приемлемой альтернативой для фермеров. Им требуется оказывать значительную поддержку, которую можно будет уменьшить только после улучшения общего положения.

ВЫБОР СЕЛЬСКОХОЗЯЙСТВЕННЫХ ЗЕМЕЛЬ, ИСПОЛЬЗУЕМЫХ В НЕСЕЛЬСКОХОЗЯЙСТВЕННЫХ ЦЕЛЯХ: ВОЗМОЖНАЯ МЕТОДОЛОГИЯ, ОСНОВАННАЯ НА ЭКОНОМИЧЕСКИХ КРИТЕРИЯХ

гг. С. Сомогий, Н. Новкович, М. Иованович,
К. Каяри, В. Родич,

В глобальном масштабе 70% объема увеличения производства продовольствия достигается за счет интенсификации производства и лишь 30% - за счет роста посевных площадей. Совершенствование сочетания фиксированных факторов (полевые площади) и переменных факторов (удобрения, культивация и т.д.) обеспечивает более эффективное воздействие на рост объема производства продовольствия. В связи с этим в условиях государства или региона, ориентированного на достижение самообеспеченности, возникает естественный вопрос о том, использовать ли все сельскохозяйственные земли или же добиваться более совершенного сочетания использования высококачественных угодий с переменными факторами производства, выводя из использования низкокачественные земли и обеспечивая их консервацию.

В Югославии отмечается необходимость в дальнейшем увеличении производства продовольствия. Вместе с тем возникает ряд вопросов, связанных с проблемой использования сельскохозяйственных земель и интенсификации производства.
В данном документе излагается примерный аналитический подход к решению этой проблемы.

ИСПОЛЬЗОВАНИЕ СЕЛЬСКОХОЗЯЙСТВЕННЫХ ЗЕМЕЛЬ ФИНЛЯНДИИ В ЦЕЛЯХ, НЕ СВЯЗАННЫХ С ПРОИЗВОДСТВОМ ПРОДОВОЛЬСТВИЯ

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РЕЗЮМЕ

Помимо мер по сокращению пахотных площадей, первостепенное значение для будущего сельского хозяйства имеет поиск альтернативных видов использования избыточных сельскохозяйственных площадей. Нынешнее десятилетие станет периодом адаптации сельскохозяйственной деятельности. Уменьшение объема сельскохозяйственного производства и требования ГАТТ о сокращении значительного объема дотаций на сельскохозяйственную продукцию приведут к тому, что фермерам придется столкнуться с целым рядом проблем. В ближайшие несколько лет в доходе фермеров менее важную роль будут играть традиционные виды сельскохозяйственной продукции, в особенности молоко, яйца и зерно. При этом существуют возможности для расширения масштабов деятельности в лесном хозяйстве, "органическом" земледелии, в отраслях, связанных с использованием специальных производственных процессов, и в рамках небольших сельскохозяйственых предприятий.

В настоящее время идет непрерывная работа по выведению новых растений и сортов растений, результаты которой можно ожидать в ближайшее время. По всей видимости, новыми источниками дохода станут лен, богатые белком растения, ароматические травы и пряности, а также "органическое" земледелие. Вместе с тем, их роль в сокращении общего количества избыточных полевых площадей является незначительной. В свою очередь, применение этилового спирта в промышленности и в качестве моторного топлива открывает интересные возможности для нового использования сельскохозяйственных площадей. По оценкам, для производства планируемого объема этилового спирта требуется около 150 тыс. га сельскохозяйственных площадей. Связанные с этим проблемы касаются уровня цен, сопутствующих экспортных субсидий и сбыта белковых кормов, образующихся в качестве побочного продукта при производстве этилового спирта.

В лесном секторе имеются возможности для расширения заготовок деловой древесины. Следует поощрять ориентирование аграрного сектора на развитие лесного хозяйства и облесения с целью повышения заинтересованности фермеров в получении основного дохода от лесохозяйственной деятельности.

Использование сельскохозяйственных земель для улучшения ландшафта местности является альтернативным вариантом, который следует рассмотреть в будущем. По мере расширения деятельности по охране и рациональному использованию окружающей среды фермеры могли бы обслуживать другие секторы путем сохранения важных особенностей ландшафта и окружающей среды, например ферм, необработанных участков местности и других искусственных элементов ландшафта. Это имеет важное значение для туризма, причем такая деятельность по сохранению качества окружающей среды могла бы приносить некоторый дополнительный доход.

ПЕРСПЕКТИВЫ НОВЫХ ВИДОВ ИСПОЛЬЗОВАНИЯ СЕЛЬСКОХОЗЯЙСТВЕННЫХ ЗЕМЕЛЬ В ЦЕЛЯХ, НЕ СВЯЗАННЫХ С ПРОИЗВОДСТВОМ ПРОДОВОЛЬСТВИЯ

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РЕЗЮМЕ

Основные методы сокращения активно возделываемых сельскохозяйственных земель носят временный характер. Единственными альтернативами, носящими относительно постоянный характер, являются облесение, отказ от обработки земель в связи с некоторыми планами вывода из эксплуатации сельскохозяйственных площадей и использование земель в целях жилищного строительства и строительства дорог. Не вызывает сомнений, что поиск наиболее приемлемых решений лежит в плоскости обеспечения эксплуатации всех площадей, при которой земли могут вновь превращаться в сельскохозяйственные угодья. Активное землепользование в целях, не связанных с производством продовольствия, должно уменьшить необходимость во вмешательстве со стороны государства. Выполнение этого требования позволит обеспечить жизнеспособность и жизнедеятельность значительного количества сельскохозяйственных ферм и сельских поселков.

ЛЕСНОЕ ХОЗЯЙСТВО С КОРОТКИМ ОБОРОТОМ РУБКИ ЛЕСА АВСТРИИ КАК ФОРМА ИСПОЛЬЗОВАНИЯ СЕЛЬСКОХОЗЯЙСТВЕННЫХ ЗЕМЕЛЬ В ЦЕЛЯХ, НЕ СВЯЗАННЫХ С ПРОИЗВОДСТВОМ ПРОДОВОЛЬСТВИЯ

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РЕЗЮМЕ

В нашей аграрной политике существует общее понимание необходимости приостановки и сокращения все возрастающего перепроизводства сельскохозяйственной продукции. С другой стороны, существующая система потребления энергии истощает имеющиеся резервы и приводит к возникновению необратимых экологических изменений. Лесное хозяйство с коротким оборотом рубки леса предоставляет возможности для альтернативного использования сельскохозяйственных земель в целях, не связанных с производством продовольствия, и уменьшает остроту этих двух проблем. В настоящем документе излагаются исходная ситуация, относительное значение, производственные методы, вопросы рентабельности, положение на рынке, а также экологические аспекты использования лесного хозяйства Австрии в энергетических целях.

При современном среднем уровне приращения сухого вещества за 30-летний период в размере 8 т на 1 га в год 2,7% текущего потребления первичных энергоносителей в Австрии соответствуют 200 000 га избыточных площадей. Автор отмечает, что он хорошо знаком с методами производства, используемыми при ведении лесного хозяйства с коротким оборотом рубки леса. Основные проблемы связаны с нехваткой оборудования для лесозаготовок и методикой сушки свежей древесной щепы. В настоящее время осуществляется интересное исследование, касающееся сушки древесины в анаэробных условиях. В случае получения позитивных результатов это исследование станет важным шагом на пути к сокращению расходов и трудозатрат при лесозаготовках.

В последние несколько лет достигнут значительный прогресс в области совершенствования отопительных систем и печей с точки зрения повышения их эффективности и сокращения выбросов. Потребности национальной экономики и охраны окружающей среды также свидетельствуют о необходимости ведения лесного хозяйства с коротким оборотом рубки леса. Однако в нынешних условиях фермерам не выгодно заниматься производством лесоматериалов в энергетических целях. Ключом к решению этой проблемы является рациональная сельскохозяйственная политика. Приоритетное внимание должно уделяться производству энергии из биомассы, а не энергопроизводству на основе ископаемых видов топлива.

Необходимо ввести налог на нефть, газ и уголь и отказаться в дальнейшем от перекладывания внешних издержек, связанных с использованием таких ископаемых видов топлива на потребителей, а также установить дополнительные нормы использования электроэнергии для обогрева помещений и увеличить размеры субсидий для расширения площади лесов, используемых в энергетических целях, и строительства дополнительного числа тепловых электростанций, работающих на биомассе. Это гарантирует установление приемлемых цен на древесную щепу и обеспечит экономическую заинтересованность фермеров в ведении лесного хозяйства с коротким оборотом рубки леса.

ИСПОЛЬЗОВАНИЕ СЕЛЬСКОХОЗЯЙСТВЕННЫХ ЗЕМЕЛЬ В ЦЕЛЯХ, НЕ СВЯЗАННЫХ С ПРОИЗВОДСТВОМ ПРОДОВОЛЬСТВИЯ

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РЕЗЮМЕ

Советский Союз располагает исключительно большими земельными ресурсами, в том числе для производства сельскохозяйственной продукции, продовольствия. На душу населения приходится 2,1 га сельскохозяйственных угодий. Наблюдается абсолютное уменьшение площади сельскохозяйственных угодий, составив 4,0 млн. га за 1970-1989 годы. За этот период площадь сельскохозяйственных угодий на душу населения снизилась с 2,5 га до 2,1 га, а площади пашни - с 0,93 до 0,79 га.

СССР располагает достаточными замельными ресурсами не только для обеспечения населения страны продовольствием, по научно обоснованным нормам потребления, но и для его экспорта.

Однако изъятие сельскохозяйственных угодий в целях, связанных со строительством промышленных предприятий, гидротехнических сооружений, горных предприятий (без должной затем их рекультивации), развития городов, усложняет решение продовольственной проблемы в стране, особенно в отдельных ее регионах. Социально-экономически неоправданным является отвод плодородных земель под указанные и другие объекты. Это особенно касается таких малоземельных районов, как Средняя Азия, Северный Кавказ, Закавказье.

К тому же ситуация резко ухудшилась в связи с аварией на Чернобыльской АЭС, в результате которой произошел выброс значительного количества радиоактивных веществ. Площадь земель с плотностью загрязнения от 5 и более кюри составляет 2,8 млн. га. Если учесть загрязнение с уровнями от 1 до 5 кюри, то эта площадь значительно возрастет. Из оборота выведена часть сельскохозяйственных угодий, прекращено лесопользование на отдельных лесных территориях.

Программами ликвидации последствий Чернобыльской аварии предусмотрены меры, обеспечивающие, прежде всего, охрану здоровья населения, приведение агропромышленного производства в соответствие с требованиями выращивания экологически чистой продукции.

Продолжаются обследования по выявлению и уточнению радиоактивного загрязнения на территории Российской Федерации, Украинской ССР и Белорусской ССР. Вместе с тем есть необходимость в обследовании новых территорий, в частности, Белгородской, Липецкой, Воронежской, Тамбовской областей РСФСР, Винницкой, Ровенской областей Украины, части Минской области Белоруссии и др.

Подлежат переселению жители десятков, а то и сотен поселений, подвергшихся радиоактивному заражению. Это значит, что дополнительно выпадут из сельскохозяйственного оборота значительные площади плодородных земель.

ИСПОЛЬЗОВАНИЕ СЕЛЬСКОХОЗЯЙСТВЕННЫХ ЗЕМЕЛЬ В ВЕНГРИИ В ЦЕЛЯХ, НЕ СВЯЗАННЫХ С ПРОИЗВОДСТВОМ ПРОДОВОЛЬСТВИЯ

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РЕЗЮМЕ

По сравнению с промышленно развитыми странами Европы сельское хозяйство играет в Венгрии более важную роль. Доля сельскохозяйственных и продовольственных продуктов составляет 20-23% в общем объеме национального экспорта, и, помимо сельского хозяйства, только туризм может обеспечить поступление иностранной валюты. Среди всех активных работников, получающих заработную плату, 12% непосредственно заняты в сельскохозяйственном производстве, 4% - в пищевой промышленности и около 6% - в сфере несельскохозяйственной деятельности, осуществляемой на крупных фермах (коммерческая деятельность, обслуживание, промышленная и другие виды деятельности). В отличие от других бывших "социалистических" стран Восточной Европы рынок продовольствия в Венгрии на протяжении ряда лет неизменно характеризуется избыточным производством продукции. Однако до недавнего времени устранение избыточных объемов сельскохозяйственной продукции обеспечивалось с помощью внешней торговли и других видов вмешательства. При таких обстоятельствах сельскохозяйственные земли использовались до настоящего времени в целях, не связанных с производством продовольствия, лишь эпизодически для проведения экспериментальных и научных исследований.

Положение коренным образом изменилось в конце 1990 года и в 1991 году, когда у производителей остались невостребованными значительные объемы продовольственной продукции.

В исследовании авторов затрагиваются следующие вопросы:

- сокращение площадей, используемых в сельскохозяйственных целях;
- облесение;
- охота, заповедники для охоты на дичь;
- производство лекарственных трав;
- туризм, включая сельский туризм;
- содействие развитию несельскохозяйственных видов деятельности в фермерских хозяйствах.

ИСПОЛЬЗОВАНИЕ СЕЛЬСКОХОЗЯЙСТВЕННЫХ ЗЕМЕЛЬ НИДЕРЛАНДОВ В ЦЕЛЯХ, НЕ СВЯЗАННЫХ С ПРОИЗВОДСТВОМ ПРОДОВОЛЬСТВИЯ

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РЕЗЮМЕ

a) Определяемая проблема

Производительная способность сельскохозяйственных земель в рамках ЕС является слишком высокой для традиционного положения на рынке и становится с каждым годом все выше и выше. Эти изменения происходят и в Нидерландах как государстве-члене. Возможность использовать такие избыточные производительные мощности заключается в выращивании сельскохозяйственных культур для рынка промышленных сырьевых материалов. Возможными альтернативными вариантами ограничению таких избыточных производительных способностей являются схемы сокращения посевных площадей и использование земель в несельскохозяйственных целях, например для сохранения природных ландшафтов, отдыха на открытом воздухе и лесного хозяйства.

b) Площадь сельскохозяйственных угодий в Нидерландах

Общая площадь обрабатываемых земель в Нидерландах составляет примерно 2 млн. га, или 1,6% общей площади в рамках ЕС. Характерной особенностью сложившейся в Голландии ситуации является нехватка земель для жилищного строительства, отдыха, ведения промышленной деятельности, природных ландшафтов и т.д. Это привело к изменениям в использовании земель и, в результате, к повышению цен на землю. После 1950 года общая площадь обрабатываемых земель уменьшилась на 10%.

c) Возобновляемые сырьевые материалы и источники энергии

Многие виды сельскохозяйственной продукции, выращиваемой в Нидерландах, можно использовать в качестве возобновляемых сырьевых материалов в промышленных целях. Основными видами сельскохозяйственной продукции является картофель, зерновые, масличный рапс и лен. Общая площадь под этими культурами, выращиваемыми в целях, не связанных с производством продовольствия, уменьшилась за последние 15 лет на 25% и составляет 73 000 га.

Правительственные организации, торговля и промышленность стремятся обеспечить выращивание новых сельскохозяйственных культур и создать условия для новых видов их использования. В долгосрочной перспективе необходимо обеспечить выращивание и переработку этих сельскохозяйственных культур без государственных дотаций.

Сельскохозяйственные исследования и исследования проблем сбыта в этой области обеспечиваются с помощью государственных субсидий.

Правительство намерено также оказывать помощь при проведении исследований, осуществляемых торговлей и промышленностью. Государственные субсидии предоставляются также отдельным фермерам с целью осуществления соответствующих опытно-конструкторских разработок. Ожидается, что широкомасштабное применение результатов этих исследований станет возможным лишь через 10 лет.

Выращиваемые сельскохозяйственные культуры, рассматриваемые в качестве источников энергии, пока еще не могут конкурировать с ископаемыми видами топлива. Решение вопроса о том, является ли экономически выгодным добавление растительных присадок в ископаемые виды топлива, зависит от рыночных факторов и, возможно, от ужесточения норм по охране окружающей среды. Следует ожидать, что в будущем будут происходить дальнейшие изменения в этой области.

d) <u>Схемы сокращения посевных площадей</u>

В целях сокращения посевных площадей Нидерландами выплачиваются наиболее высокие возможные субсидии: 700 ЭКЮ (1 854 гульденов Нидерландов). В связи с падением цен на сельскохозяйственные культуры эти схемы становятся весьма привлекательными для фермеров. К настоящему времени заявления о сокращении посевных площадей охватывают 14 000 га сельскохозяйственных угодий. Это составляет примерно 4% общей площади, рассматриваемой в рамках данной схемы.

e) <u>Природа</u>

Природные ландшафты Нидерландов, на которых осуществляется возделывание сельскохозяйственных культур, включают весьма ценные природные элементы. Этим природным элементам может быть нанесен ущерб в результате применения современных методов ведения сельского хозяйства. Разработана схема, в рамках которой фермеры, вносящие соответствующие изменения в применяемые методы ведения сельского хозяйства, могут получать государственные субсидии, предназначенные для компенсации возможных потерь в доходах. Ежегодные размеры субсидий колеблются в пределах от 270 до 1 500 гульденов на 1 га земель. Эта схема применяется для участков пахотных земель площадью 100 000 га. Было завершено составление планов землепользования для сельскохозяйственных земель площадью 50 000 га, и в настоящее время вступили в силу соглашения между правительством и отдельными фермерами об использовании сельскохозяйственных земель площадью 13 000 га.

Участки площадью более 100 000 га включают природные элементы, рациональное использование которых уже не может обеспечиваться отдельными фермерами. Эти участки могут продаваться правительству отдельными фермерами на добровольной основе. В настоящее время 8 500 га земель превращены в природные охраняемые территории.

f) <u>Ландшафты</u>

Правительство определило 66 районов, в которых фермеры могут вступать в соглашения с правительством с целью сохранения характерных элементов ландшафта, находящихся на территории их фермерских хозяйств. Такими элементами являются живые изгороди, полезащитные полосы, водоемы, пруды и отдельные деревья. В зависимости от вида и количества таких элементов ежегодный размер субсидии может колебаться от 500 до 2 500 гульденов для каждого фермерского хозяйства.

В рамках этой схемы получены удовлетворительные результаты.

g) Отдых на открытом воздухе

Лишь в редких случаях пахотные земли Нидерландов отводятся для целей, предусматривающих использование значительных пространств, например, для игры в гольф. Наиболее часто фермеры содержат кемпинги (вместимостью до 10 человек) и продают сельскохозяйственные продукты путешественникам и туристам с целью увеличения своего дохода. Благоприятными для такой деятельности являются районы, наиболее часто посещаемые туристами. В некоторых таких районах отдых на открытом воздухе создает условия для значительного увеличения доходов фермеров.

В настоящее время более 1 100 фермеров зарегистрировано в качестве фермеров, являющихся владельцами кемпингов.

h) Лесное хозяйство

Нидерланды не могут обеспечить внутренний спрос на древесину. Поэтому фермерам выделяются субсидии на выращивание быстрорастущих деревьев на сельскохозяйственных землях. Такая субсидия представляет собой единовременное пособие в размере 3 000 гульденов. После 20 лет деревья могут вырубаться и земля использоваться в сельскохозяйственных целях. Эта субсидия выделяется для участков площадью 15 000 га. После падения цен на возделываемые сельскохозяйственные культуры площадь, занятая быстрорастущими лесами, превысила 3 000 га.

i) Взаимосвязь между различными формами землепользования

Борьба между альтернативными формами землепользования характеризуется острой конкуренцией. В связи с высокой плотностью населения в Нидерландах ощущается нехватка земель, и в результате цены на землю являются высокими. Цены на землю оказывают негативное воздействие на необходимое расширение сельскохозяйственного сектора.

В настоящее время невозможно предсказать, каким образом будет развиваться земельный рынок Голландии. Однако не вызывает никаких сомнений тот факт, что с национальной точки зрения спрос на землю и ее предложение носят сбалансированный характер.

ОБЛЕСЕНИЕ КАК АЛЬТЕРНАТИВНЫЙ ВАРИАНТ ИСПОЛЬЗОВАНИЯ СЕЛЬСКОХОЗЯЙСТВЕННЫХ ЗЕМЕЛЬ В ЦЕЛЯХ, НЕ СВЯЗАННЫХ С ПРОИЗВОДСТВОМ ПРОДОВОЛЬСТВИЯ

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РЕЗЮМЕ

Облесение сельскохозяйственных земель издавна практикуется в Австрии и находит широкую поддержку у общественности. Практика облесения регулируется законодательством, и облесение может выступать в качестве одной из форм экстенсивного землепользования при условии выполнения землепользователем некоторых специальных сопутствующих требований.

В настоящем докладе кратко излагаются имевшие место изменения в новых видах облесения, интересы государства и отдельных лиц, юридические требования, вопросы, относящиеся к поддержке со стороны общественности, экономические аспекты и причины облесения сельскохозяйственных земель.

ПРОИЗВОДСТВЕННОЕ ИСПОЛЬЗОВАНИЕ РАЙОНОВ, НАХОДЯЩИХСЯ ПОД ЭКОЛОГИЧЕСКОЙ УГРОЗОЙ, ДЛЯ ПРОИЗВОДСТВА НЕПРОДОВОЛЬСТВЕННЫХ ТОВАРОВ

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РЕЗЮМЕ

Преобразование экономической структуры Польши, в том числе введение рыночной экономики и либеральная политика по отношению к импорту привела к возникновению относительного излишка продовольственных товаров. Следовательно, появилась возможность альтернативного использования земельных угодий, расположенных на плохих почвах, в трудных географических условиях и прежде всего в экологически опасных районах. Наиболее индустриальным и одновременно самым экологически опасным регионом в Польше является Верхнесилезский Промышленный Округ. Загрязнение этого региона пылевыми и газовыми осадками, в частности тяжелыми металлами, указывает на необходимость ликвидации сельскохозяйственно их использования. Рекомендуется, чтобы существующая структура сельскохозяйственнго производства постепенно превращалась в сторону несельскохозяйственного и непродовольственного использования. Земельные угодия городской зоны, наиболее пострадавшие в экологическом отношении, должны быть преобразованы в парки и рощи и точки по выращиванию цветов и питомники, а постоянные земельные угодия следует использовать для выращивания ивняка. Менее экологически пострадавшая городская зона должна изменить профиль производства на непродовольственный, следовательно - садоводство, выращивание рапса для производства технического масла и волокнистых растений. В зоне с уменьшенными прямыми осадками, но со значительным загрязнением почвы и грунтовых вод рекомендуется непродовольственное производство, а также производство семян и промышленных растений. Преобразование структуры земельных угодий связано с большими капиталовложениями, которые должны финансироваться главным образом из региональных фондов экологического преобразования. Сельскохозяйственным производителям следует смягчить экономические потери путем финансовой компенсации в виде экологической ренты.

ИНФОРМАЦИЯ О СОСТОЯНИИ И НАМЕРЕНИЯХ ИСПОЛЬЗОВАНИЯ СЕЛЬСКОХОЗЯЙСТВЕННОЙ ЗЕМЛИ ДЛЯ НЕПРОДОВОЛЬСТВЕННЫХ ЦЕЛЕЙ В ЧСФР

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РЕЗЮМЕ

В настойщее время использование сельскохозяйственных земель для непродовольственных целей было не очень значительно и скорее исходило из традиционной структуры сельскохозяйственного производства в ЧСФР. Это обстоятельство было связано с тем фактором, что основным приоритетом развития чехословацкого сельского хозяйства в условиях централь-но планируемой экономики было обеспечение полного покрытия потребностей страны в продовольствии умеренного пояса. Значительная доля использования сельскохозяйственных земель для непродовольственных целей была до сих пор связана с получением возобновимых источников сырья и с налаживанием режима ведения хозяйства,учитывающего частично влияние антропогенных и экологических факторов, включая защиту природы, что в определенной мере касается более 50 % сельскохозяйственных земель.

Настоящий трудный период перехода чехословацкой экономики к рыночному хозяйству характеризован программой приватизации, либерализации цен и макроэкономической регуляции. Значительное ограничение связанное с понижением платежеспособного спроса населения приводит к выразительному избытку сельскохозяйственной продукции(I5-25%) и необходимости принципиальных перемен в структуре сельскохозяйственного производства и использовании сельскохозяйственных земель.

Продукция непродовольственной биомассы будет представлять в ближайщем будущем желательную часть новой стратегии решения избытка сельскохозяйственной продукции или положительного влияния на экологическую ситуацию. Перспективное альтернативное использование сельскохозяйственных земель для продукции биомассы для энергетических целей и промышленное использование будет в ЧСФР в значительной мере связано с развитием выращивания рапса(с приблизительно 3% в настоящее время до I0 % посевных площадей) и помимо этого с выращиванием льна. Размер выращивания табака, целебных растений, продуктов овощеводства и садоводства и т.п. не будет даже в будущем представлять слишком высокую долю сельскохозяйственного земельного фонда(около 0,I % каждый). В ближайший период можно предполагать существенное расширение использования сельскохозяйственных земель для деятельностей связанных с проведением свободного времени. Существуют также официальные программы, значительно поддерживающие развитие нетрадиционного сельского хозяйства.

В связи с сокращением дотаций в сельское хозяйство проводится выделение т.н.маргинальных почв, что лимитирует социальное и экономическое развитие всего региона. Большое применение найдет экстенсификация сельскохозяйственного производства и облесение маргинальных почв.

Основной предпоссылкой осуществления приведенных намерений использования сельскохозяйственных земель для непродовольственных целей является как можно быстрее составление полной аграрной программы, подчеркивая выделение долговременных и приоритетных целей и соответствующих этому инструментов.

ИСПОЛЬЗОВАНИЕ ПАХОТНЫХ ЗЕМЕЛЬ В ШВЕЦИИ ДЛЯ ЦЕЛЕЙ, НЕ СВЯЗАННЫХ С ПРОИЗВОДСТВОМ ПРОДУКТОВ ПИТАНИЯ

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Обзор

В апреле 1990 г. правительство Швеции представило в парламент страны законопроект о существенном изменении направления сельскохозяйственной политики. Предложенные новые принципы были приняты парламентом в июне 1990 г. Реформа, которая начала проводиться в жизнь 1 июля 1991 г., рассчитана на пять лет, в течение которых будет изменена система производства сельскохозяйственной продукции и сделан переход к условиям чисто рыночной экономики. Это означает, что будут отменены регулируемые внутренние цены и другие виды вмешательства в рыночную экономику, а также экспортные субсидии.

В течение переходного пятилетнего периода будет практиковаться стимулирование интересов фермеров путем прямых выплат, предназначенных для быстрого и перманентного перехода от производства продуктов питания к другим видам производства на избыточных пахотных землях. Будут также выделены средства на обучение и консультативные цели. Парламент констатирует, что принятые меры для перехода к новой системе создают хорошие предпосылки для изменения использования прибл. 500000 гектаров пахотных земель. Это составляет около 20% площади всех пахотных земель в Швеции. Те фермеры, которые в 1990 г. возделывают сельскохозяйственные культуры для продажи по регулируемым ценам, имеют возможность в 1991 г. получить переходные субсидии (в среднем 9000 шведских крон на гектар). Такие субсидии могут быть получены для принятия активных мер по перманентному изменению использования земли в течение переходного периода, т. е. для перехода от производства продуктов питания к другим видам деятельности. Фермеры могут также присоединиться к этой программе в 1992 г. (6000 крон на гектар) или в 1993 г. (4000 крон на гектар).

В нижеприведенных примерах выполняются условия перманентного изменения использования земли в соответствии с поставленными требованиями для получения субсидии: лесонасаждения, посадка быстрорастущего леса для получения топлива, обводнение земель, выращивание топливных и промышленных культур по контракту, выращивание специализированных культур, строительство оздоровительных зон и превращение пахотных земель в обширные пастбища. Наиболее частыми альтернативами будут, вероятно, лесонасаждения и выращивание топливного леса, превращение пахотных земель в пастбища и выращивание культур для производства этилового спирта.

Для получения такой субсидии фермер не должен указывать, какую именно альтернативу он намерен претворить в жизнь. Ему предоставляется время и возможность выбора такого решения, которое наилучшим образом подходит для его фермы. Все намеченные им мероприятия должны быть осуществлены и одобрены Коммунальным Административным Советом заблаговременно до истечения переходного периода (30 июня 1996 г.).

Субсидии за лесонасаждения будут выплачиваться за обводнение земель, выращивание лиственных лесов, а также лесов для производства топлива. Эти субсидии являются дополнением к переходным субсидиям. Общая стоимость не должна превышать 500 млн. шведских крон.

Фермеры выразили несомненный интерес к правительственной программе экономической помощи. В 1991 г. около 25% шведских фермеров подали заявки на субсидии в размере, соответствующем 400000 гектаров пахотных земель (14% от общей площади пахотных земель в Швеции). Кроме этого, были заключены временные соглашения по специальной программе производства этилового спирта в размере, соответствующем 31000 гектаров.

Фермеры, участвующие в указанных программах, должны осуществить все необходимые меры в течение пяти лет. Это является стимулирующим фактором для выбора и внедрения таких решений, которые могут конкурировать с выращиванием зерновых культур.

DEUTSCHE ZUSAMMENFASSUNGEN

DIE EUROPÄISCHE LANDWIRTSCHAFT ALS LIEFERANT VON ENERGIE UND ROHSTOFFEN FÜR DIE INDUSTRIE

S. Lanner, Straßburg

Der Bericht, erstellt auf Grund eines Teiles der Schlußfolgerungen der Ratskonferenz "Europäische Landwirtschaft als Industrielieferant - Ein Weg aus der Krise?" vom September 1988 in München, appelliert an alle Mitgliedsländer des Europarates, einen umfassenden Plan zu entwickeln, der es der Landwirtschaft ermöglicht, ein bedeutender Lieferant von erneuerbaren Rohstoffen für die Industrie als auch von Energie zu werden, sowohl für ihren eigenen Nutzen als auch für den der gesamten Gesellschaft. Diese Neuorientierung (welche aber nichts an der Hauptfunktion der Landwirtschaft als Nahrungsmittelversorger ändert) ist notwendig, wird argumentiert, um die Zukunft der Bauern und der ländlichen Gesellschaft zu sichern und im Interesse des Umweltschutzes. Sie ist auch der gegenwertigen Politik der Überproduktion, der Quotenbeschränkungen und der Bodenstillegung vorzuziehen. Wenn Land, auf welchem derzeit Nahrung erzeugt wird, die niemand essen kann, statt dessen für Energiepflanzen und Rohmaterialien für die chemische, pharmazeutische, Verpackungs-, Textil- und andere Industrien verwendet wird, so dient dies dem Bauern und dem Konsumenten.

Zuoberst erfordert dies aber auf der Seite der Politiker Mut, Visionen und langfristige finanzielle Bindungen, die Landwirte, Industrie und Forschungseinrichtungen in einer dauerhaften Partnerschaft zusammenbringen; dabei sollen sowohl neue Pflanzen, Produkte und Prozesse entwickelt als auch die notwendige Infrastruktur für den Transport und die Verarbeitung nachwachsender Rohstoffe aufgebaut werden. Unter den detaillierten Empfehlungen in dem Bericht ist die Forderung nach der obligatorischen Verwendung von biologisch abbaubaren, landwirtschaftlich erzeugten Plastikmaterialien und die Beimischung von 3 % bis 5 % Bioethanol zum Benzin hervorzuheben. Allerdings halten sowohl die Landwirte als auch Industrie und Wissenschaft eine gesetzliche Regelung, die diese neuen Entwicklungen fördert, für unumgänglich; der Bericht schließt mit dem Satz: "Nun ist es an uns Politikern, die Gelegenheit zu ergreifen und die Dinge zum Besseren zu wenden".

DIE DEUTSCHE POLITIK BEI NACHWACHSENDEN ROHSTOFFEN - NEUERE ENTWICKLUNGEN

H. Meyer zu Drewer und *R. Seehuber*, Bonn

Die Produktion und ~~die~~ Verwendung land- und forstwirtschaftlicher Erzeugnisse für bzw. im Nichtnahrungsbereich - kurz mit dem Schlagwort nachwachsende Rohstoffe bezeichnet - ~~hat~~ eine lange Tradition. Die Agrarrohstoffe wurden jedoch in vielen Bereichen der Industrie und des Gewerbes von Produkten aus der Kohle- und Erdölchemie verdrängt. Angesichts einer veränderten Rohstofflage - Überschuß an Agrarprodukten, Versorgungs- und Preisschwankungen bei Erdöl - finden nachwachsende Rohstoffe nicht zuletzt wegen ihres möglichen Beitrages zum Umweltschutz verstärkt Beachtung.

Zu den Rahmenbedingungen nachwachsender Rohstoffe zählt vor allem die gemeinsame Agrarpolitik der EG. Die Marktordnung Fette stellt sicher, daß der industrielle Verbraucher auch die innerhalb der EG produzierten Ölsaaten zu Weltmarktpreisen erhält. Die EG erstattet ihm die Differenz zwischen einem von ihr festgesetzten Richtpreis und dem jeweils ermittelten Weltmarktpreis. Die EG-Zucker- und Stärkeregelung gewährt den Herstellern von bestimmten Erzeugnissen aus Zucker, Mais-, Weizen-, Kartoffel- und Reisstärke eine Produktionserstattung. Somit gelten im industriellen Bereich Weltmarktpreise für die agrarischen Rohstoffe. Eine Regelung, die eine Sonderbeihilfe für den Anbau von Getreide für Nichtnahrungszwecke auf einem Teil der stillgelegten Flächen vorsieht, tritt 1991 in Kraft.

Die bisherigen Regelungen reichen aber nicht aus, um nachwachsende Rohstoffe ausreichend konkurrenzfähig zu machen.

Nachwachsende Rohstoffe, von denen ein bedeutender Teil importiert wird, machen rund 10 % am Rohstoffeinsatz der deutschen chemischen Industrie aus. Heimische Rohstoffe - vor allem Stärke und Rapsöl - werden auf ~~rd. 170.000 ha oder~~ 2,3 % der Ackerfläche produziert, (Gebietsstand vor Oktober 1990). Der Energiesektor ist aufgrund der ungünstigen Wettbewerbssituation nicht erschlossen.

Einzelne nationale Maßnahmen zielen auf die Verbesserung der Wettbewerbsstellung nachwachsender Rohstoffe. Der finanzielle Aufwand für FuE- sowie Demonstrationsvorhaben soll auf ca. 69 Mill. DM 1991 steigen. Ein Stromeinspeisungsgesetz ermöglicht eine bessere Vergütung für die Einspeisung von Strom aus regenerativen Energieträgern einschließlich Biomasse. Ferner läßt die Bundesregierung die Möglichkeiten einer Beimischung von Bioethanol und Biodiesel zu fossilen Kraftstoffen im Rahmen eines CO_2-Minderungsprogramms prüfen.

Nachwachsende Rohstoffe sind bei den derzeit niedrigen Preisen fossiler Rohstoffe keine ausreichende Alternative für den Landwirt. Ihr Stützungsbedarf ist erheblich und kann erst mit verbesserten Rahmenbedingungen abgebaut werden.

AUSWAHL VON LANDWIRTSCHAFTLICHEN BÖDEN ZUR VERWENDUNG FÜR NICHT-LANDWIRTSCHAFTLICHE ZWECKE: EINE MÖGLICHE METHODE BASIEREND AUF ÖKONOMISCHEN KRITERIEN

S. Somogyi, N. Novković, M. Jovanović, K. Kajari, V. Rodić,
Novi Sad

Jugoslawien hält man zu Recht für ein Land mit geringer Bodenausstattung. Nur 16 % von fast 10 Millionen ha Ackerland sind staatliches Eigentum (Gesellschaftseigentum); 20 % besitzen die Vollerwerbsbauern, während der Rest den Haushalten, den Nebenerwerbsbauern und den gemischten Haushalten gehört. Die Dualität der Eigentumsstruktur hatte eine besonders negative Wirkung auf die Nahrungsversorgung und auf den Bodenschutz.

Erst seit kurzem wird dem Umweltschutz und den Problemen der Landwirtschaft, besonders aber dem des Bodens entsprechende Bedeutung gegeben. Die Probleme, die man in den nächsten Jahren lösen muß, sind folgende:

- Die meisten Weiden mit niedriger Ertragsfähigkeit bedürfen der Bodenverbesserungen, Erosionsschutzmaßnahmen und in manchen Fällen der Aufforstung.
- Unfruchtbarer Berg- und Gebirgsboden soll ebenfalls bewaldet werden.
- Etwa 5 Millionen ha besonders saurer Ackerflächen müssen gekalkt werden.
- Einige Teile der Provinz Vojvodina brauchen Schutz vor Versalzung.
- In vielen Teilen Jugoslawiens sind Erosionsschutzmaßnahmen nötig.
- Kleine, durch Hecken abgesonderte Farmen (salasi genannt), die früher weit über das Flachland verteilt waren, sind heute fast verschwunden; statt diesen sollten Windschutzstreifen als Barrieren vor der Winderosion wirken.
- Wegen der Konzentration auf die staatlichen Farmen wurde die Viehzucht zur umweltbelastenden Technologie, während die Verwendung der früheren Weiden eine offene Frage geblieben

ist. Auf der anderen Seite wird die Erhaltung der organischen Substanz auf dem Ackerland von immer größerer Bedeutung.

Andererseits ist, wie Analysen gezeigt haben, die jugoslawische Import- und Exportbilanz in den letzten 15 Jahren negativ. Darum ist das Problem sehr komplex; die Produktion sollte steigen, damit genug Nahrung erzeugt wird. Gleichzeitig öffnen sich die "Scheren" durch die Preispolitik zu Ungunsten des landwirtschaftlichen Sektors, d.h. die Relation von Ertrags- und Aufwandspreisen ist ungünstig. Die Frage der Produktionsintensivierung ist sehr schwierig und bedarf einer Verbesserung in der Kombination der festen und variablen Produktionsfaktoren.

Das Problem der Transformation landwirtschaftlichen Bodens in nicht-landwirtschaftlichen Boden ist nicht nur eine Frage von ökologischer und wirtschaftlicher Bedeutung. Es ist vor allem eine strategische Frage, da jede Nationalökonomie die Tendenz zur ausreichenden Selbstversorgung mit Nahrungsmitteln zeigt.

Der Ausgangspunkt im Modell, das zur Bestimmung der potentiellen "Überschüsse" an landwirtschaftlichem Boden verwendet wird, ist die Forderung nach bestimmten Mengen bestimmter Bodenerzeugnisse. Langfristig werden die jährlichen Mengen dieser bestimmten Bodenerzeugnisse berechnet, sodaß eine ausreichende inländische Versorgung mit Nahrung gesichert ist und auch gute Ausfuhrchancen berücksichtigt werden. Aufgrund dieser Voraussetzungen wird ein allgemeines strategisches Modell formuliert, nach welchem die potentiellen "Überschüsse" landwirtschaftlicher Bodenkapazitäten nach den Bodenqualitäten berechnet werden können.

NICHT-NAHRUNGSMITTELNUTZUNG LANDWIRTSCHAFTLICHEN BODENS IN FINNLAND

R.M. Niemi, Helsinki

Neben Maßnahmen zur Verringerung der Ackerfläche ~~ist~~ die Forschung auf dem Gebiet alternativer Verwendungsmöglichkeiten für Überschußflächen von größter Bedeutung für die Zukunft der Landwirtschaft. Dieses Jahrzehnt wird eine Zeit der Anpassung für die Landwirtschaft sein. Die Verringerung der landwirtschaftlichen Produktion und der Druck, den GATT ausübt, um eine Reduzierung des Agrarschutzniveaus zu erreichen, wird die ländlichen Gemeinden mit zunehmenden Schwierigkeiten konfrontieren. Traditionelle Landwirtschaft, speziell Milch, Eier und Getreide, ~~wird~~ zum Einkommen der Bauern in den nächsten Jahren nur noch wenig ~~beitragen. Es~~ gibt Wachstumsmöglichkeiten in der Forstwirtschaft, im biologischen Landbau, bei speziellen Erzeugungsverfahren und in anderen kleinen ländlichen Gewerben.

Neue Pflanzen und Pflanzensorten werden ständig entwickelt; wichtige Ergebnisse sind in nächster Zukunft zu erwarten. Flachs, Eiweißpflanzen, Gewürze und andere Pflanzen sowie biologischer Landbau werden voraussichtlich neue Einkommensquellen ~~darstellen.~~ Ihre Bedeutung für die Verringerung der Überschußflächen ist allerdings nur geringfügig. Die Verwendung von Äthanol als Industrie- und Motorentreibstoff stellt hingegen eine interessante Alternative der Ackernutzung dar. Es wird geschätzt, daß 150.000 ha für die vorgesehene Menge Äthanol benötigt werden. Schwierigkeiten gibt es noch bei den Preisen und bei der Vermarktung des Eiweißfutters als Beiprodukt der Äthanolerzeugung.

In der Forstwirtschaft bestehen Möglichkeiten der Ausweitung von Durchforstungen. Das Interesse der Landwirte an einem Haupteinkommen aus der Forstwirtschaft sollte gefördert werden.

Die Nutzung des Bodens zur Landschaftsgestaltung ist eine in Zukunft vermehrt zu beachtende Alternative. Mit der Entwicklung von Umweltschutz und -management in ländlichen Regionen kann die Landwirtschaft an der Erhaltung wichtiger Landschaften und an der Umweltgestaltung mitwirken, und zwar sowohl als ganzer Betrieb als auch über Brachflächen und andere Flurteile. Dies ist wichtig für den Tourismus und kann zusätzliches Einkommen bringen.

DIE AUSSICHTEN FÜR NEUE NUTZUNGSARTEN LANDWIRTSCHAFTLICHEN BODENS FÜR NICHT-NAHRUNGSMITTEL

I. Vainio-Mattila, Helsinki

Die wichtigsten Lösungen für eine zeitweise Verringerung landwirtschaftlich genutzter Flächen sind zeitlich begrenzt. Nur die Aufforstung, die Nutzungsaufgabe in Verbindung mit bestimmten Ruhensbestimmungen und die Verwendung von Land für den Siedlungs- und Straßenbau sind mehr oder weniger dauerhafte Alternativen. Es ist sicher empfehlenswert, Lösungen zu suchen, bei welchen kein Land brach liegt und leicht der Landwirtschaft zurückgegeben werden kann. Aktive Landnutzung für Nicht- Nahrungsprodukte könnte die Notwendigkeit von staatlichen Maßnahmen verringern. Wird diese Anforderung erfüllt, wird es möglich sein, mehr landwirtschaftliche Betriebe am Leben und ländliche Gemeinden lebensfähig zu erhalten.

ENERGIEHOLZANBAU IN ÖSTERREICH ~~-~~ EINE ALTERNATIVE BODENNUTZUNGSFORM ZUR HERKÖMMLICHEN LANDWIRTSCHAFT

G. Pelzmann, Graz

Dieser Artikel beschreibt die Ausgangssituation, die relative Bedeutung, Produktionstechniken, ~~die~~ Rentabilität, ~~die Situation am~~ Markt und ökologische Aspekte des Energieholzanbaus ~~in Österreich~~.

In der derzeitigen Agrarpolitik besteht Einigkeit darüber, daß die immer noch steigende Überproduktion von Getreide, Fleisch und Milchprodukten gestoppt und abgebaut werden muß.

Gleichzeitig zeigt sich, daß durch die derzeitige Form der Energienutzung Reserven aufgebraucht und irreversible ökologische Schäden angerichtet werden.

Eine Möglichkeit einer alternativen landwirtschaftlichen Flächennutzung zur Minderung beider Probleme ist die Produktion von Holzbiomasse im Kurzumtrieb zur Energiegewinnung.

Bei einem geschätzten durchschnittlichen Gesamtzuwachs in 30 Jahren von 8 ~~Tonnen~~ Trockensubstanz pro ~~Hektar~~ und Jahr könnten auf 200.000 ha Überschußproduktionsfläche 2,7 % des heutigen Primärenergiebedarfs durch Holzbiomasse aus Kurzumtriebsflächen bestritten werden. Aus Forschungsprojekten sind bereits ausreichend Ergebnisse vorhanden, um eine Produktionstechnik zum Energieholzanbau anbieten zu können.

Technische Probleme gibt es noch bei geeigneten Erntemaschinen und der Trocknung von im frischen Zustand gehacktem Holz. ~~Zur Zeit~~ läuft ein ~~vielversprechender~~ Versuch zur Trocknung von feuchten Hackschnitzeln ohne Fremdenergiezufuhr. Ist dieser Versuch erfolgreich, wäre das ein weiterer wichtiger Schritt zur Kostenreduktion bei der Energieholzernte. Auch erfolgte in den letzten Jahren eine Weiterentwicklung der Verbrennungstechnik. Die heute am Markt angebotenen Hackschnitzelheizungen haben hohe Wirkungsgrade und geringe Emissionswerte.

Obwohl die Anlage von Energieholzflächen volkswirtschaftlich und ökologisch sinnvoll ist und seit 1986 vom Bundesministerium für Land- und Forstwirtschaft gefördert wird, stagniert der Energieholzanbau in Österreich und befindet sich nach 10 Jahren noch immer im Versuchsstadium.

Der Hemmschuh für einen verstärkten Energieholzanbau liegt in der politischen Dimension.

Die Energieerzeugung aus Biomasse muß gegenüber den nicht erneuerbaren, fossilen Energieträgern klare Priorität erhalten. Durch die Besteuerung von Öl, Gas oder Kohle (Energieabgabe), - ein Teil der bisher externalisierten Kosten muß aufgerechnet werden - durch ordnungspolitische Maßnahmen bei der Nutzung von Strom für Heizzwecke, durch eine höhere finanzielle Förderung bei der Anlage von Energieholzflächen und bei der Errichtung von Biomasseheizwerken wäre dieses Ziel erreichbar.

VERWENDUNG LANDWIRTSCHAFTLICHEN BODENS FÜR NICHT-NAHRUNGSZWECKE

A.B. Soskiev, Moskau

Die Sowjetunion verfügt über ~~außergewöhnlich~~ große ~~Land~~reserven, darunter auch für die landwirtschaftliche und Nahrungsmittelerzeugung. Pro Kopf der Bevölkerung beträgt die landwirtschaftliche Nutzfläche 2,1 ha. Die gesamte Landwirtschaftsfläche nimmt absolut ab, und zwar von 1970 bis 1989 um etwa 4 Mill. ha. In dieser Zeit verringerte sich die landwirtschaftliche Nutzfläche von 2,5 ha auf 2,1 ha und das Ackerland von 0,93 ha auf 0,79 ha pro Kopf.

Die USSR verfügt nicht nur über ausreichende Landreserven zur Ernährung der Bevölkerung entsprechend wissenschaftlich basierten Verbrauchsnormen, sondern auch für den Nahrungsmittelexport.

Trotz allem machen es die Verwendung landwirtschaftlichen Bodens für Industriegelände und Elektrizitätswerke, für Bergbau (ohne ordentliche Rekultivierung danach) und Stadtentwicklung besonders in einigen Regionen schwieriger, das Nahrungsproblem zu lösen. Die Widmung fruchtbaren Bodens für diese und andere Zwecke ist ökonomisch und gesellschaftlich nicht zu rechtfertigen. Dies gilt speziell für Regionen, die weniger gut mit kultivierbarem Land ausgestattet sind, wie das sowjetische Zentralasien, der Nordkaukasus und Transkaukasien.

Die Situation hat sich nach dem Unfall im Kernkraftwerk Chernobyl, als beträchtliche Mengen radioaktiver Substanzen freigesetzt wurden, wesentlich verschlimmert, und dies auf 2,8 Mill. ha Land mit einer radioaktiven Belastung von 5 Ci/km² oder mehr; diese Fläche wird wesentlich größer, wenn man die Gebiete im Bereich zwischen 1 und 5 Ci/km² einbezieht. Ein Teil des landwirtschaftlichen Bodens wurde aus der Nutzung genommen, und die forstliche Nutzung wurde in einzelnen Forstgebieten eingestellt.

Die Programme, die sich mit den Folgeerscheinungen des Unfalles von Chernobyl befassen, sehen vor allem Maßnahmen zur Sicherung der allgemeinen Gesundheit und die Anpassung der agrarindustriellen Produktion der ökologisch rückstandsfreien Produkte vor.

Untersuchungen zur Feststellung und Quantifizierung radioaktiver Kontamination werden in der Russischen Föderation, in der Ukraine und in Weißrußland fortgesetzt. Es besteht die Notwendigkeit, weitere Gebiete zu untersuchen, und zwar die Regionen von Belgorod, Lipesk, Woronesh und Tambov in Rußland, die Regionen Vinnitsa und Rovno in der Ukraine und Teile der Region Minsk in Weißrußland.

Die Einwohner von Dutzenden, wenn nicht sogar Hunderten Siedlungen, die von der radioaktiven Verschmutzung betroffen sind, müssen umgesiedelt werden. Dies bedeutet, daß weitere bedeutende Flächen fruchtbaren Landes der landwirtschaftlichen Nutzung entzogen werden.

NUTZUNG VON LANDWIRTSCHAFTLICHEN FLÄCHEN FÜR ZWECKE DER NICHTNAHRUNGSMITTELPRODUKTION IN UNGARN

L. Csete und *L. Dorgai*, Budapest

die Landwirtschaft noch

Die Rolle der Landwirtschaft in Ungarn hat ~~eine~~ größere Bedeutung als in anderen industrialisierten europäischen Ländern, da die Produkte der Landwirtschaft und der Lebensmittelindu-

ökonomische

strie etwa 20-23 % der Gesamtausfuhr des Landes ausmachen. Die Landwirtschaft und der Fremdenverkehr ergeben ein Außenhandelsaktivum in Dollar-Verrechnung. 12 % der aktiven Erwerbstätigen sind unmittelbar in der landwirtschaftlichen Produktion beschäftigt, 4 % in der Lebensmittelindustrie und etwa 6 % in nichtlandwirtschaftlichen Tätigkeiten der landwirtschaftlichen Großbetriebe (Handels-, Industrie-, Dienstleistungstätigkeiten usw.). Abweichend von den übrigen ost-europäischen ~~ehemals "sozialistischen"~~ Ländern ist seit mehreren Jahren eine dauernde Überversorgung auf den Nahrungsmittelmärkten vorhanden; das Überangebot wurde jedoch bis in die letzte Zeit durch den Außenhandel und andere Interventionen abgeleitet. Unter solchen Umständen hat sich die Nutzung von landwirtschaftlichem Boden für Zwecke der Nicht-Nahrungsmittelproduktion bis jetzt nur fallweise für Experimente und Forschung ergeben.

Die Lage hat sich Ende 1990 und im Jahre 1991 völlig verändert, als es bei den Produzenten zu unverkaufbaren Mengen von Nahrungsmitteln kam.

Die Arbeit der Autoren berührt folgende Problemkreise:

- Übersicht über die Reduzierung der landwirtschaftlich genutzten Flächen;
- Erweiterung der Aufforstung;
- Jagd, Wildbewirtschaftung; die
- Produktion von Heilpflanzen;
- Fremdenverkehr (einschließlich dörflicher Tourismus);
- Förderung der nichtlandwirtschaftlichen Tätigkeiten in den landwirtschaftlichen Betrieben.

NUTZUNG LANDWIRTSCHAFTLICHEN BODENS FÜR NICHT-NAHRUNGSZWECKE IN DEN NIEDERLANDEN

J.Th.C. de Jong, G.G. van Leeuwen, H.R. Oosterveld und *J. de Vos*, Den Haag

a) Problembeschreibung

Die Produktionskapazität der landwirtschaftlichen Flächen in der EG ist für die traditionelle Marktsituation zu groß und wird von Jahr zu Jahr größer. Die Niederlande als Mitgliedsland sind Teil dieser Entwicklung. Eine Möglichkeit, diese Überproduktionskapazität zu nutzen, ist die Erzeugung von Produkten für den industriellen Rohstoffmarkt. Mögliche Alternativen sind Flächenstillegungsprogramme und die Verwendung des Bodens für nichtlandwirtschaftliche Zwecke.

b) Landwirtschaftliche Fläche der Niederlande

Die gesamte Kulturfläche der Niederlande beträgt etwa 2 Mill. ha~~, das sind~~ 1,6 % der EG. Ein charakteristisches Bild der ~~hol~~ländischen Situation ist die Knappheit an Boden für Erholung, Industrie, Naturausstattung, Besiedlung usw. Dies hat zu Veränderungen in der ~~Land~~nutzung und als Folge davon zu höheren Bodenpreisen geführt. Seit 1950 hat die Kulturfläche um 10 % abgenommen.

c) Erneuerbare Rohstoffe

Viele der in den Niederlanden erzeugten Pflanzen sind als Rohstoffe für industrielle Zwecke verwendbar. Die wichtigsten sind Kartoffeln, Getreide, Raps und Flachs. Die Gesamtfläche dieser Pflanzen für Nicht-Nahrungszwecke ist in den letzten 15 Jahren um 25 % auf 73.000 ha zurückgegangen.

Regierung, Handel und Industrie haben auch den Anbau anderer Pflanzen erwogen. Auf längere Sicht sollte die Erzeugung und Verarbeitung dieser Produkte ohne öffentliche Stützungen möglich sein.

Landwirtschaftliche und Marktforschung auf diesem Gebiet werden durch staatliche Unterstützung gefördert. Der Staat ist auch bereit, die Forschung im Handels- und Industriesektor zu unterstützen.

Nachwachsende Rohstoffe als Energiequelle sind derzeit mit fossilen Treibstoffen nicht wettbewerbsfähig. Ob der Zusatz pflanzlicher Additive zu den fossilen Treibstoffen rentabel ist oder nicht, hängt von den Marktkräften und von möglichen strengeren Umweltnormen ab.

d) Flächenstillegungsprogramme

Für Flächenstillegungsprogramme zahlen die Niederlande die höchstmöglichen Beihilfen: 700 ECU/ha (Dfl. 1.854,-). Die Preisrückgänge für Feldpflanzen haben dieses Programm für die Landwirte sehr attraktiv gemacht. Bisher wurden Anträge für 14.000 ha für die Stillegung gestellt. Das sind etwa 4 % des dafür vorgesehenen Gebietes.

e) Biotope

Die landwirtschaftlich kultivierten Flächen der Niederlande sind von hervorragender Qualität. Diese Qualität wird durch moderne landwirtschaftliche Bewirtschaftungsmethoden gefährdet. Ein Programm ermöglicht es Landwirten, die ihre Bewirtschaftungsmethoden anpassen, Beihilfen als Ersatz für dadurch eingetretene Ernteverluste zu erlangen. Die Beihilfen betragen zwischen Dfl. 270,- und Dfl. 1.500,-/ha/Jahr. Im Programm sind bis zu 100.000 ha Ackerland vorgesehen. Für 50.000 ha wurden Bewirtschaftungspläne fertiggestellt, und für 13.000 ha Fläche ~~wurden~~ Bewirtschaftungsverträge zwischen der Verwaltung und einzelnen Landwirten abgeschlossen.

Flächen von über 100.000 ha enthalten Naturwerte, die eine weitere Bewirtschaftung durch einzelne Betriebe nicht mehr zulassen. Dieses Land kann von den Betrieben freiwillig an den Staat verkauft werden. ~~Zur~~ Bis Zeit wurden 8.500 ha in Naturreservate umgewandelt.

f) Landschaftsausstattung

ferner

Die Regierung hat 66 Gebiete festgelegt, in welchen Landwirte mit der Regierung Verträge zur Erhaltung charakteristischer Landschaftselemente auf ihren Betrieben abschließen können. Solche Elemente sind Hecken, Schilfgürtel, Teiche, Tümpel und Einzelbäume. Je nach Art und Anzahl dieser Elemente betragen die Beihilfen zwischen Dfl. 500,- und Dfl. 2.500,- je Betrieb und Jahr. Das Programm ist zufriedenstellend.

g) Erholung

Die Verwendung landwirtschaftlichen Bodens für großflächige Aktivitäten wie z.B. Golf sind in den Niederlanden eine Ausnahme. Gebräuchlicher ist das Angebot von Campingmöglichkeiten (bis maximal 10 Plätzen) und der Verkauf von Farmprodukten an Tagesausflügler und Touristen zur Aufbesserung des Einkommens.

Über 1.100 Betriebe sind als sogenannte Camping-Farmer registriert.

h) Forstwirtschaft

Die Niederlande können ihren Holzbedarf nicht selbst decken. Deshalb sind Beihilfen für Farmer erhältlich, die schnellwüchsige Hölzer auf landwirtschaftlichem Boden pflanzen. Die Beihilfe ist eine Gesamtbeihilfe von Dfl. 3.000,-. Nach 20 Jahren können die Bäume gefällt, das Land kann wieder landwirtschaftlich genutzt werden. Beihilfen sind für 15.000 ha vorgesehen. Seit dem Preisrückgang für Ackerpflanzen ist der Umfang schnellwüchsiger Hölzer auf über 3.000 ha angestiegen.

i) Wechselwirkung zwischen den verschiedenen Formen der Landnutzung

Es besteht ein scharfer Wettbewerb zwischen den alternativen Formen der Landnutzung. Entsprechend ihrer hohen Bevölkerungsdichte haben die Niederlande einen Mangel an Land und daraus resultierend hohe Bodenpreise. Die Bodenpreise haben eine negative Auswirkung auf die notwendige Erweiterung im Sektor Landwirtschaft.

Derzeit ist es nicht möglich anzugeben, wie sich der niederländische Bodenmarkt entwickeln wird. Es ist aus der nationalen Sicht aber ein Faktum, daß sich Angebot und Nachfrage an Boden die Waage halten.

AUFFORSTUNG ALS EINE ALTERNATIVE DER NICHT-NAHRUNGSVERWENDUNG VON LANDWIRTSCHAFTLICHEM BODEN

E. Unteregger, Graz

Aufforstung von landwirtschaftlichem Boden hat in Österreich eine lange Tradition und wird öffentlich gefördert. Sie ist gesetzlich geregelt und kann für extensive Flächen eine Nutzungsmöglichkeit sein, wenn der Eigentümer einige spezielle Umstände beachtet.

Im Bericht werden die historische Entwicklung der neuen Aufforstungen, das öffentliche und individuelle Interesse, die gesetzlichen Bedingungen, öffentliche Unterstützung, ökonomische Aspekte und Gründe für die Aufforstung von landwirtschaftlichen Flächen kurz beschrieben.

VERWENDUNG LANDWIRTSCHAFTLICHEN BODENS FÜR NICHT-NAHRUNGSZWECKE IN ÖSTERREICH

H. Pirringer, Wien

Der technische und züchterische Fortschritt, die Verbesserung in der Produktionstechnik führte zu einer beachtlichen Ertragssteigerung, sodaß nicht nur volle Bedarfsdeckung bei den Hauptnahrungsmitteln erreicht wurde, sondern auch gewaltige Überschüsse produziert wurden. Die Verminderung der Überschußproduktion ist ein Hauptproblem der heimischen Landwirtschaft, da es immer schwieriger wird, Absatzmärkte zu finden. In den nächsten Jahren ist die Herausnahme von 200.000 bis 300.000 ha Getreideanbaufläche dringend erforderlich.

Vor diesem Hintergrund gewinnt im Bereich der landwirtschaftlichen Bodenproduktion der Anbau nachwachsender Rohsoffe zur Produktion von Grundstoffen des Nichtnahrungs- und Energiesektors zunehmendes Interesse. In Österreich wird beispielsweise seit 1988 durch gezielte Förderungsmaßnahmen versucht, den Flachsanbau auszuweiten. Derzeit werden rund 500 ha Faserflachs angebaut. Weiters werden Bioenergie-Projekte gefördert. Auf Grund der positiven Forschungsergebnisse bei der Verwendung von RME (Rapsmethylester) als Substitutionskraftstoff für Dieselöl kam es zur Errichtung einer kommerziellen Anlage mit rund 12.000 t RME Jahreskapazität und mehrerer Kleinanlagen mit Kapazitäten von 500 bis 2.000 t/Jahr. Eine Großanlage und weitere Kleinanlagen sind im Planungsstadium. Die Biomasseproduktion mit raschwachsenden Holzarten (Energieholzanbau) umfaßt derzeit eine Fläche von rund 600 ha. Ein seit vielen Jahren diskutiertes Projekt, nämlich die Beimischung von Bioethanol zum Vergasertreibstoff, soll nun realisiert werden. Die Anlage zur Errrichtung von 100.000 Tonnen Ethanol soll 1993 in Betrieb gehen. Eine weitere Alternative zur herkömmlichen Agrarproduktion ist die Verwertung planzlicher Öle und Fette als Grundstoff für die oleochemische und Schmierstoffindustrie, wo sich die Wirtschaftlichkeit eher erreichen läßt als am Treibstoffsektor. Auch die Nachfrage nach Rohstoffen aus zucker- und stärkehaltigen Pflanzen ist im Steigen begriffen.

Die Förderung von Grünbrachefläcben hat das Ziel, landwirtschaftlich genutzte Flächen vorübergehend aus der Ackernutzung auszugliedern. 1990 gab es 14.660 ha Grünbrachefläche. Durch die Errichtung von Sport- (z.B. Golf-, Reitanlagen) und Freizeitanlagen werden ebenfalls Flächen aus der Nahrungsmittelproduktion herausgenommen.

BEITRAG DER AGRARSTRUKTURELLEN BODENORDNUNG ZUR BEREITSTELLUNG UND ENTWICKLUNG VON FLÄCHEN ZU NICHT-NAHRUNGSZWECKEN UND ZUR ENTFLECHTUNG VON FLÄCHENNUTZUNGSKONFLIKTEN

K.-F. Thöne, Bonn

1. Rahmenbedingungen

Die eingeleitete Reform des europäischen Agrarmarktes, gekennzeichnet durch eine Marktentlastung von Überschußprodukten und das Erkennen der ökologischen Grenzen einer intensiven Landbewirtschaftung, hat schon heute Auswirkungen auf die Gestaltung der Flächennutzung und die Wirtschaftskraft ländlicher Räume in der Bundesrepublik Deutschland und in Europa.

Hinzu kommen Ansprüche der Gesellschaft, landwirtschaftliche Flächen in Verkehrs-, Siedlungs- oder Erholungsraum umzuwidmen und Flächen für den Natur- und Umweltschutz aus der landwirtschaftlichen Nutzung zu nehmen.

Die agrarstrukturelle Bodenordnung (Flurbereinigung) hat sich dabei als Instrument zur Gestaltung einer geordneten Flächennutzung und zur Konfliktlösung bei entgegenstehenden Nutzungsansprüchen bewährt. Die sie bestimmenden Zielvorgaben bestehen insbesondere

- in Programmen zur Extensivierung und Umwidmung der Landnutzung (EG-Programme, deren nationale Umsetzung, Programme der Bundesländer sowie regionale und sektorale Programme);
- in der Umwidmung von Flächen für die Produktion nachwachsender Rohstoffe (chemisch-technischer und energetischer Bereich);
- in der Umwidmung von Flächen für infrastrukturelle Maßnahmen (Verkehr, Bebauung, Freizeit und Erholung).

2. Ordnungsbedarf für die Flächennutzung

Die Verwendung und Ordnung der aus der Landwirtschaft herausgenommenen oder in der Nutzung umgewidmeten Flächen ist eine raumordnungs-, umweltpolitische Frage, der aber wegen der sozio-strukturellen Komponente eine hohe agrarpolitische Bedeutung zukommt. Der Ordnungsbedarf ergibt sich aus dem Schutz der Eigentumsrechte. Bodenordnende Maßnahmen sind immer dann erforderlich, wenn die Nutzungsrechte der Eigentümer an der Fläche mit Agrar-, Umwelt- und Raumordnungsbelangen in Konflikt geraten und einer Entflechtung bedürfen. Bodenordnungsmaßnahmen werden überall dort in Europa als geeignetes Instrument der Neugestaltung angesehen, wo aus der landwirtschaftlichen Produktion genommene Flächen einer neuen Nutzung zugeführt werden müssen. Derartige Flächen lassen sich in ihrer zufälligen bisherigen Lage nur bedingt für andere Zwecke nutzen, da eine zielgerichtete Verwendung bestimmter Lagen, Formen, Größen, Erschließung und Nachbarschaftsverhältnisse bedarf.

3. Instrumente zur Neugestaltung der Flächennutzung

Nationale Instrumente zur Neugestaltung der Flächennutzung sind die agrarstrukturelle Vorplanung und Neuordnungsverfahren nach dem Flurbereinigungsgesetz. In der großräumig angelegten agrarstrukturellen Vorplanung werden die raumbedeutsamen Belange in ihrem Bestand erfaßt sowie Notwendigkeit, Dringlichkeit und Zweckmäßigkeit von geeigneten Bodenordnungsmaßnahmen vorgeschlagen. In den Bodenordnungsverfahren nach dem Flurbereinigungsgesetz wird auf der Grundlage einer interdisziplinären Bestandsaufnahme und Bewertung ein Flächennutzungskonzept für die ökonomisch und ökologisch sinnvolle Nutzung im Verfahrensgebiet planerisch erarbeitet und anschließend in der Fläche auch umgesetzt. Die Neugestaltung des Verfahrensgebietes (Schlaggrößen landwirtschaftlicher Flächen, Erschließung durch Wege und Gewässer, Boden- und Gewässerschutz, Naturschutz- und Landschaftspflege) wird auf die anzustrebende Landnutzung abgestimmt. Die erforderlichen ökologischen und ökonomischen Entwicklungsmaßnahmen werden durchgeführt und die Anlagen an einen geeigneten Träger übergeben.

Da in der Flurbereinigung dauerhafte Lösungen angestrebt werden, bieten sich insbesondere bei langfristig angelegten Vorhaben (dauerhafte Stillegung, Umwidmung von Flächen für die Produktion nachwachsender Rohstoffe und für den Arten-, Biotop- und Wasserschutz, Aufforstung und Maßnahmen der Infra- und Wirtschaftsstruktur) wirkungsvolle Möglichkeiten des Vollzugs oder der Unterstützung an. Die Flurbereinigung sichert die Existenzgrundlagen einer bäuerlich geprägten Landwirtschaft und trägt zur Konfliktlösung bei entgegengesetzten Nutzungsansprüchen von Landwirtschaft, Natur- und Umweltschutz und Infrastruktur bei, wenn Eigentum und Nutzung der Flächen dauerhaft neu zu regeln sind und ein integrales Entwicklungskonzept im Verbund mit anderen Zielen verwirklicht werden soll.

PRODUKTIVE NUTZUNG ÖKOLOGISCH BEDROHTER GEBIETE FÜR NICHT-NAHRUNGSZWECKE

E. Otolinski und *W. Musiał*, Krakau

Die Umstrukturierung der polnischen Wirtschaft, die Einführung der Marktwirtschaft und die liberale Importpolitik hat zu einem relativen Überschuß an Nahrungsmitteln geführt. Dadurch hat sich die Möglichkeit ergeben, die sehr schlechten Böden in schwierigen Lagen, vor allem in ökologisch bedrohten Gebieten, jetzt alternativ zu nutzen.

In Polen gehört zu den oben genannten Gebieten vor allem das Oberschlesische Industriegebiet. Die Vergiftung dieser Gebiete durch Abgase und Staub und speziell die Verseuchung durch Schwermetalle macht die Einschränkung der landwirtschaftlichen Nutzung notwendig. Die ökologisch degradierten landwirtschaftlichen Nutzflächen, die im Stadtumland liegen, sollen in folgende Richtungen genutzt werden: als Waldfläche, Parkanlagen, Zierpflanzenbau, Baumschulen, Korbweiden. In weiteren Zonen können Kulturen für Nichtnahrungszwecke gebaut werden, wie Zierpflanzen, Raps für technische Öle und Faserpflanzen. In den weit von der Stadt entfernten Gebieten, die durch die Luft wenig verschmutzt werden, aber wo die Böden und Grundwässer bedeutend verseucht sind, sollte man landwirtschaftliche Produktionen für Nichtnahrungszwecke entwickeln, aber auch Industriepflanzen und Saatgut erzeugen.

Die Umstrukturierung der Bodenverhältnisse ist mit hohem Aufwand verbunden, der im wesentlichen aus den regionalen Fonds zur ökologischen Wiederherstellung finanziert werden sollte. Die Landwirte sollen für ihre wirtschaftlichen Verluste in Form einer ökologischen Rente finanziell entschädigt werden.

RAPSÖL ALS EIN ALTERNATIVTREIBSTOFF

P. Martykán, Prag

Pflanzliche Öle und Fette finden auch als Grundstoffe zur Erzeugung von Ökodiesel, von umweltfreundlichen Schmierölen und -fetten sowie hydraulischen Ölen Verwendung. Vorteilhaft ist vor allem deren leichte biologische Abbaubarkeit und ein wesentlich kleinerer Gehalt an Schadstoffen. Ökologisch günstig wirkt der geschlossene CO_2-Kreislauf, was eine Senkung des Treibhauseffektes zur Folge hat. Nicht zu übersehen sind die positiven Wirkungen der tiefwachsenden Wurzelmasse von Raps (Bodenlockerung, Nährstoffverwertung und Nitratauswaschung ins Grundwasser).

Raps wird für die Erzeugung von Speiseölen und -fetten auf etwa 2 % der gesamten Ackerfläche der CSFR angebaut. Die Naturalerträge sind im Durchschnitt 2,8 t/ha. Das entspricht einem Output von 360.000 t Rapssaat pro Jahr. Damit ist der gesamte Rapsölbedarf für Nahrungszwecke in der CSFR gedeckt. Die Rapsanbaufläche könnte von diesen 2 % bis auf 12 % für die Produktion von Biomasse ausgeweitet werden.

Für die Verwendung von Raps als Energieträger bzw. für die Wirtschaftlichkeit der Ölgewinnung aus Rapssaat ist es zunächst wichtig, die Naturalerträge zu stabilisieren und die Produktion völlig auf 00-Sorten (ohne Glucosinolat) umzustellen, um eine bessere Haltbarkeit des Rapskuchenschrots zu erreichen.

In Betracht kommt die Verbrennung von chemisch unbehandeltem Rapsöl im Elsbett-Dieselmotor, was aber mit ökonomischen Nachteilen verknüpft ist (hoher Ankaufspreis des neuen Motors). Ein gangbarer Weg ist die Umesterung von Rapsöl zu Diesel-Alternativtreibstoff. Der aus Rapsöl erzeugte Treibstoff wird für den Antrieb der herkömmlichen Dieselmotoren verwendet. Der durch Umesterung des Rapsöles gewonnene Raps-Methyl-Ester (RME) kann also ohne Veränderung am Motor als Ersatz für aus Mineralöl gewonnenen Dieseltreibstoff dienen. Im Produktionsprozeß, wo als Inputs Methanol und ein alkalischer Katalysator verwendet werden, fallen neben RME noch Rapskuchenschrot und Glyzerin an. Der anfallende Ölkuchen ist ein hochwertiges Eiweißfutter für die Schweine-, Rinder- und Geflügelfütterung.

Für die tschechoslovakischen Bedingungen kommen eher die mittleren oder kleinen Anlagen zur Herstellung von Treibstoff aus Raps in Frage. Bei den gegenwärtigen Preis- und Kostenrelationen, sogar unter Berücksichtigung der ziemlich hohen Mineralölbesteuerung in der CSFR, schneidet Bio-Diesel im Vergleich zu herkömmlichen Mineralprodukten nicht wesentlich besser ab.

Die Herstellung von Treibstoff aus Raps stellt eine Alternative dar, die es ermöglicht, wenigstens teilweise unabhängig von Mineralölimporten und ökosozial zu sein. Die umweltfreundlichen Produkte aus pflanzlichen Ölen und Fetten werden sicherlich ihren Platz in der tschechoslovakischen Wirtschaft finden.

INFORMATION ÜBER DEN STAND UND DIE ZUKÜNFTIGE ENTWICKLUNG DER BODENNUTZUNG FÜR NICHT-NAHRUNGSZWECKE

M. Svatoš, Prag

Der bisherige Umfang der Bodennutzung für nicht-nahrungsmittelwirtschaftliche (NNMW) Zwecke war nicht groß und wurde eher durch die traditionelle Struktur der landwirtschaftlichen Produktion in der ČSFR bestimmt. Diese Tatsache hängt mit dem Faktum zusammen, daß unter den Bedingungen der zentral geplanten Ökonomik als Grundpriorität der weiteren Entwicklung der tschechoslowakischen Landwirtschaft die Erreichung der Selbstversorgung in der Produktion der Nahrungsmittel bestimmt wurde. Der größte Anteil an der Bodennutzung für NNMW-Zwecke wurde verbunden mit der Gewinnung regenerierbarer Rohstoffe und mit der Anpassung der landwirtschaftlichen Bewirtschaftungssysteme an die Notwendigkeiten humaner und ökologischer Faktoren einschließlich des Naturschutzes. Mehr als 50 % der landwirtschaftlichen Nutzfläche werden dadurch betroffen.

Die derzeitige schwierige Periode des Überganges zur Marktwirtschaft ist durch die Programme der Privatisierung, Preisliberalisierung und makroökonomischen Regulierung charakterisiert. Eine starke Restriktionspolitik, verbunden mit der Senkung der einkommensbedingten Nachfrage, führten zu einem bedeutenden Überschuß an landwirtschaftlichen Produkten (15 bis 25 %) und zu nötigen grundsätzlichen Änderungen in der Struktur der landwirtschaftlichen Produktion sowie in der Bodennutzung.

Die Produktion der NNMW-Biomasse stellt in der nächsten Zukunft einen Teil der neuen Strategie zur Lösung des landwirtschaftlichen Produktionsüberschusses und der positiven Beeinflussung der ökologischen Situation dar. Die zukünftige alternative Nutzung des Bodens zur Produktion von Biomasse für energetische Zwecke und zur industriellen Verwendung wird in der ČSFR wesentlich mit der Entwicklung der Rapsproduktion (von derzeit ca. 3 % auf 10 % der Ackerfläche) und mit der Flachsproduktion zusammenhängen. Der Umfang des Tabakanbaues von Heilpflanzen, gärtnerischen Produkten u.ä. wird auch in Zukunft keinen größeren Anteil an der Nutzung des Bodens darstellen (ca. á 0,1 %).

In sehr kurzer Zeit rechnet man mit der Verbreitung der Nutzung der landwirtschaftlichen Flächen für Aktivitäten, die mit der Freizeit zusammenhängen. Es existieren auch offizielle Programme zur Unterstützung der Entwicklung der unkonventionellen Landwirtschaft. Im Zusammenhang mit der Senkung der Subventionen für die Landwirtschaft wurden Gebiete mit sog. marginalen Böden abgegrenzt, wodurch die weitere soziale und wirtschaftliche Entwicklung der ganzen Regionen limitiert wird. Deswegen wird eine weitere Extensivierung der Landwirtschaft und die Aufforstung der marginalen Böden die Folge sein.

Die Grundbedingung für die Realisierung der vorgenannten beabsichtigten Bodennutzung für NNMW-Zwecke ist jedoch die umgehende Erstellung eines allgemeinen Agrarprogrammes, in dem die Hauptzielrichtungen sowie die dazugehörigen Instrumentarien festgelegt sind.

EG-POLITIK ZUR MARKTORIENTIERUNG (BODENSTILLEGUNG) - IHRE ANWENDUNG IN DER BUNDESREPUBLIK DEUTSCHLAND

M. König, Bonn

Die Lage auf den meisten EG-Agrarmärkten ist durch Überkapazitäten gekennzeichnet. Mit den Beschlüssen des Europäischen Rates vom Februar 1988 wurde versucht, den Überschußproblemen zu begegnen. Diese Beschlüsse beinhalten u.a. auch eine Maßnahme zur Flächenstillegung, die EG-weit (Ausnahme Portugal) Anwendung findet.

Landwirte, die sich freiwillig an der Maßnahme beteiligen, müssen mindestens 20 % der während eines Bezugzeitraumes mit Marktordnungsprodukten bestellten Ackerfläche für die Dauer von 5 Jahren stillegen. Dabei kann die Fläche brachgelegt (Dauerbrache oder Rotationsbrache), aufgeforstet, in extensiv zu nutzendes Grünland umgewandelt oder zu nichtlandwirtschaftlichen Zwecken genutzt werden.

Je nach Stillegungsart müssen die Landwirte in der Bundesrepublik Deutschland bestimmte Auflagen einhalten, u.a. müssen z.B. bei der Brachlegung die Flächen begrünt werden, es dürfen keine Dünge- und Pflanzenschutzmittel angewendet werden, und der Aufwuchs muß auf der Fläche verbleiben.

Die jährliche Beihilfe, die der Landwirt für die Nichtproduktion erhält, orientiert sich am entgangenen Einkommen und beträgt in Abhängigkeit von der Bodenqualität bis zu 1.416 DM je Hektar.

In der Bundesrepublik Deutschland (alt) wird das EG-Flächenstillegungsprogramm seit 1988 angeboten. Bisher wurden 312.000 ha aus der Produktion genommen; das entspricht einem Anteil von 4,3 % der Ackerfläche.

Im vergangenen Jahr wurde auch in den fünf neuen Bundesländern eine zunächst auf 1 Jahr befristete Flächenstillegungsmaßnahme angeboten. Die Bestimmungen entsprachen, mit einigen Ausnahmen, im wesentlichen den EG-Bestimmungen. Die Beihilfe betrug in Abhängigkeit von der Bodenqualität bis zu 750 DM/ha. In den neuen Bundesländern wurden 600.000 ha (= 12,8 % der Ackerfläche) stillgelegt.

In der gesamten EG liegen zum jetzigen Zeitpunkt rd. 990.000 ha still; nicht berücksichtigt sind hierbei die stillgelegten Flächen in den neuen Bundesländern.

In der Bundesrepublik Deutschland werden ab dem Wirtschaftsjahr 1991/92 für das gesamte Bundesgebiet einheitliche Beträge für die Flächenstillegung gelten. Erstmals wird dann den Landwirten auch gestattet sein, auf bis zu 50 % der stillgelegten Flächen Getreide für Nichtnahrungsmittel-Zwecke anzubauen.

Zur Zeit wird im Rahmen der Preisverhandlungen in Brüssel ein Vorschlag der EG-Kommission diskutiert, zusätzlich zu dem dargestellten fünfjährigen Flächenstillegungsprogramm ein einjähriges Sonder-Flächenstillegungsprogramm im Wirtschaftsjahr 1991/92 einzuführen. Der Vorschlag sieht vor, daß Landwirte, die 15 % ihrer mit Marktordnungsprodukten bestellten Flächen für die Dauer von einem Jahr stillegen, eine Beihilfe erhalten und außerdem von der Mitverantwortungsabgabe befreit werden. Die Beihilfehöhe bei diesem einjährigen Programm wird so zu gestalten sein, daß beide Flächenstillegungsprogramme eine etwa gleich hohe Attraktivität aufweisen.

DIE VERWENDUNG LANDWIRTSCHAFTLICHEN BODENS FÜR NICHT-NAHRUNGS-ZWECKE IN ITALIEN

G. Barbero und *A. Zezza*, Rom

Der erste Teil des Berichtes bringt eine Analyse der Motive, die das steigende Interesse an einer landwirtschaftlichen Bodenveränderung in Richtung Nicht-Nahrungsnutzung unterstützen. Erstens geht es um die Folgen der "Krise der traditionellen Agrarpolitik" sowohl hinsichtlich der Überschußanhäufung und Budgetkosten als auch hinsichtlich der mit den höchst intensiven Produktionsverfahren verbundenen Umweltschäden. Bemühungen um eine Neuorientierung der Agrarpolitik verbleiben aber innerhalb der "Landwirtschaftsideologie" (und "Nahrungsmittelkultur"). Zweitens handelt es sich um den gesellschaftlichen Aspekt, nämlich um den "wachsenden Bedarf an Land und ländlichen Diensten" in Industriegesellschaften, charakterisiert durch hohe Bevölkerungsdichten, hohe Pro-Kopf-Einkommen und Bedrohungen durch Umweltverschlechterungen und zunehmende regionale Disparitäten.

Der zweite Teil ruft Italien's Außenhandelsbilanz erneuerbare Güter betreffend in Erinnerung und beschreibt den derzeitigen Stand der Politik der Programme und Erfolge in bezug auf Nicht-Nahrungsverwendung von landwirtschaftlichem Boden. Schwergewicht wird auf vier Punkte gelegt: (a) Wald und Holzprodukte, andere geeignete Arten für eine Reihe von Verwendungen; (b) Anwendung des EG-Bodenstillegungsprogrammes; (c) geschützte Gebiete verschiedener Art; (d) Agrotourismus.

Die Forstflächen haben sich im letzten Jahrzehnt merklich ausgeweitet; man hat ihre Bedeutung für den Schutz und die Wasserbewirtschaftung speziell Italiens erkannt. Zusätzlich zur Pappel wurden andere geeignete Arten für die Kurzrotationen in Betracht gezogen. Versuche zur Entwicklung oder Anpassung an örtliche Bedingungen oder Kultivierungen zur industriellen Verwendung in der Textil-, Energie-, Öl-, Essenzenproduktion wurden durchgeführt. Derzeit scheint der meistversprechendte Versuch der mit Sorghum zu sein, vor allem im Süden.

Das EG-Bodenstillegungsprogramm von 1990 umfaßt mehr als 20.000 Betriebe (mit durchschnittlich 13 ha je Betrieb) und eine Gesamtfläche von 266.000 ha; die meisten Betriebe liegen in Zentral- und Süditalien. Die überwiegenden Bestimmungen waren Dauerbrache, Fruchtfolgebrache und Extensivweide.

Die gesamte Schutzfläche beträgt in Italien 2,2 Mill. ha (7,4 % der Staatsfläche) und besteht aus National- und Regionalparks, Naturreservaten und Feuchtgebieten von internationaler Bedeutung. Weitere 10.000 ha werden von "Grünorganisationen" und von Universitäten betrieben. Weitere Entwicklungen werden erwartet und das Umweltministerium schätzt, daß sich die gesamte Schutzfläche auf 10 % der Nationalfläche ausdehnen werde. Zusätzlich bestehen bereits 3.500 Tierreservate, die sich auf eine Fläche von etwa 2,5 Mill. ha ausdehnen.

Die Entwicklung des Agrotourismus geht auf die 60er Jahre zurück und hatte in den beiden Regionen Trient-Südtirol und in der Toskana begonnen. Nun sind mehrere Regionen damit beschäftigt, es wurden spezielle Regionalgesetze erlassen. Allerdings ist die finanzielle Unterstützung dafür nach wie vor sehr gering, verglichen mit den Anreizen für landwirtschaftliche Aktivitäten; die Hilfe ist in Regionen mit einer schlechten landwirtschaftlichen Basis relativ höher.

NICHT-NAHRUNGSNUTZUNG VON LANDWIRTSCHAFTLICHEM BODEN IN SCHWEDEN

E. Brasch, Jönköping

Im April 1990 hat die schwedische Regierung einen Gesetzesantrag an das Parlament übermittelt, der eine radikale Änderung der Agrarpolitik vorschlug. Die vorgeschlagenen neuen Prinzipien wurden vom Parlament im Juni 1990 angenommen. Die Reform wird am 1. Juli 1991 beginnen und wird nach einer 5-Jahres-Periode der Anpassung der Produktion und dem Übergang auf die Bedingungen eines unregulierten Marktes abgeschlossen sein. Dies beinhaltet die Eliminierung sowohl der festgesetzten internen Preise und der Marktinterventionen als auch der Exportstützungen.

Während der 5-jährigen Übergangsperiode werden die Farmer durch Direktzahlungen zu einer schnellen und dauernden Anpassung der Produktion von Nahrungsmitteln zu anderen Formen der Produktion auf überflüssigem Ackerland angeregt. Investitionen wird es auch im Unterrichts- und Beratungswesen geben. Das Parlament hat festgelegt, daß die Übergangs- und Anpassungsmaßnahmen gute Voraussetzungen für eine veränderte Verwendung von etwa 500.000 ha Ackerland ermöglichen. Das sind etwa 20 % des Ackerlandes Schwedens. Farmer, die 1990 preisregulierte Produkte erzeugten, haben 1991 die Möglichkeit, um Anpassungsbeihilfen (durchschnittlich 9.000 SEK/ha) anzusuchen. Solche Beihilfen können für Land erhalten werden, welches durch aktive Maßnahmen während der Übergangsperiode dauernd von der Nahrungsmittelproduktion zu anderen Formen der Produktion überführt wurde. Farmer können auch 1992 (6.000 SEK/ha) und 1993 (4.000 SEK/ha) in das Programm eintreten.

Die folgenden Beispiele erfüllen die Bedingungen für eine dauernde Anpassung im Sinne der Anpassungsbeihilfe: Aufforstung, Energiewald, Anlegen neuer Feuchtgebiete, Anbau von Energie- und Industriepflanzen auf Vertragsbasis, Anbau von Nischenprodukten, Anlage von Erholungseinrichtungen, Extensivweiden. Aufforstung, Energiewald, Extensivweiden und Getreide zur Äthanolproduktion sind die meistgewählten Alternativen.

Im Antrag auf eine Anpassungsbeihilfe ist es nicht notwendig, anzugeben, welche Anpassungsalternative realisiert werden soll. Dem Farmer wird so Zeit und die Möglichkeit gegeben, eine Lösung zum Vorteil seines Betriebes zu finden. Alle Anpassungsmaßnahmen müssen vor Ablauf der Umstellungsperiode (30. Juni 1996) vom Farmer durchgeführt und von der regionalen Verwaltungsbehörde überprüft werden.

Pflanzungsbeihilfen werden für die Anlage von neuen Feuchtgebieten, zur Pflanzung von Laubwäldern und für Energiewälder gewährt. Diese Beihilfen werden zusätzlich zu der Anpassungsbeihilfe bezahlt. Die Gesamtkosten sind mit 500 Mill. SEK limitiert.

Die Farmer haben großes Interesse an der Teilnahme an der vom Staat angebotenen wirtschaftlichen Unterstützung gezeigt. Etwa 25 % der schwedischen Landwirte haben 1991 um Anpassungsbeihilfen für 400.000 ha Ackerland angesucht (14 % des schwedischen Ackerlandes). Zusätzlich wurden vorläufige Vereinbarungen für das spezielle Äthanolprogramm über 31.000 ha getroffen.

Die am Programm teilnehmenden Landwirte haben nun 5 Jahre Zeit, die verschiedenen Maßnahmen durchzuführen. Dies wird sie in die Lage versetzen, jene Alternativen zu wählen und zu entwickeln, die mit der Getreideproduktion für Nahrungszwecke wettbewerbsfähig sind.

AUSSICHTEN ÜBER DIE VERWENDUNG VON LANDWIRTSCHAFTLICHEN FLÄCHEN IN DER SCHWEIZ, WELCHE NICHT ZUR NAHRUNGSMITTELPRODUKTION VERWENDET WERDEN

E. Meister, Zürich

Im Bericht wird ein Überblick über die derzeitige Landnutzung in der Schweiz gegeben und auf die Projekte Bio-Treibstoff, Biodiesel aus RME, Energiegras und Feldholz sowie auf die Rohstoffe für den industriellen Gebrauch eingegangen. Der Autor kommt für die Schweiz zu folgendem Ausblick:

- Die Rapsölproduktion zur Herstellung von Biodiesel könnte frühestens 1993 starten. Es wird davon ausgegangen, daß die derzeitige Rapsfläche von 17.000 ha verdoppelt werden kann, ohne dabei negative Effekte wie Pflanzenkrankheiten in Kauf nehmen zu müssen.

- Etwa 1/8 der heutigen Futtermittelproduktion (ca. 1 mill.t TS) könnte zur lokalen Energieversorgung eingesetzt werden. Dies entspricht energetisch der gleichen Menge, welche heute der Wald liefert. Die Einführung ist abhängig von den verfügbaren Technologien und dem Preis der anderen Energiequellen.

- Es ist absehbar, daß die Nachfrage für industrielle Produkte aus wiedererneuerbaren Quellen in der Schweiz zunehmen wird.

- Beim Anbau von Nachwachsenden Rohstoffen darf nicht übersehen werden, daß fruchtbare landwirtschaftliche Böden die Grundlage für die zukünftige Erzeugung von Nahrungsmitteln, Energie und industriellen Rohstoffen darstellen.

III. POSTERS Выставка плакатов

BIO-DIESEL FROM RAPE SEED : AUSTRIA GOES INTO THE FUTURE

*Werner Körbitz**, Vienna

The planning phase lasted about three years - one and a half years for the installation: At the end of August 1990, the world's first bio-diesel plant was opened in Aschach in the Danube valley of Upper Austria. 39,000 liters of bio-diesel, an equivalent - and already recognized by the important tractor manufacturers - substitute for diesel fuel, 53 tons of rape-seed cake meal - a high value protein feed - and 3.5 tons of glycerine are produced from rape seed.

Austria is thus, the first European country to produce such a renewable energy. May-be, it is due to the availability of advanced technology: The Vienna Gaskoks Vertrieb, in the form The Bio-Energie Ges.m.b.H. - a joint subsidiary of Gaskoks, the Upper Austrian Commodity Agency (OÖ-Warenvermittlung) and Prochaska; they manage the plant-, the Federal Institute for Agricultural Engineering in Wieselburg and the German construction firm, Feld & Hahn took about three years to make improvements.

The result makes the bio-energy mainly a know-how-vehicle: The bio-diesel experiments - whereby the fuel is produced in a small pilot plant constructed by the Federal Institute of Agricultural Engineering in Wieselburg - as well as the feeding experiment series with Danubia-Rapskuchenschrot run extremely positive. Nothing stood in the way of the erection of a plant with an annual processing capacity of 30,000 tons of rape.

During the planning of the plant it was considered that the whole society can only finance bio-energy and utilize all the advantages which bring about a reduction in the emission of pollutants from vehicles - if an advanced technology which is also cost neutral is available.

In Future society cannot overlook the existing technologically advanced, fast bio-degradeable, environmentally harmless rape seed oil products, which could replace chain saw oil, compressor oil or fossil fuels.

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* Director of Bio Energie Ges.m.b.H.

The plant and the technology

The challenge for the bio-diesel project lies especially in the putting together of the available constituents for the production of rape methyl ester (RME), to use this product completely as fuel, to find an optimal scale, to acquire an efficient input/output ratio and to bring the product to a higher quality standard.

The plant in Aschach has been designed for an annual processing capacity of 30,000 tons of rape seed. This quantity is processed into ca. 10,000 tons of bio-diesel, 19,000 tons of Danubia-Rapskuchenschrot and 1,000 tons of glycerine.

These three products are formed during the production process which has been improved by Gaskoks, Bio Energie and Feld & Hahn (see illustration 1). First, the rape seed is pressed in the so-called Walzenflockierung, then it is warmed in the conditioning apparatus and then the products are squeezed out in a spiral press via the direct press method. Rape seed oil is obtained this way. The rape seed oil cake which contains a fat content of 8 to 10 percent, 34 percent raw protein and 6 percent water, stays behind.

The rape seed oil is purified by removing the impurities - the slime - and then de-acidified. It is then estered through the addition of methanol and alkaline catalysator. The result is rape methyl ester (RME).

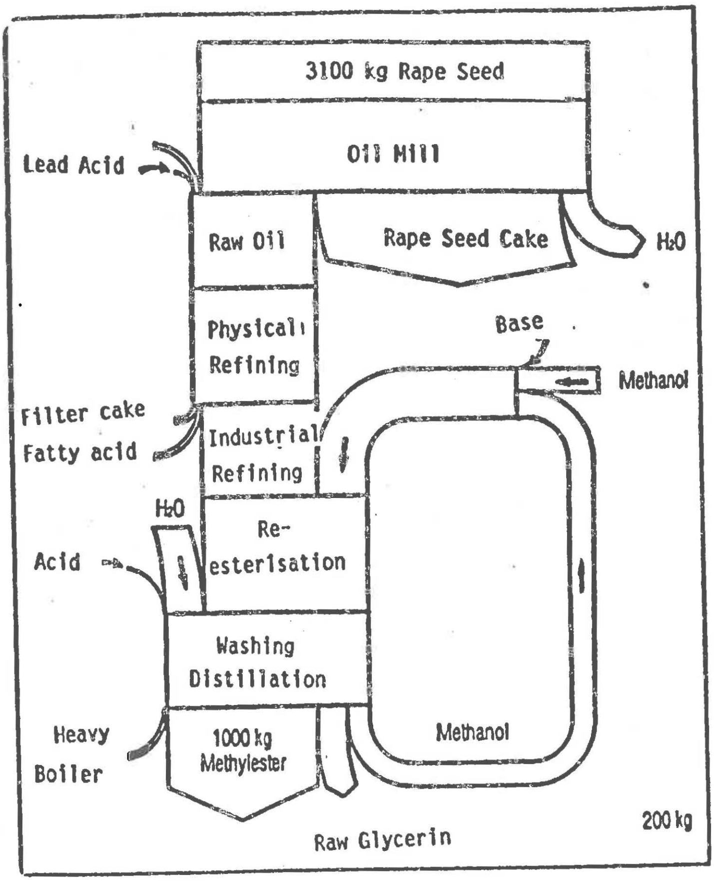
In order to produce bio-diesel with the highest requirements, the methanol residue and glycerine are removed. The methanol is purified and re-used in the production process. The glycerine is also purified into a technically pure quality product.

The energy balance of this process is extremely positive: the energy input in the production process - form cultivation through fertilizer application to the processing in the plant - is 2.2 energy units with regard to the end product.

The investment costs for the plant were about 90 million shillings. The Austrian federal government and the Upper Austrian provincial government financed the project with a single contribution of 25 million shillings. There were no other subventions.

The bio-energy relates the rape seed to the prevailing world market price. The selling prices of the products orientate themselves to the prices of the existing competitive products: so that the price of bio-diesel is about the same as that of normal diesel. With "Danubia-Rapskuchenschrot", this is the reference price for soja. For glycerine, it is the real market price.

FIGURE 1: Scheme of production process

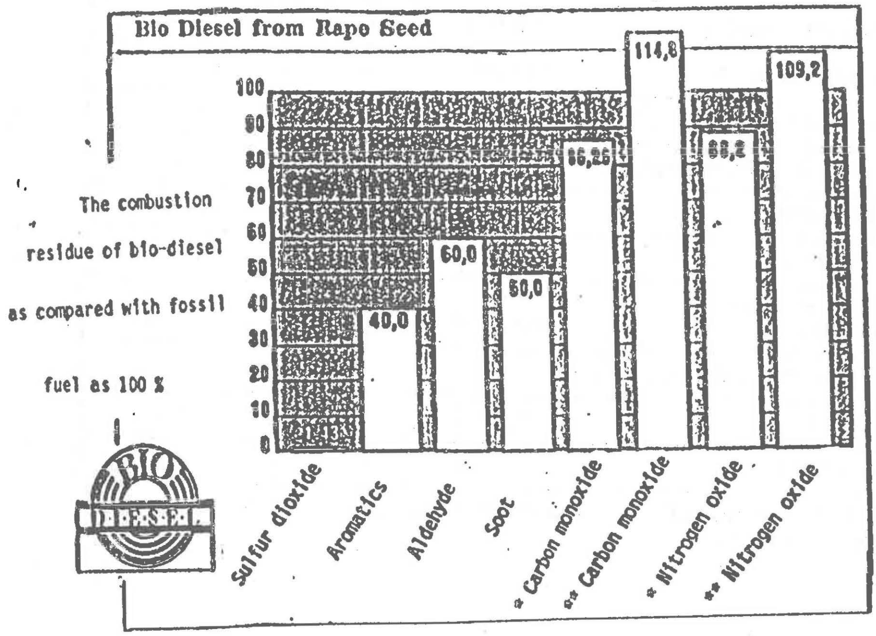


<u>Bio-diesel: high value fuel for tractors</u>

Bio-diesel, which is produced in the plant at Aschach can be fully substituted for normal diesel fuel because they are similar in character and possible uses. The high quality of this bio-diesel (guaranteed by the Aschach plant) can be used readily by many tractors without any modifications.

Its greatest plus: bio-diesel is essentially more environmentally sound than normal diesel fuel because the CO_2-circulation remains closed and this prevents the emissions during the combustion process from leading to greenhouse effect. The SO_2 emissions amount to only one-seventieth of that from normal diesel fuel. The bio-diesel exhausts gases contain 40 percent less hazardous aromatics and 60 percent less hazardous aldehydes. The soot emissions are also about 50 percent less. Only the CO and NO_x emissions are slightly higher (see illustration 2). This is actually not the case when the engines which were originally designed for normal diesel fuels are modified to suit bio-diesel: in this case the CO and NO_x emmissions are lower for the bio-diesel (by about 14 and 12 percent respectively).

FIGURE 2



* Engine with optimization based on Bio-diesel

** Engine without optimization based on Bio-diesel

Source: Bio Energie Ges.m.b.H.

The new fuel has been tested intensively and further developed upon in the past years. The objective: highest quality. The Federal Institute for Agricultural Engineering in Wieselburg performs its own experiments with more than 30 old and new tractors from the leading manufacturers with respect to their engines. The fuel which is used is produced by the institute's small pilot plant which is based on the Aschach technique.

TABLE 1: Properties (comparison of Diesel - Bio-Diesel)

		Diesel fuel in accordance with ÖNORM C1104	R M E
		Summer Quality	
Density at 20 °C	(g/ml)	0.840-0.860	0.875-0.880
Lower Heat Capacity	(MJ/l)	35,7	32,7
Viscosity up to 20 °C	(mm2/5)	5-8	ca. 7
Cetane number (Ingition Quality)		at least 48	48-53
CFPP (Filtration Boundary)	(°C)	+ 5	- 10
Sulfur content	(%)	max. 0,15	0,002
Flash point	(°C)	over 55	over 100
Boiling behaviour Distillant up to 350 °C	(%)	> 85	ca. 97
Non-standarized Average Values			
Boiling begin	(°C)	180	300
Boiling end	(°C)	350	380

Bio-Diesel corresponds in its physical properties to a great extent the normal diesel fuel

The results: Bio-diesel produced from the institute's plant can be used directly by tractors. There were no engine problems. The performances differed with respect to the engines - about 5 percent on the average. The consumption also differed - on the average it was 5 percent higher. With the majority of the tractors there were no problems from the dilution of the engine oil. There were also no problems with the rubber and lacquer. Cold start was also possible up to temperatures of minus 10 degrees Celsius.

As a result of this a row of prominent manufacturers have given the "Green light" for bio-diesel which is based on the Aschach technique. Some manufacturers demand the replacement of rubber conductors or tank lids (average cost: ca. 1,000 shillings; the Upper Austrian provincial government grants a subsidy of 500 shillings) or a shortening of the intervals at which the oil is changed. No modifications are needed on tractors of John Deere (1967 Models and onwards) and Deutz-Fahr (1969 models and onwards) and Same. Massey Ferguson, Ford, Case, Fiat, Steyr, Lindner and MB have released models using bio-diesel. Currently Fendt and Renault are working on an RME-packet.

Experiments are going on with cars, lorries and communal vehicles: no problem has been documented in this area as at now.

"Danubia-Rapskuchenschrot": high quality protein

Under the Danubia trade mark, rape-seed-cake pellets are used as high quality protein feed in cattle, swine, sheep and also poultry nutrition. The greatest strength of Danubia is its high energy value (through the fat content of 8 to 10 percent). The raw protein content is about 34 percent, water and roughage each with 10 percent.

Danubia has been tested intensively in a row of animal nutrition experiments. The results were on the average positive and this means that it can be employed widely.

Glycerine: basis for the chemical industry

The glycerine which is obtained during the production process can be used as a raw material in the chemical industry due to its extremely high quality. Glycerine which Austria imports is the basis for liquid fuels, nitro-glycerine etc. and it is used in the cosmetic and technical spheres.

Enormous interest

With regard to the bio-diesel plant, Austria is playing a pioneering role in the world. The domestic and external interests are enormous. Inquiries about the technique and products come from all over Europe and overseas.

No wonder, environmentally sound products are needed everywhere.

BIOLOGICALLY BASED TECHNICAL OILS AND LUBRICANTS

*Franz Ch. Krizek**, Vienna

The problem situation

It is inevitable that lubricants get to the environment. This occurs with the so called lost lubricating ingredients of which examples are: chain-saw oils, 2-stroke oils, grease, rail lubricants, carriage way oils etc.

Accidentally and also inevitable is the arrival of encapsulated circulating lubricants in the environment. Be it through losses from packages, seals, spillage, defects - such as the breaking of hydraulic pipes, accidents etc. One should not forget that lubricants, for example - in the engine, undergo combustion and often come into contact with the skin.

It is therefore important to make lubricants environmentally tolerant and as we say, safe to the biosphere. We would, however, distant ourselves from the term, bio-degradeable because it could be misleading.

Raw Materials:

Basic oils:

As starting point for basic oils which are safe for the biosphere are natural products such as rape seed oils etc. or synthetic ester and glycols. Mineral oils are not suitable.

The first known environmentally safe product ever developed was a 2-stroke oil, on synthetic basis. 2-stroke oils have up till now not been successful due to the cost situation.

The biologically based lubricants were rather successful as society's preference shifted towards natural products. Natural products are products which do not undergo any change - chemically or under intensive refining. Biologically based technological modifications of plant oils for technical purposes are in the initial stage.

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* Director of Technical Department, CASTROL Austria Ges.m.b.H.

The Relative Costs of Environmentally Tolerant Basic Lubricanting Oils

Refined Mineral Oil	1
Refined Rape Seed Oil	ca. 1,4 - 2
Synthetic Oil	ca. 10 - 20

Environmentally tolerant products on ester basis have currently an almost unsurmountable cost handicap. Glycols are water-soluble, do not easily mix with other lubricants, are aggressive towards elastomers and paints and are as such hardly used. They are tenable only where solutions with over average qualities are required - for example, engine oils.

The current quality requirements in the case of many refined plant based oils can be met. The surprise with the plant based lubricants was that they performed better than has been envisaged. We have therefore decided not to go to the synthetis because it currently has no cost advantage and also because it is a special subject of its own. In future, synthetis based natural products are going to gain importance. Also important would be changes in the market caused by these natural products.

Additives

The use of chemical additives in the basic oils is important in order to meet the required product profile and product quality. Without mineral additives, synthetic or plant based lubricants cannot meet the market requirements.

Similarly additives used in environmentally tolerant lubricants must be environmentally sound and not toxic or carcinogenic and would be examined and selected under these qualities. If possible, they should be defined as chemically pure substances.

My employer does not permit me to go into detail at this stage. The secret is that the function and quality of a naturally based lubricant depends to a great extent on the additives it contains.

Choice of basic oils

Table 1 reveals that there are a range of plant oils which can be used as lubricants. Luckily for temperate countries, like Austria, refined rape seed oil is most suitable and available. The technical properties of refined rape seed oil are good.

The flat temperature-viscosity behaviour as shown in Fig. 1, is essentially better than every mineral oil and many synthetic oils. Normally, in the case of mineral and synthetic oils with polymers, this behaviour must be improved. These improved mineral and synthetic products, however, lose viscosity during unavoidable wear and tear - which in many cases requires a change of oil.

Refined rape seed oil does not loose viscosity during mechanical shearing stress - an inestimable advantage.

Let us consider the wear and tear behaviour in Fig. 2 as compared to mineral oils. Here we see likewise, a clear advantage.

The thermal-oxidative stability is the most controversial point. Usually these basic plant oil products are condemned by conventional thinking critics (see Fig. 3).

Not taken into consideration is that the usual testing process based on basic plant oils and synthetic ester is not applicable to mineral oils. For example, extremely stable synthetic lubricants of high thermal values also fail these tests. A suitable testing process which correlates better with practice should be developed.

There is one negative aspect of plant oil: during the operation the oxidation number rises and it also forms a sticky deposit. The oxidation number which is important for the aging beha- viour of mineral oils, has no importance for plant oils.

When mineral oils form acids, then they are short-chain aggressive acids which are very corrosive on metals. The acids formed by aging plant oils are long chain fatty-acids, which can be effective as corrosion inhibitors. These long-chain acids found are used in the lubrication technique to lower friction.

A further aging product of mineral oils are the insoluble combinations which take control of depositions, sludge and blockages.

Aging plant oils develop polymers - sticky products which are rather oil soluble. This means that with the aging of plant oils, only the rise in viscosity is a criterium for the change of oil.

The polymers which develop from the aging of plant oils improve the viscosity-temperature behaviour (see Table 2). Some research is still to be done in this direction.

With regard to the marginal temperatures for the limited duration of use as a lubricant, without considering the viscosity, the following range is currently given:

Refined rape seed oil additive	120 - 130 °C
Refined mineral oil additive	150 °C
Synthetic oil additive	> 150 °C

Besides uses in engines, the temperatures at which lubricants can be used are far below 120 °C - between 60 and 80 °C. Exceptions in this case, are automobil gears where under circumstances, temperatures can reach 150 °C. When one puts the results together, one comes to the conclusion that refined rape seed oil is a very useful basic lubricant.

Current use of biologically based lubricants

Examples from practice show those of the current situation.

(1) 2-Stroke oils for combustion engines

There are at the moment a range of 2-stroke oils for combustion engines, which are biologically degradeable.

(2) Chain saw oil

It is the first biologically based lubricant to appear on the market on a large scale. Within 5 years it has captured the Austrian market. From January 1, 1991, only biodegradeable chain saw oils are allowed to be used. About 99 % are based on rape seed and have fully fulfilled the promised quality. That is, better lubrication at high and low temperatures, reduction of the necessary oil quantity by 40 %.

As against mineral oils, which poured ca. 3 million liters of non degradeable lubricants into the environment, the bio-degradeable lubricants reduced this amount by 1.8 million liters. A great success.

(3) Hydraulic oils

After the chain saw oils came the rape seed based hydraulic oils. They are used at the moment in forest machines, building machines, agricultural machines, cranes, communal vehicles, hydraulic presses.

Apart from the soiling problem associated with the filler pipe, there are no other known problems. Normally, cleanliness eliminates this problem.

(4) Stock absorber oils

Use in stock absorbers of motor cycles and in shaft oils has shown great successes up to date. Very even damping, no wear and tear. Till now there have been no problems.

(5) Fluids for hydrostatic drives

Rape seed based fluids successfully replace automatic gear fluids based on minerals which up till now have been used in equipments for mechanical preparation of skiing slops (Ratrac). There has been no wear and tear of the product as usual, and as such the effectiveness of the hydraulic gear remains unchanged. The effectiveness depends on the loss through cracks which in turn is influenced by the viscosity.

(6) Lubricants for drive chains

Drive chains for motor cycles etc. have more advantages than the previously used mineral lubricants. The adhesiveness and crawling ability are better.

(7) Air filter oil for combustion engines

Combustion engines for simple equipments, such as grass mower and motor cycles use oil fluids as air filter. Rape seed based products have advantages against mineral products. They stick better.

(8) Biologically based fats

Fats based on rape seed and bio-degradeable synthetics from NLG I-2 to NLGI-000, are available on the market. There has been no problem as at now.

(9) Variations

There are variations in these products, which are used in uncountable areas which cannot be mentioned here.

(10) Corrosion prevention oils

The known "contact sprays" for industries, commerce, "do-it-yourself", are obtained from biological sources. This area is currently expanded by corrosion prevention oils.

(11) Lubricants for railways and tramways

Almost all lubricants are, and can be obtained from biological sources. For example, the rackrailway uses these types of lubricants very effectively.

(12) Cable lubricant

Available on the market.

(13) Cutoils for industries

For the metal shredding industries, there is a coolant which has overtaken its competitors.

International and national situation

In the area of environmentally tolerant lubricants, Europe has a leading role. Especially in Middle Europe, where the quality standard of lubricants is regarded world-wide to be the highest, biologically based lubricants are currently the most successful. At the moment impulses go from here to the whole world.

Personally, I am especially happy that Austria has taken a leading role in this area. We should all try to maintain this position and further reinforce it.

Future applications

The thermal-oxidative stability and its improvement for future application require further research.

The frictional behaviour must also be studied exactly alongside the development of additives for the improvement of EP (Extreme-Pressure) properties.

Also important is the research into the long term behaviour at very low temperatures, where plant oil based lubricants have problems. At the moment one is in a safe zone up to minus 23 °C with refined rape seed oil additives. For Scandinavia, fluids of up to minus 30 °C have been developed at additional costs.

Nevertheless, for temperatures under minus 23 °C, viscosity and stable solidifying-point test must still be carried out. Fluids stand out already.

It is now possible to offer combined tractor-gear-hydraulic-units with wet braking systems, such as those available in agriculture and construction and which use plant based oil fluids. The concern of the manufacturers is the only safeguard left.

With the exception of engine oils and automotive gear oils, the extensive area of plant oil lubricants is open.

In areas where refined plant oils are not applicable, endeavours are being made to find plant based synthetic fluids. The prospects are good. I believe therefore that in times of surpluses, in future, agriculture could deliver raw materials for the lubricant industry.

TABLE 1: Different types of vegetable oils

	thickening *)	oil content %	JN	V 40 mPas	V 100 mPas	VI	C 18' %	C 18" %	C 18"' %	MP	comments
cotton	sth	14-25	103-111	23,6	-	-	22-35	40-52	tr	0-4	
coconut	nth	60-70	8-10	27	5,3	132	5-8	1-3	-	20-28	fat
line	th	32-43	169-196	23,6	5,9	207	20-26	14-20	51-54	-	
corn	sth	3-6	113-126	30	6,2	162	26-40	40-55	0-1	(-18)-(-10)	
olive	nth	38-40	79-85	34	6	123	64-86	4-15	0,5-1	(-3)	
palm	nth	30-55	51-57	37	7,4	171	38-41	8-12	tr	29-30	fat
palmcore	nth	40-50	12-18	25,1	-	-	10-18	1-3	-	23-30	fat
rape (classic)	sth	30-45	99-108	46	9,9	213	11-24	10-22	7-13	0-2	41-52% erucic acid
rape (lesira)	sth	30-45	89-108	35	8,1	210	59-60	19-20	7-8	0-2	
castor	nth	50-60	86-94	232,3	17	72	2-3	3-5	-	(-18)-(-12)	80-90% ricinolic acid
soja	sth	18-20	118-134	27,5	6,1	175	22-31	49-55	6-11	(-15)-(-8)	
sunflower	sth	42-63		27,8	6,5	188	14-35	30-75	< 0,1	(-18)-(-16)	

*) th=thickening, sth=semithickening, nth=nonthickening

TABLE 2: Aging of plant oils

KV40	NZ	Ölunlösl.	Gewichtsverlust		Bewertung	
			Cu	Fe	Cu	Fe
[mm²/s]	[mgKOH/g]	[%]	[mg/cm²]		[-]	
2800	9,3	0,05	0,06	0,01	2	+
fest	---	0,1	0,08	0,03	1-2	+
>>3000	12,6	0,06	0,07	0,02	2	+
>>3000	11,9	0,07	0,08	0,03	2	+

FIGURE 1: Technical properties of refined rape seed oil

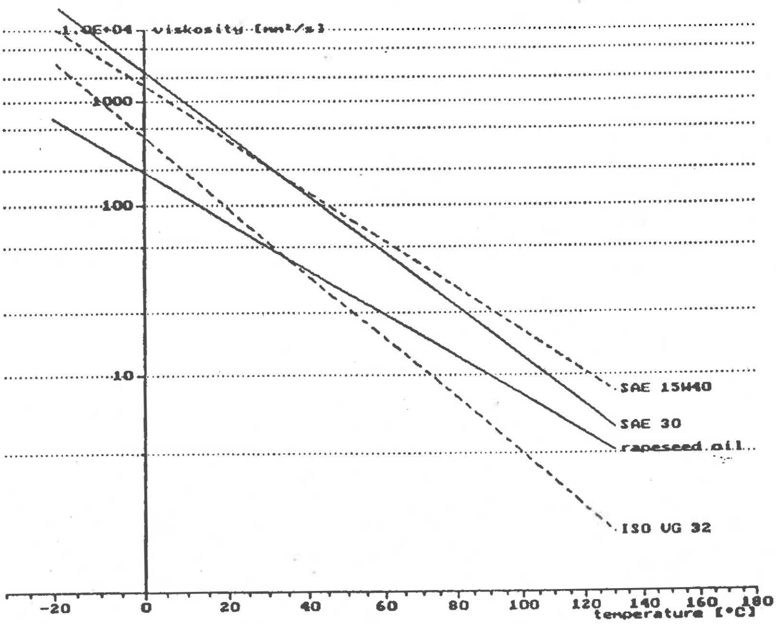


FIGURE 2: Vickers Vane Pump Test
V 104 C

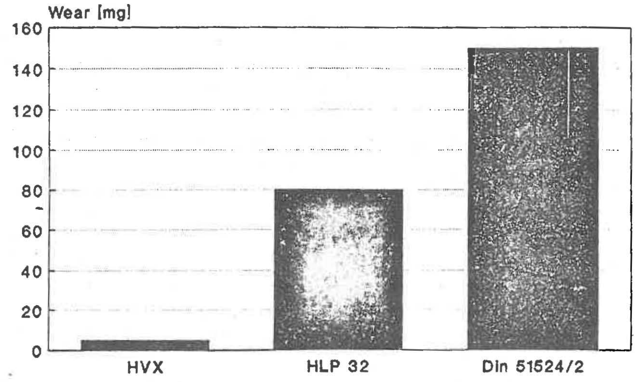


FIGURE 3: Oxidationstest HVX
Verschiedene Temperaturen

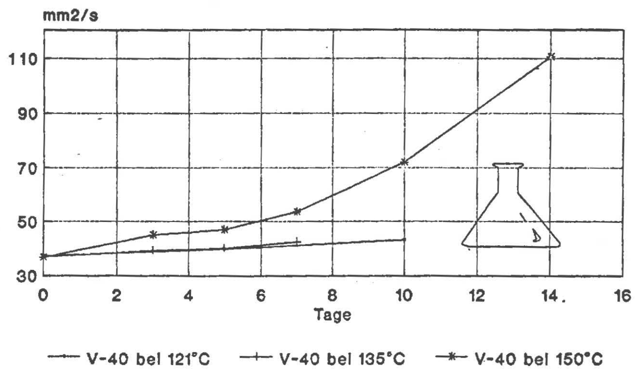


FIGURE 4: Industriepresse
6000 l Biotec HVX

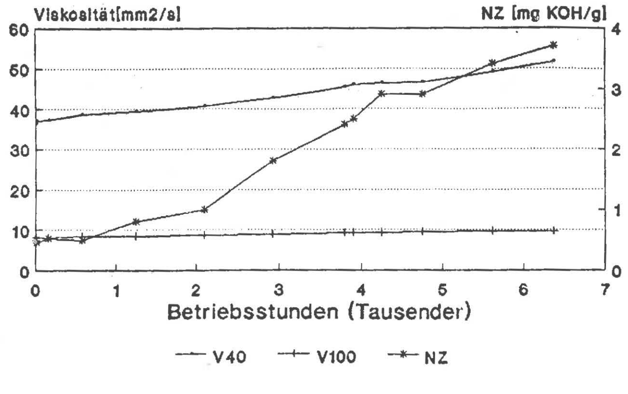


FIGURE 5: Baumaschine
Hydrauliköl: Castrol "Biotec HVX"

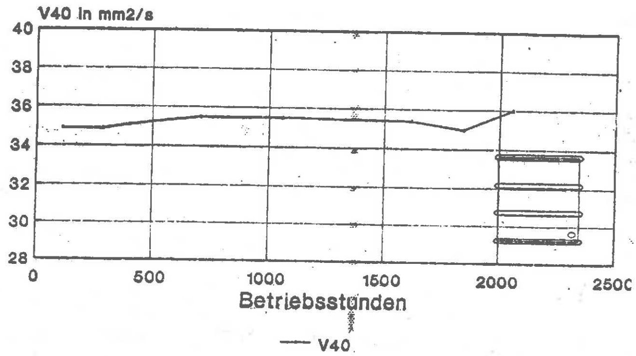


FIGURE 6: Industriehydraulik
Hydrauliköl: Castrol "Biotec HVX"

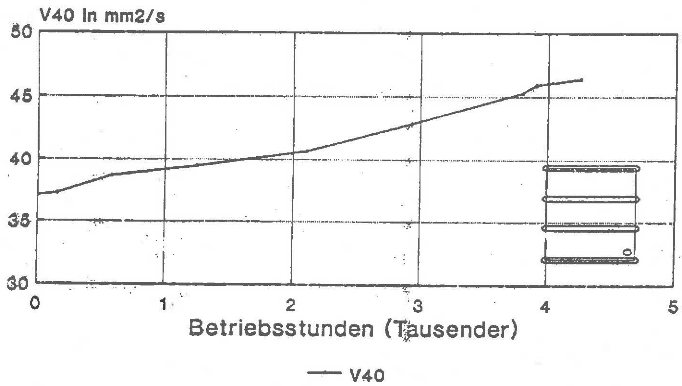


FIGURE 7: Hydraulik-Prüfstand
Hydrauliköl: Castrol "Biotec HVX"

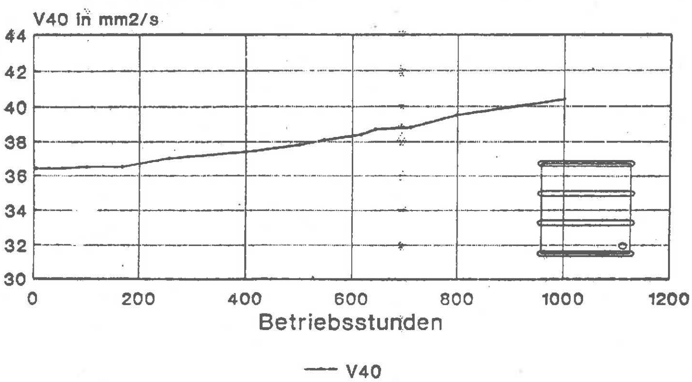


FIGURE 8: Fahrhydraulischer Antrieb
Hydrauliköl: Castrol "Alpin 22"

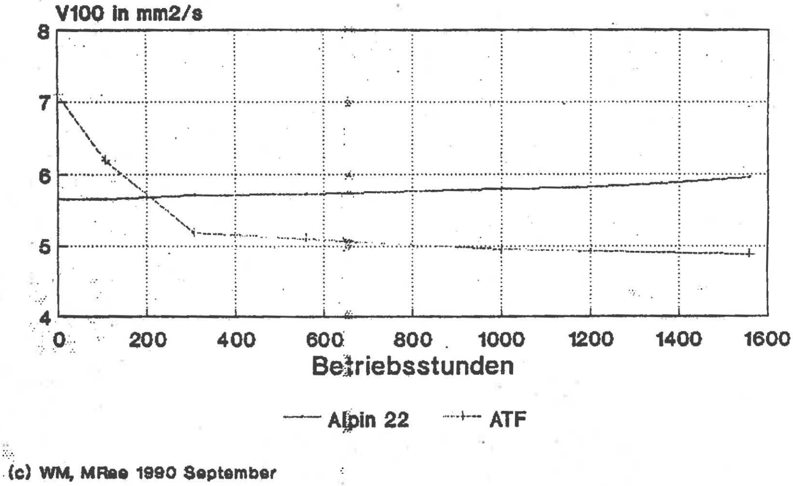
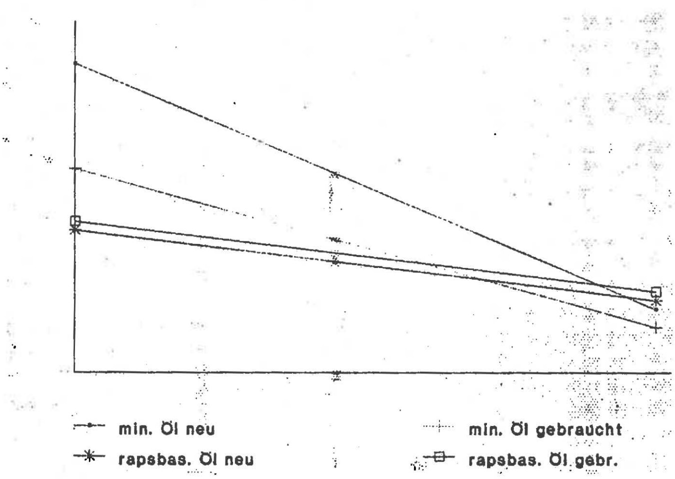


FIGURE 9: Stoßdämpferöle



BIOLOGICALLY BASED OILS FOR HIGHER TEMPERATURE LOADS

*Johann Kellersperg**, Ragnitz

INTRODUCTION

As you might know, Messrs "BIOSTAR" - Dipl.-Ing. Johann Kellersperg GesmbH & Co KG have been engaged already for many years in the field of vegetable oils, above all rape-oil, used as lubricants. At the beginning it was considered necessary to use vegetable oils instead of mineral oils as basic oils above all in the field of loss lubrication. Of course all the products offered by Messrs "BIOSTAR" - Dipl.-Ing. Johann Kellersperg GesmbH & Co KG are meanwhile offered also by other companies. As you know also the company of CASTROL is offering these products. But as we consider ourselves as a progressive company with many new ideas as far as environment protection is concerned, it was not enough for us merely to offer these products. Our ambition was to conquer also fields, which where considered impossible up to now.

Although in the past vegetable oils have been hardly used as lubricants, they have become more popular in the last years. This is due especially to improved concern for environmental protection, to the possibility of replacing fossil raw materials by natural, growing products, also as far as the economic aspect is concerned.

At the beginning we were using these vegetable lubricants only in fields with low temperature development over a longer period of time. Then we started developing oils, which could not only be used with normal temperature. In this respect hydraulic oils are very important. After some set-backs at the beginning as far as temperature resistance is concerned, we could find additives, which made possible heating hydraulic oils up to 80 °C for a longer period of time. As in all lectures given about biological oils on a vegetable basic higher temperature were strongly advised against, it was enough motivation for us, to check the real temperature borders of a biological oil on vegetable basis above all under practical conditions. So it was decided in the management of our company to use biological motor oils on the basic of rape-oil.

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* Managing member of BIOSTAR Ges.m.b.H. & Co KG

TARGETS

The main idea was to supply cars and tractors completely with biological lubricants and fuels without any changes of the engine or the vehicle. Therefore it was important, that the compatibility of biological lubricants and fuels with normal products on mineral-oil basis was guaranteed. Another important aim of these tests was to achieve intervals of motor-oil change, which corresponded to practical needs. As the test-cars and tractors were supplied with biological gear lubricant oil on rape-oil basis, the same requirements concerning oil change intervals had to be observed.

SUITABILITY OF RAPE-OIL

The reaction of additives and their effectiveness will be influenced by the contamination not processed during the refining. This depended mainly on the tryglycerid-molecules. But it can considerably differ among verious sorts of rape-oil and among different harvests, which may lead to different solving characteristics of additives. For all these tests therefore rape-oils were used, the refining degree of which corresponded to salad-oil. As rape-oil has many positive characteristics by its nature as far as lubrication attitude is concerned, we paid especial attention to the possible abolition of the strong oxidation ability of the oil when finding the right formula of the oil.

TEST STRUCTURE

For these tests of the biological oil Citroen cars were used, with a parallel test of a BX turbo-supercharger. All cars were already filled when new, in order to guarantee, that the results could not be falsified. Tractors of different producers were used. The tests have been performed since 1988.

RESULTS

Due to the shortness of time I cannot discuss these extremely interesting experiences, I will mention briefly only the results. Despite the opinions of nearly all experts, who have engaged themselves with lubricants, it has been proved, that it is possible with the necessary know-how and with a certain readiness to take a risk for new developments, to develop biological motor-oils and gear lubricant oils, which do fulfill the requirements of modern engine lubricants. During all these tests, while some 100.000 km were covered, not the slightest damages of engines and gears could be stated. Visual controls of dismantled engines did not show any additional abrasion of engine parts. No resinification of parts of the engine or the gear, which could have led to the impairment of functions could be proved. The popular opinion, that the turbo-charger in the engine will be ruined, when using biological oils, has not been confirmed until today. Allthough these biological oils do already correspond to the service life of cars and tractors, we still are trying to improve the intervals of oil change, in order to have certain guarantees in the practical use.

FUTURE ASPECTS OF BIOLOGICAL ENGINE AND GEAR LUBRICANTS

If it is possible to find additives in co-operation with additive producers, which do improve the service life of these oils, we see certain possibilities to use these oils in certain fields. Among well-known aspects of environmental protection another reason to use biological engine oils may be the excellent recycling possibilities of these oils.

If and when these oils will be admitted for general use will depend on the availability of an engine producer, who is willing to perform extensive field tests and who will use these oils for his engines after achieving positive results.

RAPE METHYL ESTER PILOT PLANT IN GÜSSING

*Franz Jandrisits**, Güssing

The rape methyl ester pilot plant (rape-, eco-, biodiesel) in Güssing started work on 10th January 1990. 237 farmers with an area of 555 hectares of rape in the municipalities of Güssing and Jennersdorf are owners of this plant and at the same time members of the first "Farmers' co-operative producing carburettor fuel and combustibles".

1. Basic economic conditions for the cultivation and processing of oil seeds in Austria

The analysis of the foreign trade statistics shows that since 1980 Austria has imported about 120.000 tons of plant oils and about 500.000 tons of protein food every year. Because of the existing GATT-contracts for oil seeds and the products thereof, there is no agreement on foreign trade, so that the Austrian expenditures for these imports are determined by world market prices.

The total value of oil seeds and the oil seed products imported by Austria might differ from 2 to 3 milliard ATS per year.

On the other hand, a permanently increasing overproduction of corn, which in 1987 in Austria already worked out at over 1 million tons, is recognized. This overproduction is cultivated on an area of about 250,000 hectares, increasing every year without counter-measures for about 10,000 hectares at least and swallowing up an export subsidy share between three and four milliard shillings.

Seen purely from the point of view of plant cultivation, the estimation of the total Austrian cultivation potential for rape and sunflower shows that the cultivation of a total area of about 250,000 hectares with a yield potential of 625,000 tons oil fruit would be possible.

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* Manager of the "Bäuerliche Alternativ-Treib- und Heizstofferzeugungsgenossenschaft (BAG)"

2. Aims of the farmers' small plants

With the erection of the "ecological diesel plant", the farmers of the municipalities Güssing and Jennersdorf give a practical answer to the socioecological solution in the field of agriculture:

- Higher net product gain for the farmers
  Independance from the suicidal agrarian export and import policies, because the refinement of the raw material into carburettor fuel and protein feed is in the hands of the farmers.
- Less strain on the society
  Decrease of the agrarian overproduction, especially of the corn overproduction
- Less harm to the environment
  The farmers keep the energy production in their own hands and produce the feed for their pulling animals (tractors), cows and pigs in the well-tried rotation of cultivation themselves.
- Environmental protection
  The CO_2-cycle is closed and a continuation of the hothouse effect is prevented. No sulphur dioxide in the wast gases. Low content of soot.
- Prevention of economic crisis
  By the erection of decentralized plants in provinciale areas. They provide working places and stimulate the existing economic flow in the region.

3. Calculation of the net product for the cooperation farmers

3.1 Assumed data:

Yield/hectare	3.000 kg rape
Premium for rape cultivation area/hectare	5.500 ATS
Standard price	4.73 ATS gross/ kg rape
Support for the product (assumed world market price of 1.32 ATS/kg rape)	3.41 gross/kg rape
Fee, required for services of the "Farmers' co-operative producing carburettor fuel and combustibles"	1.70 ATS/kg rape
Rape methyl ester (ecodiesel, biodiesel)price	8.00 ATS/litre
Colza cake price	2.50 ATS/kg

3.2 Calculation:

	variant I (refinement in small plants)	variant II (sale of rape)
a) G r o s s p r o f i t		
rape seed 3.000 kg x ATS 1.32	-,--	S 3.960,--
value of the rape products:		
1,000 litres ecodiesel x ATS 8,--	S 8.000,--	-,--
2.000 kg colza cake x ATS 2.50	S 5.000,--	-,--
premium for rape cultivation	S 5.500,--	S 5.500,--
support for the product 3,000 kg x ATS 3.41	S 10.230,--	S 10.230,--
S u m gross profit	S 28.730,--	S 19.690,--
b) V a r i a b l e costs		
seeds, fertilizer, combine harvester	- S 10.489,--	-S 10.489,--
Fee, required for services of the "Farmer's co-operative producing carburettor fuel and combustibles"	- S 5.100,--	-,--
GROSS MARGIN/hectare	S 13.414,--	S 9.201,--

The gross margin of variant I leads to an increase of proceeds of + ATS 3,490,--/hectare. Out of this sum the investment costs for the erection of a small plant have to be covered; the rest can be booked as increase of proceeds.

Source: Standard gross margin catalogue 1990/91, Federal Ministry for Agriculture and Forestry, own investigations and calculations.

4. Capacity of the testing plant for the production of rape carburettor fuel

4.1 rape store: about 80 tons

4.2 Oil extraction: with 8 screw presses about 5 tons oil/day are produced

Produced quantity: 3.5 tons colza cake/day

	1.5 tons rape oil/day
Esterification:	in a 5-8 hour process the 1.5 tons of rape oil produced by oil extraction are turned into 1,500 litres of rape methylester = biodiesel = ecodiesel under addition of methanol and a catalyzer.
4.4 Stores:	Colza cake store: about 60 tons Tanks under ground 140 cubic metres = 140,000 litres above ground 100 cubic metres = 100.000 litres S u m : 240 cubic metres = 240.000 litres

5. Production of rape methyl ester

Plant oils are almost exclusively triglycerides, which means that three long-chained fatty acids are bound to a trihydric alcohol (glycerine). During the esterification, the glycerine is replaced by a monohydric alcohol (methanol) and receives three smaller molecules of fatty acid methyl ester instead of the highmolecular triglyceride.

Thus the two main disadvantages of untreated rape oil are eliminated:

a) The viscosity is reduced to about 1/10 and reaches a value similar to summer diesel.
b) The triglycerides responsible for the coking are eliminated.

The process in Güssing is running according to an esterification method developed by two professors of the Graz university, Mr. JUNEK and Mr. MITTELBACH. The practical testing of this method took place in the agricultural professional school in Silberberg under the supervision of Mr. LEODOLTER. Everything was carried out without chemical solvents and was therefore environmentally friendly. The energy balance is very positive because one part of energy provides an output of 3.86 times of the used energy. Out of one hectare rape about 1,000 litres rape oil and 2,000 kg colza cake can be produced. This "Eco-diesel plant" was worked out and planned by the company "Vogel & Noot AG, A-8661 Wartberg, Steiermark".

ECO-DIESEL FACTORY MURECK/STYRIA/AUSTRIA

*Karl Totter**, Mureck

The SEEG (Southern Styria Energy and Protein Producer Cooperative) was established on 20.10.1989 after a pilot project.

300 members (farmers) of this cooperative grow rapeseed and soybean for their energy and protein requirements and get these crops processed in the jointly constructed eco-diesel plant, into fuel and lubricants as well as feed concentrates. Naturally, there is also the possibility of producing cooking oil for domestic requirements.

- No buying and selling takes place. The harvested crops and their corresponding processed products remain the property of the members concerned. The ensuing running costs are merely settled among the members of the cooperative.

- The produced fuel is used to drive conventional diesel engines (without the modification of these engines). The resulting oilcakes are high value feed concentrates used in swine and cattle feeding.

- Installations

Commencement of building	18. July 1990
Completion of building + takeover	May 1991
Size of building	22 x 13.5 m
Tank-Reservoir	4 x 30,000 liters
Double-spindle-press	8 pieces for ca. 600 ha of oilseeds
Re-esterisation plant	for about 1000 ha of oilseeds

- The press and re-esterisation processing technique which was developed by the University of Graz is absolutely harmless to the environment and leaves no residues.

  A technically simple driven plant is efficient for a firm size of 500-1000 ha (rapeseed, sunflower or soybean).
  The technology was developed and delivered by the firm Vogel and Noot/Graz/Austria.

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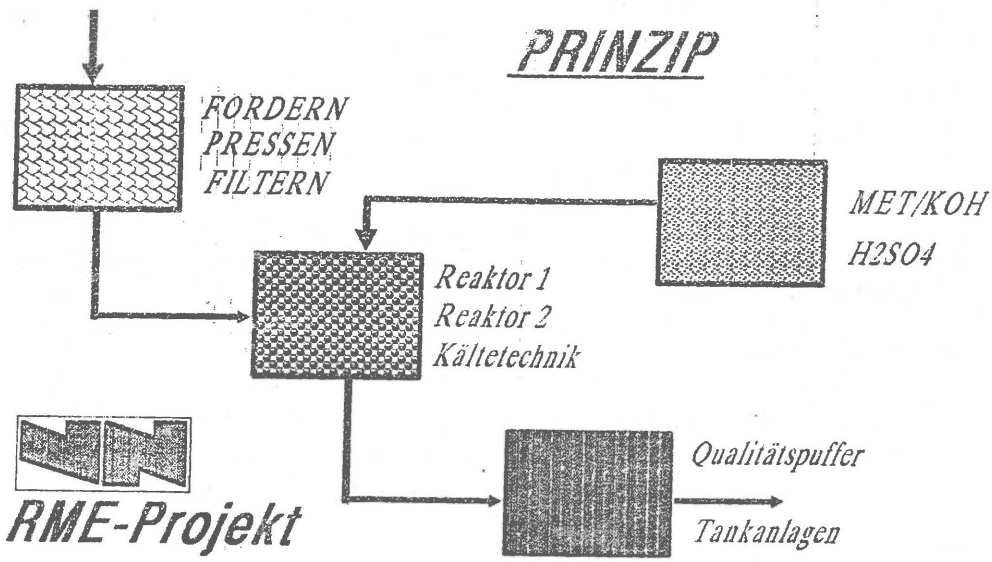
* Chairman of "Südsteirische Energie und Eiweißerzeugung Gen.m.b.H. (SEEG)

- This re-entry into the old protected revolving economy through the production of energy and protein has many advantages:

  - Environmental protection (crop-rotation, reduction of erosion and the leaching of nitrates, CO_2 circulation will be closed).
  - Surplus reduction (25 % of the arable land area for the production of energy and protein; no surplus of cereals, no land fallowing is necessary).
  - Value-added for the region (raw material producer and distributor in one hand, short transportation distances, revival of the rural area, maintenance of the cultivated landscape through decentralised units).
  - Precautions against crisis (vegetable oil is extracted from a renewable raw material and can as such secure the production of energy and the supply of food in the period of crisis.

- The motto of our cooperative: "Energy and protein from one's own field and a healthy environment for all", brings a long term positive economic impact for every country and gladdens the heart of every citizen.

FIGURE 1: Scheme of RME-Production



ECOLOGICAL AND SOCIAL ADVANTAGES OF THE USE OF PACKAGE MATERIALS FROM RENEWABLE RAW MATERIALS BASED ON STARCH

*Mag. Ernst Krottendorfer**, Leobendorf

Note

At the present time all industrial and agriculturally developed countries are faced with great problems:

1. Growing mountains of garbage and huge deposits. Political problems, the search for new areas to deposit garbage.

2. Agricultural overproduction, price support, abolition of surpluses or land set-aside.

This problem of surpluses is indirectly transfered to the third world through export of agricultural surpluses as "Development Aid" to price dumping under the suppression of the domestic production in those countries.

Advantages

a) Renewable raw material from fast regenerable plants
b) circulation principle in the CO_2-balance and material balance
c) positive contribution to the garbage problem
   - fast decomposition through composting
   - decomposition under deposition conditions
   - combustion should pose no problem
   - minimise the litter problem
   - suitable for animal feeding
d) legal protection of consumer demand.

Annotations

ad a) Starch from potatoes, maize or wheat is considered as renewable industrial raw material everywhere and is already used in many technical areas - for example, in the paper industry.

Considerable production reserves exist in agricultural areas with surplus production as well as land set-aside.

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* Collaborator, BIOPAC-Biologische Verpackungssysteme Ges.m.b.H.

ad b) The starchy plants build starch from the air's carbon dioxide under the release of oxygen. During the breakdown of starch, this process is reversed.

Limited availability of petrochemical raw materials which also posses transportation risk are preserved so that a positive contribution of the CO_2-problem is accomplished.

THE PRODUCT AND HOW IT IS PRODUCED

Production

1. Mass production

The powdery raw material starch, fibrous substances pre-mixtures such as water are automatically dosed into a mixer, mixed for a few minutes and then made ready in a receptor.

2. Baking and effervescence

The paste is then dosed into gas-heated multiple forms (Temperature 160 - 190 °C). In a continuous flow:

Dossage, baking and effervescence, the required form emerges from moulding. The frothy structure emerges through the loss of moisture. After the moulding the pieces are transported to be cooled down in the air.

3. Conditioning

In order to secure a uniform, stable texture and dimension of the required form, a temperature and humidity conditioning steps are endorsed.

4. Completion

As long as multiple forms are employed, there is an isolation of the required form, possibly through punching or sawing. The products are piled in humidity free delivery units and then sent to the store room. No special climatic conditions are required in the store room.

Use and Disposal

After the protective and carrier functions have been fulfilled, the cup and tray can be used in the household so long as they are not soiled or thoroughly wet.

Some Examples:

Picknick containers, kitchen plates, warming of apple pie in micro waves, ...

The disposal is possible through all new and conventional means:

- receptor for biologically based garbage
- composting
- animal feeding
- household waste
- combusting.

FLAX CULTIVATION IN AUSTRIA - A CHANGE FOR AGRICULTURE?

Reinhold Süssenbacher*, Stadl-Paura

REQUIREMENTS

The only Austrian Linen Spinners, Messrs. LAMBACHER HITIAG LEINEN AG are processing with the assistance of their approximately 600 cooperators an anual quantity of about 5.000 t of raw flax into linen yarns in their two works Stadl-Paura, Upper Austria and Neuda, Lower Austria. The export quota of our enterprise is over 80 %.

At the time being still the largest part of the raw material has to be imported from France, Belgium and in relatively small quantities, also from the former East Block countries. Assuming a crop of approximately 7.000 kgs of flax straw per hectare and an output of 23 % of long and short fibre flax full cover of the actual requirements of LAMBACHER HITIAG would need a cultivation area of over 3.000 hectares of homeland production.

At the time being within the development program of agricultural alternatives about 500 hectares of flax are grown in Austria and worked up in the flax scutching plants of Knittelfeld (Styria flax) and Rastenfeld (Waldviertler-flax) to spinning materials. An extension of this very limited cultivation area (Western Europe has available 60.000 to 80.000 hectares) would not only be advantageous as far as agricultural politics is concerned, but also highly recommendable for ecological reasons.

QUALITY

The quality requirements to raw flax have increased during the last years as a result of new spinning technologies and a demand for still finer linen yarns. Processing the Austrian trial crops realized the home-produced flaxes could at least partly be utilized. However, the top qualities harvested in Western Europe could not yet be achieved.

The climatical conditions for a reactivation of flax growing in Austria appear not to be unfavourable. However, the right soil and seed selection is of essential importance for cor-

* Director, LAMBACHER HITIAG LEINEN AG

responding outputs per hectare, but also correspondingly low fertilizing, adequate plant protection, proper time of seeding and harvesting, as well as the best possible date for ending flax retting. In addition to all these criteria also weather must cope with during the growing and retting stage. Beyond this also scutching of the flax straw is of decisive importance. Based on the above it can be said the flax fibre is by no means an easily cultured plant. The known diligence and the experience of the Austrian farmers should make it possible, however, to match the results of the French and Belgian flax growers. Economical success is, in fact, inseparably linked with the production of highest quality.

CHANCES FOR THE FUTURE

Flax as a cultivated plant (linen) is in fact a specimen for how the often implored "reconciliation between ecology and economy" can be realized and is at least partly realized nowadays:

1. Flax is known as the only European "naturale Textile Fibre" the cultivation area of which could be extended in territories of our continent.

2. Flax is reproducible, i.e. without any exhaustion of nature. This continously growing raw material offers big advantages with regard to the "CO_2 household" problem in comparison to fossile raw materials.

3. Flax even needs secondary soils, requires nearly no fertilization and is also of high advantages for crop sequence.

4. The production of linen from flax fibre is compatible to environment, since its production process is performed on a purely mechanical basis.

5. Linen and other flax productions are rotting without problems and thus cause no environmental damages or dumping contrary to many chemical fibres.

6. Linen is antistatic, is not fluffy, but very hygienic and with adequate treatment is distinguished by very long durability. Linen consequently should be given preferred attention as sanitary linen as a whole.

7. Taken from the topic of
   - availability in Europe
   - continuously growing raw material and
   - rotting without problems

   linen should be appield increasingly in the packing line and in other technical fields, in particular for post bags (as in the Federal Republic of Germany and in some West-European countries), package strings, crop binding yarns, ropes, sausages yarns, carrying satchels and other pakkings, etc.

8. An intensified application of flax raw material for the packing sector also for agriculture would provide the advantage that minor flax crops could still be utilized at relatively interesting prices.

9. Since synthetically produced packing materials must not necessary consider removal and environmental costs in connection with their use, they are much more competitive, as a matter of fact, compared with the natural products.

   On account of this fact an increased use of flax as natural raw material in packing (and only on this sector there are additional chances for a worthwile extension of the Austrian cultivation areas) will not be possible without "soft dictatorship".

10. AIM: It should be realized by transitory regulations on a generous scale in a high degree only rotting materials from grown materials (such as flax) will be used.

"FARMERS CREATE THE LANDSCAPE"
LANDSCAPE PROGRAM OF THE THISTLE ASSOCIATION

*Carl Manzano**, Lassee

The Thistle Association began its "Promotional Program for Ecological Strips on Arable Land" in 1987 in a town in Marchfeld, Lower Austria. Today the program encompasses seven additional areas in Marchfeld, Weinviertel and in the Lower Austrian Zentralraum and since 1990, new designed programs concerning the maintenance of "Agricultural Landscape" are implemented in seven towns in all four 'Viertels' of Lower Austria.

The starting point of all the endeavours of the Thistle Association was based on the following consideration: under the current economic, technical and social conditions, an agricultural landscape containing a large variety of species does not emerge on its own as a random by-product of farming, so to say. These positive effects which were previously a matter of course, must be brought about today. The Thistle Association developed the promotional program as an initial step in the search for passable ways.

The aim of the program is the creation of living space for a variety of flora and fauna in the intensive cultivated agricultural landscape. The ecological strips are 10 meter-wide field-strips on which the farmer "produces naturally". These new layouts of natural fields can serve different ecological purposes such as wild herb reserves short and long term fallow lands, a transformation of wet fields in meadows and dry fields in dry grass, and the expansion and 'debuffering' of existing ecologically valuable landscape elements.

One year farming contracts, which are made between the farmer and the Thistle Association, form the legal basis of the promotional programs. The farmer is hereby obliged not to build on the land but to take care of its new corresponding function. By doing that he receives a royalty of AS 4,000

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* Manager of "Distelverein", Verein zur Erhaltung und Förderung ländlicher Lebensräume

per ha, in addition to the green fallow premium[1] which is paid. This amounts to a royalty of AS 9,125 to AS 14,000 per ha according to the fertility of the field. The funds for the financing of the program originate mainly from the public coffers of the Federal Ministry of Agriculture and Forestry and the Federal Ministry of the Environment as well as from the Lower Austrian provincial government.

Certainly, the contracts are completed with the individual farmers. The Thistle Association consult the village communities because the development of the landscape can be carried out only under joint responsibility. The contracts are awarded only within the project area and the organization (eg. the organization of the contract assembly, marking of the fields, control over the keeping of the contract etc.) is taken over by the resident farmers.

Regular ecological experiments are an important basis of the promotional program. In cooperation with the existing scientific institutions, documents for the selection of new ecological strips which lead to the drawing out of different field maintenance and management proposal are acquired which are then entered into the contract.

In the eight project areas of the Thistle Association 200 contract parties participated in the promotional program. Nature is "created" out of ecological strips with a total area of 120 ha. The successes reveal: the new landscape elements bring variety and colour into the image of the landscape. According to scientific studies, a variety of rare plant species have moved into this living space and this could establish a positive effect on the stock size of wild life (eg. wild hares).

The promotional program of the Thistle Association has also contributed a new awareness for the worth of the landscape as living space: among the farmers in the project areas and also in the agricultural institutions and authorities. It was thus, possible to develop a practical model about how the set-aside program can be alligned with ecological objectives.

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1) The ecological stripes are registered in the set-aside Program (Green-Fallow Program) of the Federal Government. In the frame of this program a premium to the tune of AS 5,125 to AS 10,000 according to the fertility of the land is paid from the Cereals Fund when farm land is left fallow.

The experience gathered from the promotional program was introduced into the further development of the "Rural Landscape Management" program. In 1990, the concept of landscape management was developed in seven different natural and agricultural zones of Lower Austria, whereby specific farming and management measures were proposed. The urgency of the preservation of the ecologically valuable landscape elements and living space which emerged from traditional farming practices and whose further existence depends on the continuation of these activities was emphasized. A great part of the proposed measures will also be on the basis of farming contracts, in which farm support and performance royalty are consistent.

The Thistle Association, in partnership with the Lower Austrian Chamber of Agriculture, the Lower Austrian Nature Protection Alliance and the WWF, Austria, jointly try to solve ecological problems in the rural areas. The programs for "ecological strips" and the "Rural Landscape Management" are practically oriented models which show the future development of the agricultural landscape in Austria.

KOMET-SCREW OIL EXPELLERS FOR THE EXTRACTING OF VEGETABLE OIL BY COLDPRESSING

*W. Dimpker**, Mönchengladbach

INTRODUCTION

All oilbearing seeds (sunflower, sesame, rapeseed, linseed, cotton seed, tomato seed, poppy seed, mustard seed), nuts (groundnuts, hazelnuts, almonds, pecan nuts, babacu-nuts), kernels (palmkernels, cucumber kernels, jojoba kernels), and copra (dried coconut-meat) can be extracted by coldpressing on the KOMET double spindle or single spindle oil expellers of different sizes and with different capacities.

There is no preconditioning of the seeds required prior to the extracting process. Only big nuts, kernels, and copra have to be crushed to the particle size of peas on the KOMET cutting machine "System Crusher".

The vegetable oil yielded on KOMET oil expellers needs no refining, bleaching and deodorizing process, as long as the natural taste, smell, and colour will be accepted.

Generally, the sediments in the vegetable oil can be removed by pouring the oil from the collecting vessel into clean glass bottles after a rest of approximately 24 hours after extraction. During this time all the sediments, dust, and other impurities will have settled down on the bottom of the collecting vessel as a hard cake. In addition the clean oil may be poured through a paper or textile filter in order to remove the natural slime, too.

Since the vegetable oil will reach no higher temperatures than appr. 40 degrees C to 50 degrees C all the vital components will be preserved. Therefore it is excellently suited for natural nutrition. As long as the oil will be kept stored in dark and cool rooms, it will show an extraordinary long storage lifespan.

The KOMET oil expellers are not only utilized for the production of vegetable oil for human consumption, but also as a substitute for Diesel oil for operating Diesel motors. They open up new paths in finding alternative sources of continuously growing energy.

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* Deputy, IBG MONTFORTS + REINERS GmbH + Co.

The KOMET oil expellers will also often be utilized for extracting vegetable oil in small scale soap manufacturing factories.

The KOMET oil expellers are rigidly constructed and require a minimum of maintenance only. They will be operated easily even by unskilled people.

According to the requirements they may be operated by electric or Diesel motors drive, by pedal (bicycle-like) or by hand.

For the crushing of bigger nuts, kernels, and copra the KOMET cutting machine "System Crusher" has been developed.

TECHNICAL DESCRIPTION

The KOMET Screw Oil Expellers have been designed for the extraction of vegetable (edible) oil by cold-pressing. They can be used in laboratories, research and development departments and product control departments of oil mills as well as for the production of natural oil of high quality in small scale industry.

The input materials need no preconditioning as e.g. heating, steaming, roasting etc. Only big nuts, kernels, large pieces of copra, avocado chips etc. must be crushed to the size of peas on the KOMET Cutting Machine "System CRUSHER" prior to extraction.

Contrary to other well-known screw oil expellers, the KOMET Oil Expellers work with a conveying screw, not with a compression screw. Therefore, neither periodical grinding and sharpening of the press screws nor welding of the worn out threads, as are required for compression screws, will be necessary.

After having been fed into the hopper, the input material will be conveyed to the top end of the press screw without being squeezed and cut. At this stage no oil will be separated. It is only when the material has reached the top end of the press screw that it will fall into the gap between the top plate of the screw and the press head. The material is crushed broken. The oil then touches the hot press head for a moment and is slightly warmed up. As the viscosity of the oil is now reduced, it can flow back to the press cylinder and run out through the outlet holes of the press cylinder.

The most significant advantages of this system are
- the low exit temperature of the oil
- the extreme cleanness and
- the low proportion of sediments and impurities in the oil.

The sediments will have settled down to the bottom of the collecting tanks after a period of decanting of appr. 24 hours. In addition, the almost clean oil may be put into a centrifuge in order to remove the remaining dustlike particles.

The oil yielded by the KOMET Oil Expellers retains its natural character with regard to colour, taste, odour and consistency. Since the oil is extracted at very low temperatures, the unsaturated fatty acids, vitamines etc. remain undiminished.

The press cake emerges through the nozzles in the shape of hard rods. It may be used as a high-protein fodder for animals or as an outstanding natural fertilizer.

The oil extraction rate will reach up to appr. 85 to 90 % of the natural oil contents of the seeds and may be controlled by four means of regulation as
- the variable speed gear,
- the temperature of the press head
- the appropriate press screw and
- the best suited diameter of the nozzle.

These four parameters may be evaluated by empirical tests.

Training of the operators is not required. Nor is periodical maintenance or service by the supplier required. Repair work can be executed by any mechanic. Exchange of worn out parts does not require any technical knowledge, since these parts must be dissambled for daily cleaning anyway.

Parts that are subject to normal wear and tear are e.g. press screws, press heads, press cylinders and electric heating devices.

Foundation work or specific working areas are not required. The complete equipment may be set up on a table of profile steel structure, concrete, etc. In order to increase the productive capacity several machines can be installed side by side.

ADVANTAGES OF DECENTRALIZED VEGETABLE OIL EXTRACTION

1. This system creates job opportunities for people in villages and cooperatives in remote areas. Especially young unemployed people will no longer migrate from rural areas to the towns.

2. The presscake can be used in the village or in the cooperative for human nutrition, for feeding animals, as a high-quality natural fertilizer or as firewood substitute.

3. The required quantity of vegetable oil can be consumed on the spot.

4. If only the extracted oil is sent to refining plants, charges for transporting the oil-bearing fruits, kernels etc. can be reduced by approximately 60 %.

5. Even oil-bearing seeds that are only available in small quantities can be processed economically, if it is not a profitable enterprise to extract the material in large oil mills. A loss of raw material is thus avoided.

ADVANTAGES OF USING THE SMALL KOMET OIL EXPELLERS INSTEAD OF LARGE PLANTS

1. Extremely low investment costs.
2. No foundation required, little space occupied, low transport charges.
3. Extremely low electric power required; if necessary, the machines can be driven by Diesel-/vegetable oil motor.
4. The personnel does not require special training; even women and unskilled workers can operate the machines after a short instruction. Engineers, chemists, and electro-technicians are not required.
5. If several small machines are installed, the unemployment rate can be reduced.
6. If a breakdown occurs with a large plant, the complete production will come to a standstill.

ADVANTAGES OF THE KOMET COLD PRESSING PROCESS AGAINST VEGETABLE OIL EXTRACTION BY HOT PRESSING PROCESS AND CHEMICAL EXTRACTION

1. No pretreatment by e.g. roasting, flaking, steaming, extrusion required

2. All natural vital components like e.g. unsaturated fatty acids, vitamines, proteins, natural antioxydants/tocopheroles remain undimished in the vegetable oils
3. No treatment of extracted oils by e.g. refining, filtering by filtering presses, deodorizing etc. required
4. Cleaning and clearing of extracted oils effected by decanting/sedimentation within one or two days
5. Very long lifespan of oils due to natural antioxydants/tocopheroles
6. No drying/dehydrating process of oils required because moisture contents will be below 0,5 %
7. Presscake/pressmeal can be used for human nutrition, feedstuff for animals and as a natural organic fertilizer because of no contamination with overheat and chemical agents.

FIGURE 1: Komet-screw oil expeller

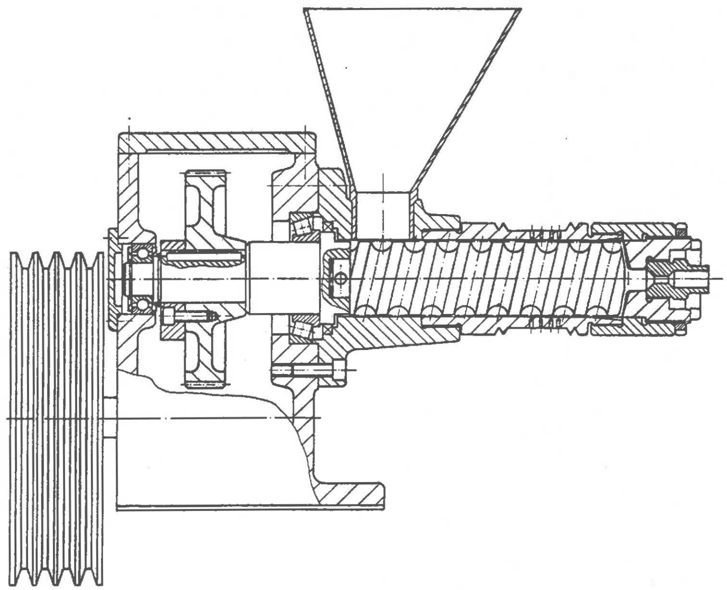

FIGURE 2: How oils are made

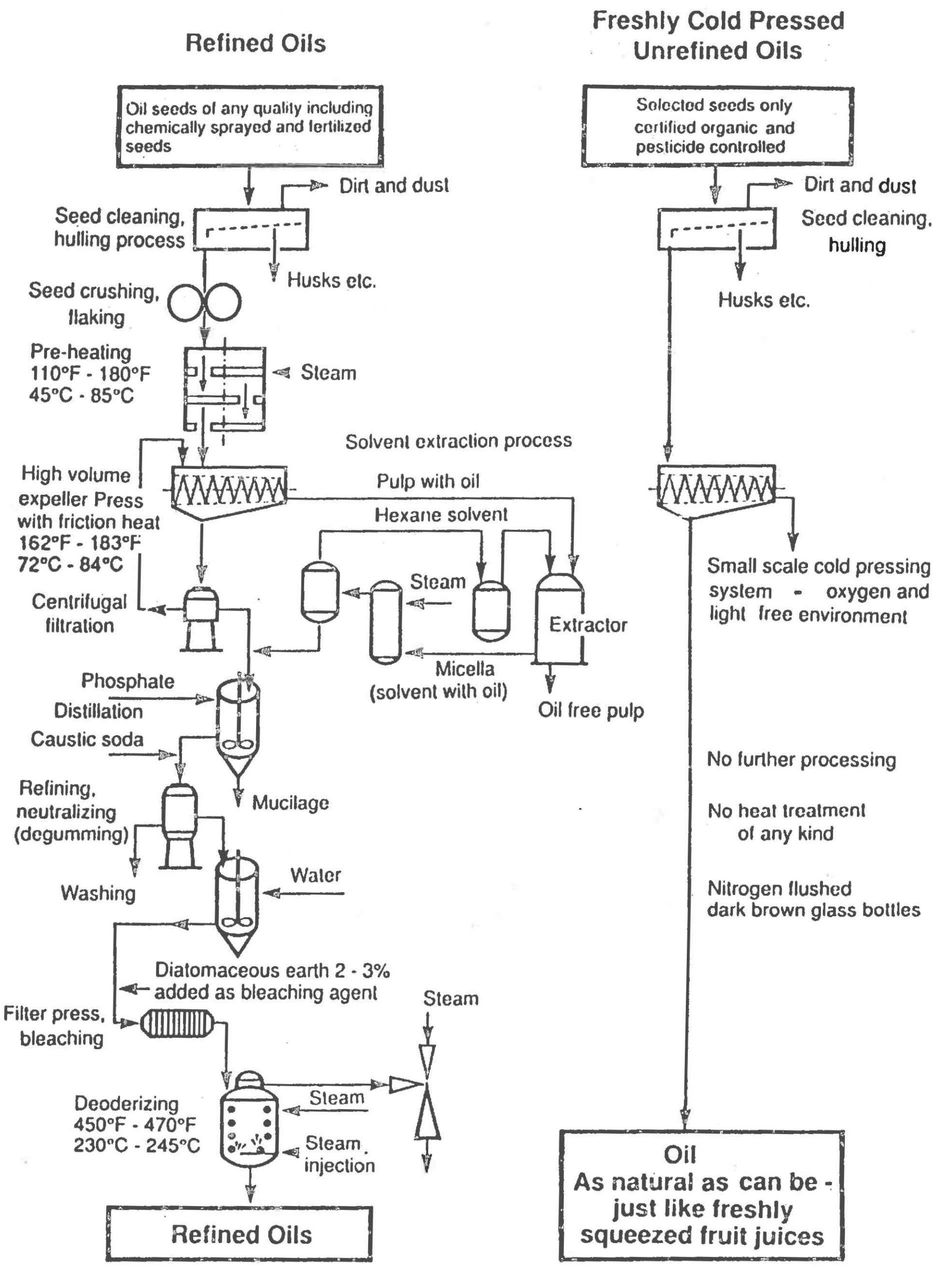

Chart courtesy of Flora Manufacturing Inc.

IV. EXCURSIONS Ознакомительные поездки EXKURSIONEN

1st EXCURSION (6.6.1991)

8.00	Departure, Graz-Raiffeisenhof.
8.45 - 10.00	Eichberg, farm of Karl Totter (Eco-diesel), Mureck, RME-factory.
11.00 - 12.30	Wies, Styrian Test Area for Special Cultures. Discussion with the farmer Johann Lampl (producing alternative plants).
12.45 - 14.15	Altenmarkt, lunch at the restaurant "Zur schönen Aussicht".
15.15 - 16.30	Piber, federal stud-farm, breeding of the Lipizza horses.
17.00 - 18.00	Ligist, long-distance heating plant with bio-mass.
18.15 - 19.00	Oberwald, farm of Franz Mörtl (member of the chip wood association).
19.00 - 21.00	Oberwald, dinner at the Hotelrestaurant "Enzianhof".
21.30	Graz - Raiffeisenhof.

March 1991

FARM DESCRIPTION

Karl and Maria Totter, Eichfeld 35, A-8480 Mureck

Manpower: 2 (farmer and his wife)
1 trainee
casual labourer for saisonal works

Functions and memberships of the farmer:

- chairman of the Southstyrian Energy- and Protein-Production cooperative (SEEG)
- chairman of the Land Consolidation Association Eichfeld
- chairman of STYRIABRID Porkproduction Association
- member of working group of Styrian Pumpkin Farmers
- member of the co-operative warehouse association Mureck

Function of the farmers wife:

- member of home economics council of the Chamber of Agriculture and Forestry

Areas:		Cultivated crops:	
0,42 ha	court-yard	60 %	grain maize
20,44 ha	fields (property)	8 %	winter grain
1,12 ha	fields (leased)	8 %	horse bean
0,22 ha	vineyard	16 %	rape seed for fuel
0,50 ha	gardens	8 %	oil pumpkin
7,10 ha	forest		
29,80 ha	total area		

Manure/ha/year:

50 m^3 pig semi-liquid manure
250 kg mineral fertilizer
1.000 kg mixed lime

Soil: Loamy sand, sandy loam.

Sea level: 241 m. Rainfall: 850-900 mm.

Temperature: 8,8-9,0°C average; 14,2°C vegetation period.

Livestock: 50 mother sows (large white x Pietrain); 2/3 of piglets for fattening on the farm, 1/3 for selling.
190 fattening places.
Selling system by STYRIABRID Porkproduction Association (death marketing - quality payment).

Mechanization:

Property: 70 HP 4-wheel-drive tractor with front loader, 3 tipping trailer, plough, combinator, semi-liquid manure mixer, fertilizer distributor, field sprayer, maize hoeing machine, hammer mill, grinding mixer, 3 grain endless screw, silage milling machine

Machine ring: drilling machine, single seed drill, combine harvester, manure spreader, wood chop machine.

Buildings:

Farmhouse: Kitchen, 2 living rooms, 5 sleeping rooms, office, 2 bathes - WC, dirt sluice, working room.

1 sow-house, 2 farrowing rooms, 4 piglets rearing rooms, 3 pig fattening houses, 3 synthetic silos (cob corn mix), grainstore, tool shed.

STYRIAN TEST AREA FOR SPECIAL CULTURES

8551 Wies 88

The Styrian Test Area for Special Cultures is an institution run by the Province of Styria, founded in 1965. The premises in Wies and its subsidiary in Halbenrain consist of various buildings, 5 ha of outdoor cultivation, 2,500 m² of heatable glasshouses and 1,000 m² of plastic tunnels.

The tests catering for the needs of small farms and horticultural enterprises comprise the fields of vegetable, drug and spice plant growing as well as floriculture. In vegetable growing, testing focuses on comparing new domestic and foreign varieties, while taking into account inner and outer quality as well as pest resistance, and examining the impact of our climate on new foreign varieties and, thus, their suitability for processing and fresh marketing. Optimal use of glasshouses and plastic tunnels vis-à-vis crop rotation and biological pest control are two more issues for testing.

With regard to floriculture, new varieties of cut and pot plants the cultivation of which involves less energy are to be developed. In outdoor cultivation summer flowers are tested on their climatic suitability. New varieties are examined in the course of the so-called "fleuroselect" testing procedure. New variations on multi-coloured balcony decoration are to be demonstrated.

Drug, spice and dye plants are tested for the cultivation on small farms. A "master garden" consisting of 140 small parcels provides a survey on all varieties to be cultivated. A farm garden shows the botanic range of a back garden.

The test results are published in an annual report issued by the producers involved.

FARM DESCRIPTION

Johann and Maria Lampl, Kopreinigg 34, 8544 Sulmeck-Greith

Family:	Farmer and his wife; 3 children (8-13 years old); Parents (64 resp. 68 years old).
Farm:	400 m above sea Agricultural area hilly to steep Member farm of the society "Schilcherlandspezialitäten" (= specialities from the land of "Schilcher" vine).
Areas:	9,20 ha agricultural land (property) 0,56 ha agricultural land (leased) 4,38 ha forest 14,14 ha total area
Cultivated crops:	1,0 ha wheat 0,8 ha oil pumpkin 0,8 ha silage-maize 0,2 ha medicinal plants (lemon balm, gold balm, peppermint, cornflower, marigold, sage) 0,2 ha pickled cucumber
Livestock:	9 cows (milk quota: 18.000 kg) 3 young stock 3 pigs 30 hens
Marketing:	For pickled cucumber contract with a cannery. Herbteas, pumpkin oil, bread via farmers market, dispatch by post and society "Schilcherlandspezialitäten"; ca. 10 % is sold on the farmer's gate.

Additional income: In harvest time driver of a combine harvester.

LONG-DISTANCE BIOMASS HEAT LIGIST

Rudolf Schriebl*

FROM OUR POINT OF VIEW

Because of the low-lying location of our hometown Ligist, the bad air-quality during the heating season has been felt more and more within the last years.

Because of this effect, the market-town Ligist, that is Mayor Kürzl and some private persons, started to look for possibilities to solve the problem.

After intensive talks and consultations with the interested population of Ligist, as well as with the wood-owners in our municipality, on 9th December 1985, the heating-company Ligist was founded as a non-commercial partnership.

Beside the possibility to produce heat on the basis of wood chips with a low content of harmful substances, the advantages of:
- the usage of a regional renewable raw-material
- the realization of the net product in the region
- the possibility to contribute to the security of the farmers' income
- the reaching of a low-cost and crisis-proof heat supply for the consumers

were of prime importance for the readiness of the ten partners to support this initiative.

In this difficult stadium we got special support and help from the Regional Chamber, Mr. Plank, graduate engineer.

The supply of the heating plant with wood chips in the range of presently about 3,000 cubic metres is ensured by the size of the wood, owned by the partnership, which is about 800 hectares. The Forestry Authorities of the Order of the Knights of Malta is an essential and important partner in the partnership.

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* Head of works council Heating-plant in Ligist

From January to March 1986 was the period of intensive work on the planning of the project. At present 89 consumers are supplied with heat from the Ligist heating plant.

This large amount of consumers shows obviously the correctness of a short-distance heat supply system for Ligist, but also documents the readiness of the population of Ligist to contribute to the amelioration of the air-quality by a heating-filament terminal.

In order to make further terminals possible at a later time, it was decided that the capacity of the network should be 2.5 megawatt.

In the heating period of this year the need of the objects being supplied was 1,654 kilowatt.

The total investment costs of the project, which was planned by the technical office Otter from Graz, are 14.8 million shillings.

A reduction of this sum could have been reached by the installation of pipes with a lower capacity. Because this project is a trend-setting alternative for ecologically benefical production of energy, in the end, although the costs are higher, the decision was made for dimensions which correspond with the needs of the future.

DESCRIPTION OF THE HEATING COMPLEX

1) Long-distance supply network

For the supply of the central area of the municipality of Ligist with low-temperature heat (maximum 95°C flow temperature), a network with a total line length of about 3,200 m is planned. The pipeline consists of medium-carrying steel pipes, nominal width from 25 to 125, with a polyurethane foam case and a water-dense lagging of hard polyethylene. The pipes are normally delivered in bars of 6 or 12 meters and welded one to the other in the area of the pipe trench. The tested welds are isolated (by welding) on the spot, according to a system which has been used for the first time in Styria. In total 89 consumers, who use up a total heating capacity of about 1,554 kilowatt, are included.

In order to definitely fix the position of a possibly-occuring pipe breack, a seepage warning and a locating device are installed in the pipes.

2) Heat production

Directly at the bypass of the municipality of Ligist is located the heating station, which includes a fuel-store with an automatic delivery device, a heating room and a common room. The heating plant is fully automatically supplied by a feeder with biomassfuel that is burned in two boilers.

The boiler's main construction is principally devided into two units:

- a combustion part
- a heat exchanger part.

The combustion part consists of an automatic fuel feeder (cone to transport the fuel into the oven), a combustion grate with the necessary primary and secondary ventilators and a chamotte case.

The heat exchanger unit, in which the hot flue gases flow through the smoke tubes, conveys the contained heat energy of the combustion gases to the surrounding water case and is further connected with the long-distance heat supply network. Undisturbed work is granted by a safety apparatus, signalling fire detectors, sprinklers, automatic valves for the exclusion of air, and cyclone filters. The necessary additional sets, such as transporting pumps, shut-off fittings, main heat counter, water treatment unit and expansion unit, are also installed in the heating room in close proximity to the boilers. The waste gases are carried off through two steel chimneys over the roof. Between the boiler and the chimney there are an adequate dust-removing plant (ash box) and a cyclone filter.

3) Consumers' network

For the registration of the delivered amount of heat and for the regulation of the right water amount for the consumers' network, a so called delivery station is used. This is connected with the heat exchanger unit, in which the water streams of the long-distance heat network and the domestic network are devided.

4) Extension possibilities

The long-distance heat network is planned for a total supply capacity of about 2,500 kilowatt. In the heating house two boilers with a capacity of 2,500 kilowatt are installed. It is thus possible that all the objects in the area of the municipality of Ligst are supplied with heat.

The comparison of emissions refers to measurements in the heating station of Ligist. The basic data used originate from the year 1986. The comparison confirms the fact that the same quantity of energy, that is about 2 million kilowatt hours, which in the heating period of 1989/1990 were produced in the heating station, in the past were produced at 60 % of extra light heating oil and at 40 % of coal and wood in separate furnaces. Due to the supply of presently 89 consumers with heat from the biomass heating station, every year a decrease of the harmful emissions of about 90 %, in comparison to the emissions, which would have occured at the production of this energy of heating oil and fuel in solid condition, has been reached.

CHRONICLE FOR HEATING STATION IN LIGIST

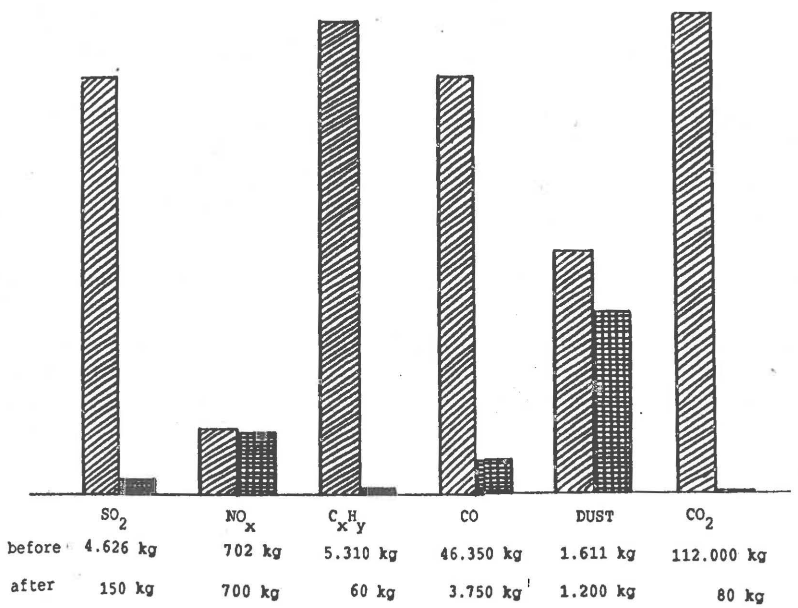
1986 foundation of the heating company as a non-commercial partnership - 10 partners, Head of Works Council and initiator: Rudolf Schriebl, Grabenwarth 3
40 consumers
Installed capacity of the boiler: 1 megawatt

1989 Installation of the 2nd boiler with 1.4 megawatt
Enlargement of the existing heating house

1990 89 consumers
Pipe length: about 6.5 km pipeline
3.25 km line length
Energy production: about 2.2 million kilowatt hours
Wood chip requriement: about 3,100 cubic meters of bulk goods

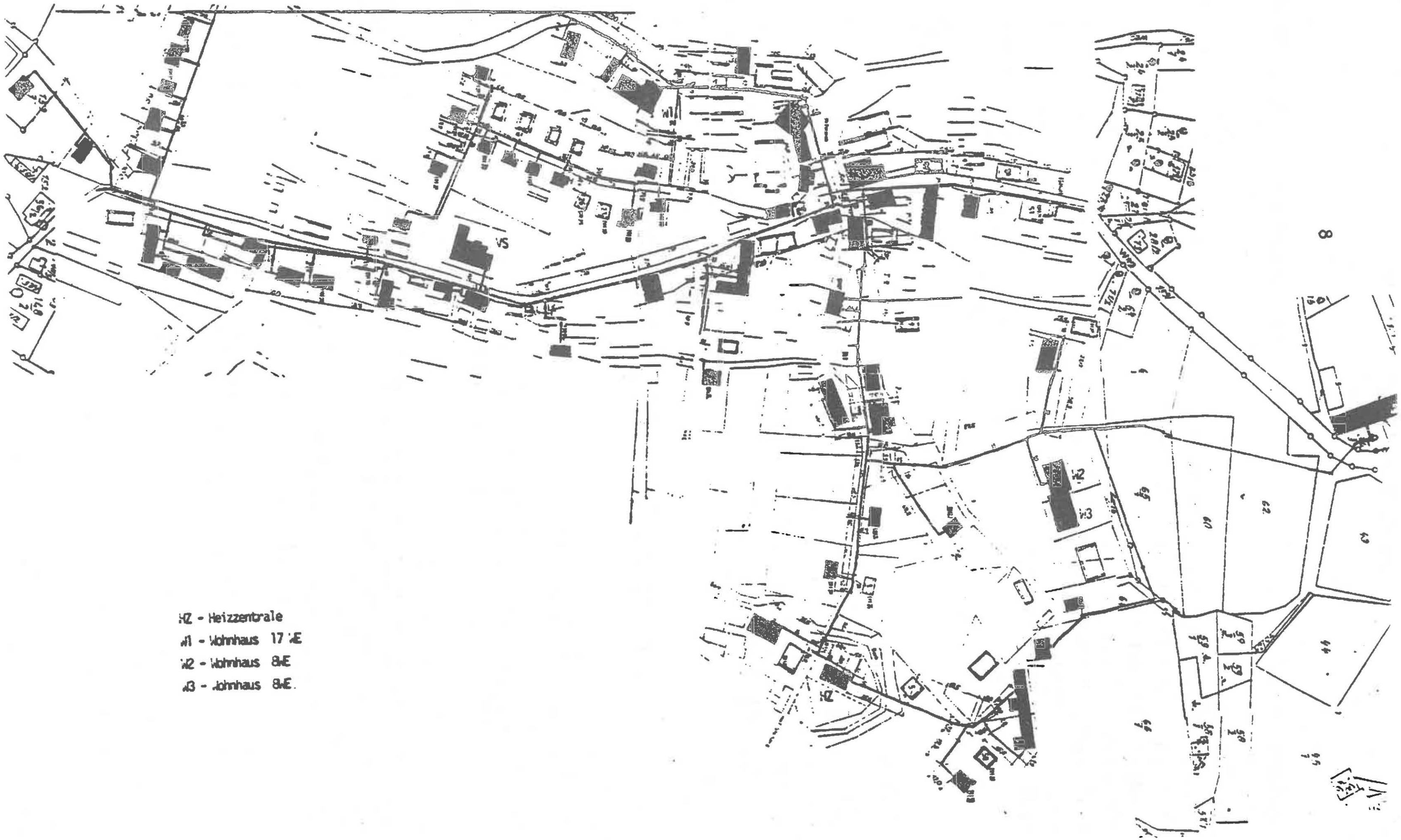
Ligist, 11th April 1991

TABLE 1: Comparison of emission long distance heat Ligist



The comparison of emission is based on measuring at the heating station Ligist in the year 1986. Than it was assumed that the energy volume of 2 mill. kWh, produced in the heating period 1989/90 by the heating station, came for 60 % from heating oil light and for 40 % from coal and wood in single heating appliances. By the supply of 89 consumers of heat produced by the biomass heating station the emission of noxious substances could be reduced for 90 %.

FIGURE 1: Leitungsnetz - Biomasse Heizwerk Ligist



LONG-DISTANCE HEAT SUPPLY
LIGIST

Project costs	in thousands of Shillings
Ring circuit	ATS 4,184
Trench and reconstruction work	ATS 2,228
Heating station (boiler, pumps, expansion unit)	ATS 3,997
Converting stations	ATS 960
Building measures, see plot of land	ATS 2,776
Planning costs	ATS 564
Heat quantity counter	ATS 287
Total	ATS 14,996

Financing

Own resources, capital and reserves	1,795
Agrarian investment loan	7,256
Direct support from the Regional Chamber	4,210
Connection costs	1,735
	14,996

COSTS OF A HEATING-FILAMENT TERMINAL

A) Single-family house:

Connected load: 12 kilowatt á ATS 1,900	22.800,-
plus 20 % value added tax	4.560,-
	27.350,-
Less direct subsidy of the Styrian State	- 25.000,-
Real own expenditures	2.360,-
Cost of the converting station incl. installation, about	35.000,-
Total costs therefore about	37.360,-

B) Flat:

Connected load: 10 kilowatt á ATS 1,900	19.000,-
plus 20 % value added tax	3.800,-
	22.800,-
Less direct subsidy of the Styrian State	- 10.000,-
Real own expenditures	12.800,-
Proportional costs of the exchanger station, about	15.000,-
Total costs therefore about	27.800,-

When the total costs are financed by loans, additionally a subsidy in the amount of 30 %! of the corresponding half-year annuity is granted by the State of Styria.

Biomass heating company of Ligist

FARM DESCRIPTION

Franz and Friederike Mörtl, Oberwald 60, 8563 Ligist

Fulltime farm. Mountain farm, zone II.

Manpower: 1,5 (farmer and his wife). In the household there are living also 2 children and 2 elder persons.

Areas:
3 ha fields (maize for ensilage, barley, grass-clover)
6 ha grassland
21 ha forest
30 ha total area

Livestock: 10 cows (5.200 l milk/cow/year)
10 young stock in the average
Female calves are raised for replacement and for auction (breeding farm); male calves are sold for fattening.
Pigs and poultry only for self-sufficiency.

Farm income: Rank by importance: milk, wood, livestock.

Chip wood association: Member since foundation (1986).
Members of the chip wood association are the Maltese forest administration (50 %) and 9 farmers (50 %).
Portion 7 % (= delivery right = apr. 300 cubic metres chip wood).
According to tax regulations it is allowed to buy 25 % of the value at most - this is about 50 % by volume (because of the price difference of chip wood between purchase and sale). About 150 cubic metres are delivered to the long-distance heating plant from his own forest (thinning, rearing- and waste wood).

Chip wood is prepared by two shredders, one owned by the Maltese forest administration and a cooperative machine owned by 40 farmers (8 of them are members of the chip wood association).
The farm house is heated by chip wood.

2nd EXCURSION (8.6.1991)

8.00	Departure, Graz-Raiffeisenhof.
8.45 - 9.45	Niederfladnitz, estate Gudenus (long-distance heating with wood chips, grain drying). Krottendorf, field trial for willow, alder and poplar.
10.15 - 10.45	Großwilfersdorf, farm Hammerlindl (flax grower).
11.30 - 12.30	Güssing, RME-factory.
12.45 - 14.00	Heiligenkreuz, lunch at the restaurant Gibiser.
14.15 - 15.15	Loipersdorf, Golf courses and discussion with the involved farmer Müller.
15.45 - 17 30	Riegersburg, guided visit of the castle.
18.15	Graz - Raiffeisenhof.

FIELD TRIAL KROTTENDORF

Dipl.-Ing. Edgar Unteregger

Site description:

sealevel	405 m
mean annual precipitation	860 mm
mean annual temperature	8,4°C
vegetation periode	March, 25 - Oct. 11

Soil: alluvial soil - clay, sandy clay
groundwater-table 60 - 80 cm
bad to moderate supply in P and K
ph-range 6.8 to 7.2

The trial is divided into three parts:

1. Northern part - willow spacing and rotation experiment
2. Centerpart - alder fertilizing experiment
3. Southern part - poplar clone testing experiment

Willow:

Trial established: April 1982
design: 48 plots in 12 variants = 4 repetitions for each variant
3 blocks with different spacing
2 willow clones
2 rotations
plot size: 160 m²

Results: (1989) Highest yield after eight growing periodes 84 t/ha or 10.5 t/ha/y. This was the result of an 80 cm x 50 cm spaced plot planted with clone 4/69 T (Salix viminalis - smithiana) and harvested after the fourth and eight growing period.

Alder:

Trial established: April 1983
design: 15 plots in fertilisation variants
8 plots fertilized, 7 plots not fertilized
plot size: 175 - 400 m^2

Results: Not yet harvested.
(1989) Estimated highest yield
in fertilized plots: 4.9 t/ha/y (1990)
in unfertilized plots: 4.2 t/ha/y (1990)
(no significant difference between fertilized and unfertilized plots)

Poplar:

Trial established: April 1983
design: 20 plots in 5 clone variants = 4 repetitions
plot size: 400 m^2

Results: 1989 not yet harvested.
(1989) Estimated highest yield in Oxford-clone plots:
10.3 t(ha/y.

In February 1991 all plots were cut down. The calculated results will be presented during the field trip.

THE BIOTHERMAL HEATING PLANT AND CEREALS DRYING EQUIPMENT OF "THANNHAUSEN" FARM ESTATE

The farm estate in Thannhausen which belongs to Mr. ERWEIN GUDENUS covers an area of about 1,996 hectars. Out of this area 1,875 ha is forest land, 108 ha agriculture (out of this 55 ha own land and the rest is leased land or game pastures within forests). The remaining acreage consists of buildings and other sites.

Alongside this is a forest sawmill which manufactures to about 4,300 cubic metres (cbm) of wood in recent years.

Due to the fragmentation of the land and also partly to the inconvenient adjustment of the management technique and labour, it is relatively difficult to run the farm as compared to other farms of the same size. Except of three small exclaves, the farm consists of three disjuncted complex parts with an inconvenient shape.

The personnel consists at the moment of one forest ranger, one sawmill foreman and one sawmill employee, one farm manager and two office employees; seven lumberjacks, four sawmill-workers of our enterprise and one on the farm complete the labourforce.

The total fellings amounted on average to 10,350 cbm during the last ten years; out of this 2,420 cbm are sold as harvestable stock of timber - that is why the total volume of timber felled was 7,930 cbm. Because of the current improvement of accessibility (forest streets, about 45 m/ha) the share of pre-harvest use could be raised in the last six years (1986 and 1987 this proportion was exactly 30 %). Due to the situation of the timber market this level could not be sustained in the last three years. Up to a few years ago the harvest took place necessarily as "clear cutting"; - now small-scale deforestation and edgewise harvesting as well as "Plenterungen" are used. The ultimate aim is to be able to work in natural regeneration and further raise the felling after having finally improved accessibility (still ca. 15 km).

The main types of timber are: predominantly spruce with larch, pine, fir, red-beech as well as marketable maple, oak, black fir and ash; the elm was almost extinct in the last years - the number of firtrees decreased esp. in the middle age group through current dieout.

Environmental damages in the forest, are ascertainable especially on slopes with west and north exposition (tree-top damages, needle decolourization, attack from drought).

The farm consists of about 55 ha of own land, out of which an area of 45 ha is ploughed; 10 ha is used for pasture. The arable land is used by a four-year crop-rotation: maize (two years) - cereals (one year) - rape seed (one year); all together 22 ha maize, 10 ha barley, 3 ha wheat, 10 ha rape seed.

There was animal breeding (stock farming) up to 1964 but due to increasing personal costs a switch to arable farming took place.

The preservation of many farm buildings including the castle develops a great problem. At the beginning of the 70's oil central heating systems were installed in Thannhausen and the "Maierhof" (offices and duty homes).

The constant rise in oil costs (with the associated drying costs of maize) and the problem of waste management (bark in the saw mill) led to the investment of a bio-thermal heating system with attached cereals dryer and remote heat network to the single farm objects and finally to Thannhausen Castle.

The plant was built in 1983 with a total investment of 2,5 million shillings. Later the remote heat network was extended. The tank is Austrian made with an installed capacity of 750 kW. The fuel loading is hydraulic and completely automatic. The plant is capable of burning wastes with high moisture contents and a small degree of fragmentation (4-6 cm), especially bark and chopped bush. The material is initially warmed in a preheating zone before it is passed on into the combustion chamber (see illustration). To attain an optimal combustion at high temperature, the fire-box is lined with fire bricks and the combustion gases are blown in by an airpipe.

The fireroom is designed in such a way that the material is first dried in a drying zone and then ignited together with the combustion gases.

The combustion accurs over stair- and planrost. The flame is led into the raised smokepipe-heat exchanger and there gives off its heat. The cooled exhaust gases are passed through a dust extraction chamber in the chimney.

The remote heating network provides the following units:

- Maierhof buildings: Estate management & 2 duty homes
- Cereals' dryer
- 3 Workers quarters
- Thannhausen Castle
- Thannhausen Local Authority.

The up to date performance of the heating system (heating and warm water) is about 350 kW.

When heating and drying together take place, then the plant becomes fully loaded. The cereals' dryer is a tower-circulating-low temperature drying equipment with air temperature of about 55 - 65 °C (ventilator; pre-heat exchange with water temperature of 80 - 90 °C).

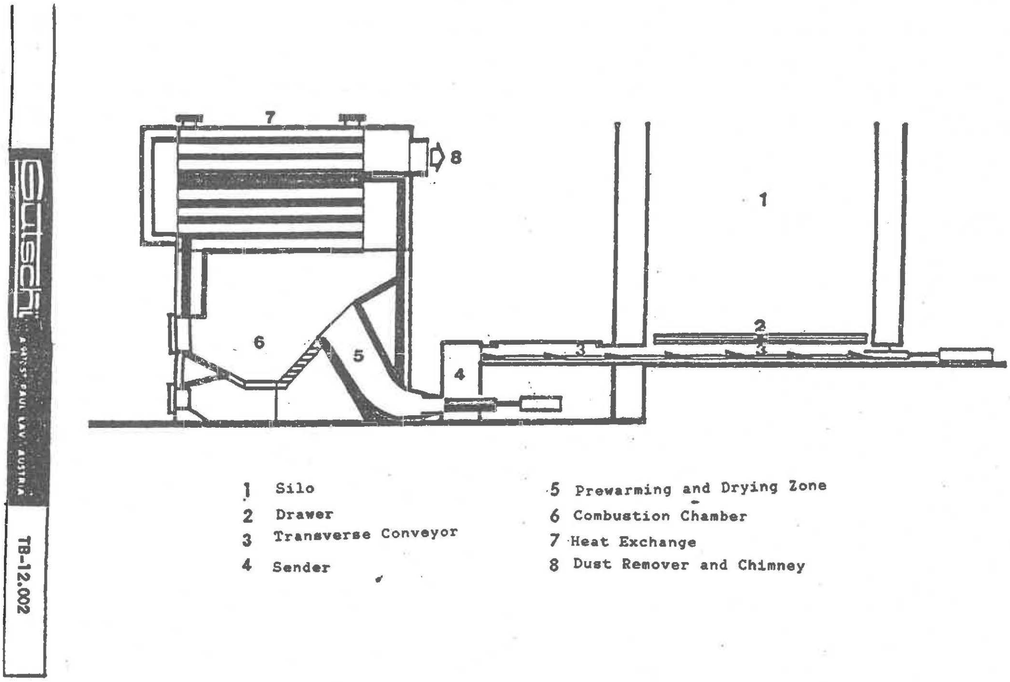
The tower dryer's capacity is about 16 tons of wet maize. The duration of drying is about 10 hours at a humidity of 30 %; therefore the fuel consumption is about 6 cbm of bark.

The fuel consumption is on the average 1,100 cbm of bark per year (for the complete system, i.e. remote heating and dryer). In comparison with the heat capacity of heating oil, 14 cbm bark replace 1,000 l fuel oil.

Due to the lower drying temperature, the quality of the dried maize is very good, the plant bud is preserved, the hectoliter weight is high and as such was sold at a favourable price in the previous year to the starch industry.

With the fluctuating oil prices, the further distance of the remote heating network and the high investment costs, (which are entirely from private capital without subvention) we anticipate an amortization period of 10 years.

FIGURE 1: Scheme of the heating plant



FIBRE (Flax)

In view of the enormous surplus in the food and feed sectors, the production of renewable agricultural raw materials for industrial and technological purposes is increasingly gaining importance and offers more market opportunities for the farmers. In this connection, the cultivation of flax offers such an opportunity.

Production Process

The fibre (Linum usitatissimum L.) is cultivated extensively between the end of March and April 20, on nitrogen deficient soils in Styria. Out of every seed, develops a stem which normally attains a height of 70 to 100 cm and a thickness of about 0.9 to 1.4 mm. The flax fibres used in textiles manufacturing is found between the bark and the wood as vasular bundle. The fibres are only of technological value when they are found in the part of the stem where there are no branches.

In Styria, the harvesting period is between early to mid July. Normally the flax is up-rooted and placed exactly in ridges. The roasting process lasts 3 to 5 weeks according to the weather. Generally, roasting is the process whereby the fibres in the stem are set free from each other through biochemical transformations by micro-organisms (bacteria and fungi). It is advantageous when wet and dry weather alternate within short periods and the daily formation of dense dew occurs so that the growth of the micro-organisms required for the roasting process would be promoted.

At the end of the roasting process the flax is pressed open into bales at a humidity of 12 to 15 %. The weight of the fibre after the roasting process is about 6,000 kg per ha, on the average in Styria, and can fluctuate between 3,500 and 8,000 kg per ha.

The total fibre yield fluctuated between 14 and 23 % in 1989 and gave about 700 kg long fibre and 700 kg short fibre at higher yields. The prices of the different parts vary and depend very much on the quality, especially in the case of the long fibre.

Market Situation

The common problem with all production alternatives - the enormous price fluctuation of raw materials on the world market - was in the case of flax particularly aggravating. For example, in 1987 the average price of the long fibre was about AS 32.-- per kilo and AS 13.50 per kilo for the short fibre.

In 1990, however, the average price for III. grade long fibre was AS 14.-- and AS 22.-- for I. grade. The average price for the short fibre was only between AS 1.50 and AS 2.-- per kilo tow in the same period.

Apart from these price fluctuations, the risk of the cultivation, especially with regard to the danger of decay during the roasting process is comparatively high. In the cultivation season 1988/89, a greater proportion of the harvest was completely lost through decay due to wet weather during roasting under dew conditions.

In order to minimize the risk as much as possible, the "Styrian Flax" (Styrian Flax Growers Cooperative) tried to obtain higher prices for the lower quality flax, especially the short fibres in an effort towards direct marketing.

The lower quality fibre is processed into rough farmers linen which is sold at AS 249.-- per meter.

A second possibility of the direct marketing is to process the short fibre into different fleece types of various strengths and, for example, in the building industry as protective and insulating material or as sound-proof material in the building of bodyworks. A further possibility for improving the low quality fibre is its processing into cords and further use of these cords instead of polyethylene cords during the pressing of straw. When round bales are to be pressed out, the cords can easily be used, but not under high pressure press due to the probability of a very low tensile strength. Through these different ways of improving the quality of the short fibre, the flax farmer should be garanteed a price of AS 10.-- to AS 15.-- per kg tow in the future in order to secure a higher profitability in flax farming.

The long fibres are then sold to the domestic spinning-mills to be further processed into high-value tissues for the manufacture of textiles. At the moment a large amount of flax from France, Belgium and Holland are used in the Austrian spinning and weaving mills. The production of flax in Austria is to a certain extent expansible, whereby at least the domestic requirements for flax should be covered by domestic production.

Extent of Flax Production in Styria

The area of land cultivated in the 1990/91 season was about 230 to 250 ha in the Pausendorf/Spielberg vicinity. Out of this, 18 ha were in East Styria and 30 ha in Burgenland. The rest of the cultivated land was found mainly in Upper Styria and partly in Salzburg and Carinthia.

FARM DESCRIPTION

Herbert Hammerlindl, Radersdorf 39

The farm was bought in 1957 by the parents of the present farmer with a total size of 75 ha (thereof 49 ha agricultural land and 26 ha forest). The ploughed land was 18 ha (maize and grain) and the rest was grassland for cattle breeding (50 cattle thereof 17 cows).

In 1968 a change took place. Cattle breeding was given up and the farmer started with 40 mother sows. 200 piglets were fattened on the farm and the rest of the piglets were reared to be sold by a "piglet ring". In 1976 pig fattening was stoped and the number of mother sows were increased to 75 heads.

In 1975 a farm of the Sovereign Maltese Knight Order of 50 ha was rented. In 1978 about 4 ha had to be sold for the foundation of an industrial zone. At the time the farm works on 122 ha.

Areas:	Cultivated crops:
45 ha agricult. land	74,4 ha grain-maize
26 ha forest	16,0 ha grain for seed production
71 ha property	2,0 ha flax
51 ha agric. land leased	1,0 ha soja bean
122 ha total	0,5 ha oil pumpkin
	0,3 ha horse beau
	0,3 ha rape seed
	1,5 ha grassland
	96,0 ha agricult. land

The farmer tends to enlarge the cultivation of alternative crops (flax, soja bean and horse bean) in the future.

Mechanization:

3 tractors (175, 110 and 90 HP),
1/3 vacuum cart, field combination, circular spike harrow, seed drill, pneumatic planting machine with paired row sprayer, hoeing machine with paired row sprayer, sprayer, drying installation.

Manpower:

1,7 (farmer and his wife)

GOLF LINK IN LOIPERSDORF

The golf link is managed by the golf club of Fürstenfeld, which, after three years of discussions and preparations, opened the course for visitors in January 1988.

Area: The 18 hole link of 68 hectares, which formerly were agriculturally cultivated, is leased from about 40 farmers. The areas are located in the municipalities of Gillersdorf and Dobersdorf.

1 % of the total area is covered by greens (which are intensively cultivated, permanently mown, intensively fertilized and from which the grass is removed).

1/3 of the area is covered by courses. They are mulched without fertilization and weed control. 2/3 of the area are still in their original state.

Agreement: A thirty-year lease was concluded with the farmers. The rent was 8,500.-- ATS/hectare when the agreement was concluded. Its value is stable.

A special problem had to be solved because of the different tax situation in connection with the agreement. Because a golf course is not an agriculturally cultivated area, this land in the rateable valuation is valued with the customary market value. That means that the rateable values per hectare increase from about 10,000 to 15,000 ATS up to 500,000 ATS. Thus the land tax, property tax, land value tax, sales tax, death duty and donation tax proportionally increase. Besides, the future pension of the farmer is diminished by the decreasing amount of agriculturally cultivated farm land.

The leaseholder in the agreements (golf operating company) agreed to refund to the farmers all tax and pension losses. The municipality took over the liability for deficit.

Effects: Loss of the agricultural production on 68 hectares.

Employment of about 10 persons of the region (further also three golf teachers) and occasional employment of 3 more persons directly on the link. 4 of the employees are farmers.

Creation of further jobs in the neighbourhood in tourism and connected business branches.

New income possibilities for agricultural firms (leasing of high-quality rooms, snackbars, direct commercialization).

Increase of the economic power in regional municipalities.

Decrease in the number of commuters.

FARM DESCRIPTION

Rudolf Müller, 8282 Gillersdorf 19

Before the foundation of the golf links the farm had a size of 15,6 ha, thereof 13,2 ha agricultural land and 2,4 ha forest. The farm was run as a fulltime farm. The agricultural land was divided into 11 plots in a range of 4 km distance. In 1976 the village Gillersdorf was included into a land consolidation and the number of parcels was reduced to 6. On the ploughed land 80 % grainmaize and 20 % grain were cultivated. The main livestock was beef and in some extend also pork.

The farm owner was educated at the agricultural school Hatzendorf in the years 1975 and 1976 and following at a technical school for bricklayer. In 1988 he took over the farm from his parents but because of the small size of the farm and the unsufficient agricultural income he was forced to stay in his profession as bricklayer (weekly commuter). In 1987 the contract was signed with the Golf Association inc. Loipersdorf and he let on lease 6,5 ha agricultural land for 30 years. At the same time he got the possibility to be hired by the Golf Association.

At the time the farm owner attends a special course for greenkeepers to improve his position in his new part time profession; the course is offered by the Chamber for Agriculture and Forestry in Styria at Graz.

By this unexpected changes coming from golf livestock was reduced to a minimum (self-sufficiency). On the arable land (reduced to 6,7 ha) the cultivation of alternative crops was enlarged (1,6 ha rape seed and 0,5 ha horse bean); the rest is used for grain-maize and grain.

Mechanization:

Agricultural machines and tools are modern and in good conditions. He owns: Tractor, manure spreader, plough, harrow, seed drill, 1/5 vacuum cart, pick up cart, crushing mill.

Persons:

1,4 manpower (farmer and his wife). In the household there are living also 2 children (6 and 2 years old) and the retired parents of the farmer.

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