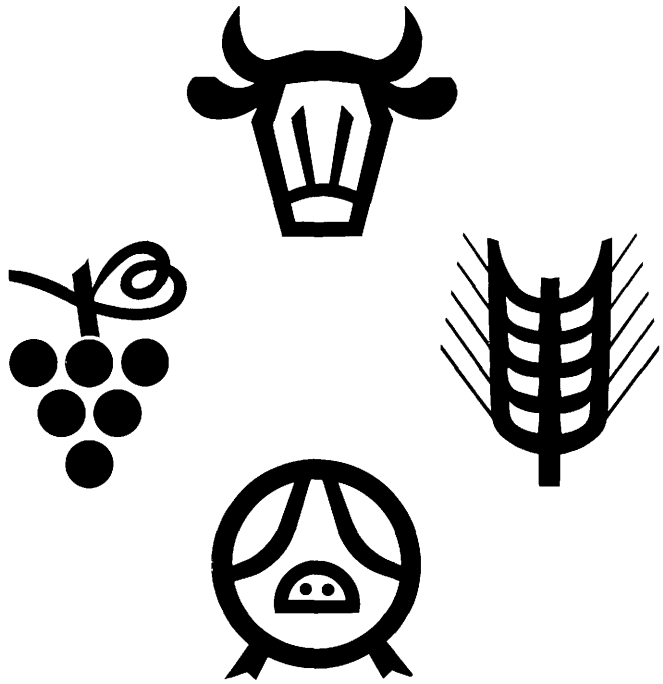
COMMISSION OF THE EUROPEAN COMMUNITIES

Information on agriculture

Effects on the environment of the abandonment of agricultural land



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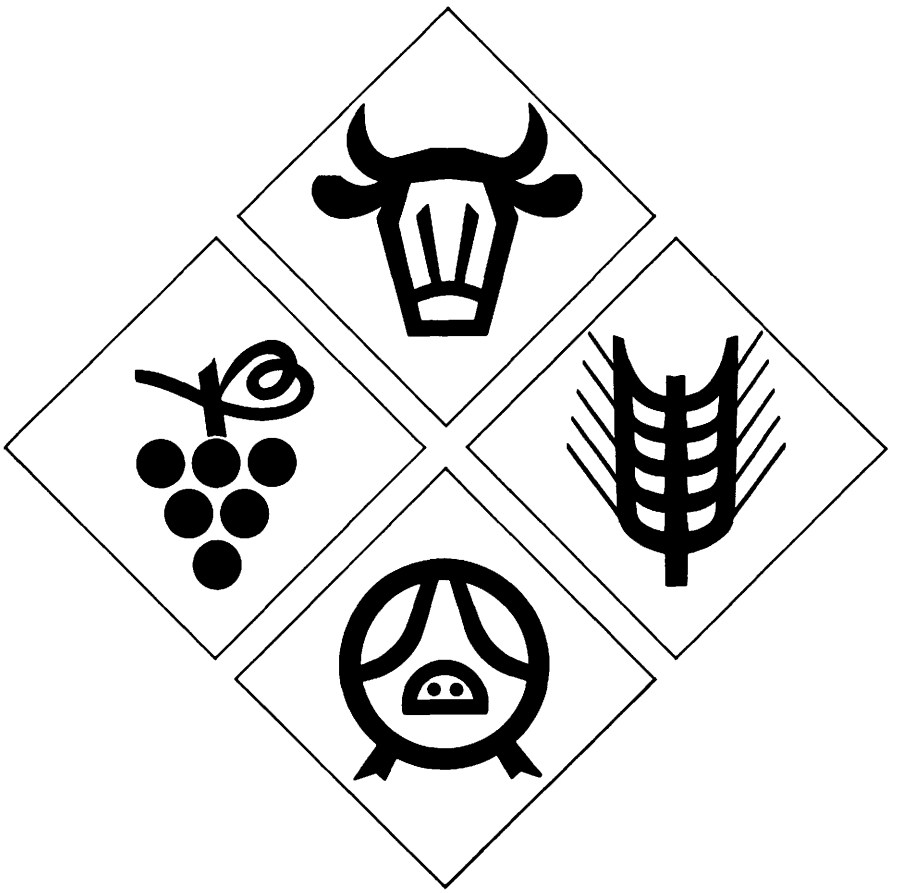

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FOREWORD

The study "Effects on the environment of the abandonment of agricultural land" was carried out as part of the study programme of the Directorate-General for Agriculture of the Commission of the European Communities.

It was prepared by the Landeskultur Company Ltd. of Bremen (Project management by Dr. L. Czinki) and elaborated by

Dr. W. BÜHNEMANN (preparation of contents)

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The Divisions "Balance sheets, studies, statistical information", "Agricultural Production Stuctures and Environment", "Social structure in Agriculture and Landownership Questions and Forestry" of the Directorate-General for Agriculture, as well as the Division "General Studies and Environmental Improvement" of the Environment and Consumer Protection Service took part in the work.

The study could not have been carried out without the manifest support from national services as well as from experts from business and science. Grateful thanks are extended to all these bodies. Special thanks are due to the following experts who gave their considered comments on a previous draft of the report :

Miss A. COLEMAN, London

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Dr. W. SCHMIDT, Göttingen

Mr. D. FAUDRY, Grenoble

Prof. F. LECCHI, Milan

Dr. D. CASATI, Milan

Dr. E. MANNI, Rome

Dr. S. SALVATICI, Rome.

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x x

The present study does not necessarily reflect the opinion of the Commission of the European Communities and does in no way prejudice its future standpoint on this subject.

Original : German

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1. TERMS OF REFERENCE

In some regions of the European Economic Community, poor natural conditions for agricultural production and/or unfavourable factors related to the structure of agriculture create a tendency for land formerly used for agricultural purposes to be left to return to an uncultivated state. In many cases this trend has proved to be disadvantageous from the viewpoint of countryside management and environment policy, especially since the negative effects can also have a direct influence on the tourist industry and other economic and ecological factors.

There is still very little information available on the extent and trend of development of letting agricultural land revert and on its consequences and possible measures for preventing the undesirable reversion. For this reason, in October 1976 the Directorate-General for Agriculture of the Commission of the European Communities requested the Gfl in Bremen (Gesellschaft für Landeskultur) to carry out an investigation of the problems.

The essence of a study of the reverted land problem was interpreted as being an assessment of existing experience on the basis of available research results and a description of the environmental effects on a range of different sites.

In addition to a detailed analysis of the literature, the main task to be undertaken in order to achieve this end was an evaluation of current research in Member States on countryside management, particularly in relation to ecological indicators (changes affecting vegetation, soils, climate, fauna and water conservation and their interrelationships) and to the potential value of various different methods of cultivation. Both the positive and the negative aspects of reverted land were to be dealt with on a uniform and geographical basis.

2. METHOD

The method of approach was determined largely by the nature of the terms of reference.

a. In each Member State, Gfl staff consulted institutions which are well-informed on the state of knowledge concerning reverted land problems in the country in question. With the aid of a list of topics approved by the Commission of the European Communities, individual aspects were discussed with scientists and official representatives. In some cases the experts consulted were also prepared to provide comments in writing.

b. In addition to personal discussions, the literature dealing with reverted land problems was evaluated with the aid of a check-list, particular importance being attached to an analysis of the statistics, maps, papers and extensive "background literature" which exist over and above the standard publications.

c. Reports on the discussions with experts and on the keyword-based evaluation of the literature have been arranged by country and topic, and both concurring and conflicting statements are compared. Each section carries a concluding comment expressing the opinion of the authors.

The scientific analyses which form part of the study had to be based predominantly on German literature because the topicality of the reverted land problem in the Federal Republic of Germany means that it is in this country that the most research results are available.

3. RESULTS OF THE INVESTIGATIONS

3.1 Definitions of concepts in the relevant ecological and socio-economic contexts

3.1.1 Brache - Schwarzbrache (Reverted land)

Owing to differences in the causes and significance of "Brache", the concept is itself interpreted differently in the Member States. In the present study, "Brache" or "Brachland" is taken generally and in the broad sense to mean an area formerly used for agricultural or forestry purposes, which is no longer managed and in the natural conditions prevailing in the countries of the Community is usually covered with vegetation throughout the year. Reverted land, insofar as it constitutes a periodically recurring link in the crop rotation, is not included in this concept.

Since there is no binding and internationally valid definition of the phenomenon to be treated here, for reasons of expediency it is advisable not to start by defining the concept of "reverted land" too narrowly. This is evident, for example, in the discussion of the extensive use of agricultural land for grazing in Ireland, which can be equated with "under-use".

The concept does not appear to be defined clearly anywhere in the territory of the Community; in any event, a great many authors make efforts to clarify the scope of its meaning, attempting to express either the cause or the effect of land reverting by attaching adjectives or forming compound words. This applies to all European languages.

"Brache" (reverted land) is "agricultural land recently left open", (Hard 1976). The concept of "Brachfläche" ("reverted land") is meaningless in itself and describes "agricultural land left idle" (Keimer 1975). "Brachland" ("reverted land") carries no immediate indication of the reasons for land reverting and makes no distinction between "fallow" and "waste agricultural land" (Niggemann 1971).
"Fallow" is generally taken to mean "Schwarzbrache" ("bare fallow"). Bare fallow constitutes resting, uncultivated land under the ancient

three-field agricultural system or simply uncultivated arable land which can be brought back into cultivation immediately (Wendling 1965).

On the other hand, "Brachland" ("reverted land") is the inclusive concept for social and fringe reversion. It can also be referred to as waste agricultural land "which has fallen into disuse for at least one year" (Nobel 1975).

3.1.2. Sozialbrache - Strukturbrache - Grenzertragsbrache (Social fallow - Structural fallow - Marginal fallow)

Whereas the concept of reverted land indicates only an area formerly used for agricultural purposes which is no longer managed at present, the terms "Sozialbrache" ("social fallow"), 'Strukturbrache" ("structural reverted land") and "Grenzertragsbrache" ("marginal reverted land") immediately convey an expression of the probable reasons which have contributed to the reversion. The concept of "Sozialbrache" ("social reversion") is appropriate in cases where a cause-effect relationship is being described, ie where agricultural land is abandoned as a result of social attitudes (Wendling 1965). Social reversion which occurs as a result of social differentiation processes occupies a special position among the processes by which land falls idle, since it can end either in recultivation or in final reversion to the wild state. Social reversion becomes "deserted land" when the traces of its former management have disappeared with the exception of a few relicts (Born 1968).

Social reverted land occurs basically on agriculturally favourable soils, ie not on marginal soils. It is not any deficiency in soil productivity which leads to the land reversion, but factors external to agriculture which govern the discontinuance of its management. National economic and social factors which result from regroupings within society following economic changes motivate the farmers who formerly worked this land to take up occupations outside agriculture in order to improve their economic and social status.

The land in question falls idle, ie it is not put to any other subsequent use (Meisel and Bürger 1972, Moos and Herot 1972, Neumeyer 1972, Niggemann 1970, Wachhorst 1972).

The concept of "Strukturbrache" ("structural reversion") covers deficiencies related to the structure of agriculture. However, size of holdings, road and drainage networks and other structural deficiencies can be improved by appropriate measures, provided that it is not a question of marginal reversion.

The situation has to be viewed quite differently in the case of land which cannot be managed profitably because the expenditure involved is too high in comparison with the yield attainable. "Grenzertragsbrache" ("marginal reversion") occurs on marginal soils or marginal sites of low natural productivity or on soils which necessitate a high expenditure of labour to be worked. When the price-cost relationship is favourable this land is returned to use as agricultural land, and when it is unfavourable it is abandoned once more (Ditt 1965).

Marginal soils or marginal sites are always defined in economic terms, ie in relation to the economic situation (Schreiber 4/1972). The progress achieved in technical development also has to be taken into account here. For example, arable land with a gradient of 12% can only be worked with modern machinery to a limited extent, and when the gradient is 18% it ceases to be possible. For grassland, the limit of feasible management is set at a 24% gradient (Meisel and Bürger 1972, Welling 1970).

The following definition is given by Neander (1973):

Grenzertragsstandorte Marginal site is a term covering any land whose present agricultural use yields a factor income (value accrued) which either cannot cover the costs of the factor amounts invested in it or, given constant productivity and price trends, will cease to cover them in the next few years. This can relate to:

a. part of the land of an individual farm;
b. all the land of one or more farms;
c. the land of an entire district.

Neander also distinguishes between the absolute and relative marginal site. This is because it is possible that a site which is a marginal site from the national economic viewpoint when the costs of land improvement, consolidation of holdings and similar measures are taken into account may not, however, be a marginal site from the viewpoint of the individual farmer if, for instance, he does not have to pay any consolidation costs or receives subsidies.

Marginal soils are potential marginal reversion sites.

3.1.3 Ödland, Unland, Dauerbrache (Waste land - Barren land - Permanent fallow)

Definitions of these three terms and of some other less common concepts are given in Annex 1 (p. 129).

3.1.4 Biocoenosis - Biotope - Ecotope

According to Leser (1976), the concept of the "biocoenosis" originated with K. Moebius and means "association of organisms" or "community of organisms". A biocoenosis relates to the assotiation of animals and plants which exist in a biotope of habitat. "Every change in any one of the contributory factors of a biocoenosis causes changes in its other factors. If any one of the external conditions deviates from its former average value for any length of time, the entire biocoenosis is transformed; it is, however, also changed if the number of individuals of a component species decreases or increases as a result of human influences or if a species is completely eliminated or a new species enters the Community." (K. Moebius, 1877 - cited in Leser, 1976). "The 'zoological' or 'zooecological' biotope concept indicates that it concerns the habitat or site of a specific and actually existing biocoenosis." An area which represents the unit of biotope (= habitat) and biocoenosis (= association of organisms) is nowadays being increasingly referred to in landscape ecology as an "ecotope" (Leser 1976).

Siebeck (1973) attributes the restriction of certain species of organism to certain biotopes to the result of an evolutionary adaptation of their vital requirements to the environmental situation existing at any given time. He concludes from this "that the properties of a biotope can be used as a basis for deducing certain vital requirements of its inhabitants, and vice versa."

3.1.5 Terminological treatment of the subject in European languages

Even on the single-language level, ie within the terminology relating to the subject of reverted land as used in a single country, some difficulties arise in connexion with the comparability of concepts. These difficulties which originate in differences in the terminology used to define the various types of land, become even greater if an attempt is made to translate these concepts into other European languages.

In order to achieve something approaching terminological conformity, a number of concepts which were encountered in the literature and in the discussions with experts will be explained. The explanations, which are provided for English, French and Italian terms, are given in Annex 2 (p. 131).

2)

3.2 Analysis of development trends in the area of reverted land in EEC countries

3.2.1 Belgium

As a country with a very high population density and very intensive agricultural exploitation in what is predominantly flat terrain presenting no difficulties in management, Belgium has no reverted areas of any significant extent. The land area of Belgium is broken down (approximately) into the following categories:

Table 1: Breakdown of land by use in Belgium

a.	agricultural land		1 450 000 ha
	comprising grassland	700 000 ha	
	arable land	750 000 ha	
b.	forest		600 000 ha
c.	built-up land and other land		950 000 ha
d.	total land area		3 000 000 ha

The area of 950 000 ha shown for "other land" cannot be differentiated in sufficient detail for the extent of reverted land to be determined accurately. It is assumed that about 3% of the agricultural land constitutes waste land and barren land, but no reverted areas.

Agricultural land in Belgium has decreased steadily since the Second World War, as demonstrated by the following figures:

Table 2: Decline of the utilized agricultural area in Belgium

1950	1 752 354 ha
1960	1 659 671 ha
1965	1 601 706 ha
1970	1 542 422 ha
1974	1 496 960 ha

Thus, between 1950 and 1974 it decreased by a total of 225 394 ha (= ca 10 000 ha per year). Of this, 65 113 ha (=28.9%) were expropriated, for roadbuilding and similar projects. The remaining 71.1% has been used chiefly for housing and development purposes (Bublot 1976).
Belgian land use statistics include a category "jachères"; this relates not to bare fallow, which is hardly found in Belgium, but cultivated land that has been abandoned.

According to these statistics, fallow areas in Belgium have developed as follows:

Table 3: Trend in fallow areas in Belgium

1959	1 223	ha	(= 0.07 % of UAA)
1970	5 311	ha	(= 0.34 % of UAA)
1971	5 328	ha	(= 0.35 % of UAA)
1972	5 658	ha	(= 0.37 % of UAA)
1973	5 433	ha	(= 0.36 % of UAA)
1974	3 213	ha	(= 0.22 % of UAA)

In 1973 the breakdown by province was as follows:

Table 4: Breakdown of fallow areas in Belgium by province,1973

Antwerp	1 518	ha
Brabant	1 423	ha
Flanders	883	ha
Limburg	769	ha
Namur	175	ha
Hainaut	148	ha
Luxembourg	138	ha
Liège	129	ha

These figures (according to Noirfalise, 1978) result from the fact that land prices are very high and population pressure very great in Belgium. Thus, virtually every hectare is worked intensively and not even marginal sites are left idle. Even in the region south of the Meuse, where most of the marginal land is located, and in the Ardennes, there are scarcely any instances of non-intensive exploitation.

The tendency towards farming as a spare-time occupation, which is detectable in Belgium as it is elsewhere, frequently associated with quite considerable commuting distances means that agricultural land is not left idle. It is equally rare for the buying up of agricultural buildings and land for weekend and second-dwelling use to contribute to land falling idle. Furthermore, past experience shows that abandoned agricultural land, primarily in the Campine, has been fairly rapidly afforested.

All in all, the extent and problem of reverted land in Belgium are insignificant. Nor is any increase in reversion expected in the future.

3.2.2 Federal Republic of Germany

The figures available on the actual extent of reverted land in the Federal Republic of Germany are contradictory. Since some of the land classification criteria used in the 1971/72 Agricultural Census were new, in many cases comparison with the results of previous censuses is either possible only to a limited extent or totally impossible. In particular, "land used for agricultural purposes" (LF) differs from the category of "land suitable for agriculture" (LN) which was entered in the census up until 1969 in that it ceases to include arable land which is not being worked, unused permanent grassland, ornamental gardens, private parks and areas under turf. On the other hand, poplas and Christmas tree plantations are counted as LF.

"Land suitable for agriculture which is unused" is either not dealt with at all in the official statistics or recorded only very unsystematically. On no account, however, can social reverted land and/or marginal reverted land be calculated from the difference between LN and LF. As a rule, figures on fallow areas in the Federal Republic of Germany are based on estimates or are the result of individual regional surveys. Statistics on reverted land therefore give no accurate information on its actual extent but at least show the regional distribution of its occurrence (Neander 1973).

The proportion of reverted land increased from 0.4% of LN in 1958 to approximately 2.0% of LN in 1975. Buchwald (1968) conjectures that in the Federal Republic of Germany some 850 000 ha are in serious danger of falling idle and 30 to 40% of agricultural units are marginal producers (Buchwald 1971). The Federal Government's Agrarbericht 1971 indicates that the figures given for reverted land are generally too low, since the bulk of "rough grazing" (1969 = 279 300 ha) probably also lies idle, and estimated the total area of reverted land at some 3% of LN. Keimer (1975) puts the total area of reverted land as high as 3.9% of LN and stresses that it is in no way a general problem, but a problem specific to certain regions or types of area.

In 1972 the Bundesminister für Ernährung, Landwirtschaft und Forsten published a 1 :1 000 000 map entitled "Land no longer used for agricultural purposes (social reverted land) as a percentage of land suitable for agriculture (LN) in the FGR". This map was compiled by Meisel and Melzer of the Bundesanstalt für Vegetationskunde, Naturschutz und Landschaftspflege on the basis of the land use survey carried out by the statistical offices of the Länder showing the position as at 1970. The map provides a clear overall picture of the proportion of reverted land in the parishes and rural districts and pinpoints the geographical foci:

a. 17% of all reverted areas in the Federal Republic of Germany are located in 13 districts which together represent 1.4% of LN (of the Federal Republic as a whole). These rural districts are:
   Biedenkopf, Siegen, Dill region, Upper and Lower Westerwald region, Main-Taunus region, Offenbach, Alzenau, Aschaffenburg, Lohr, Saarbrücken, Pirmasens and Rastatt.
b. Other areas with a regional proportion of reverted land are:
   Hartz Mountains, West Hessian Hills, northern Upper Palatinate, foothills and western part of the Swabian Alb, Southern Black Forest and Sonthofen-Garmisch-Partenkirchen area.
c. At 5.4%, the proportion of reverted land in the vicinity of large towns with more than 100 000 inhabitants is three times the average for the country as a whole.

A comparative table of the figures given by different authors on the extent of fallow land in the Federal Republic of Germany is shown in Annex 3, (p. 135).

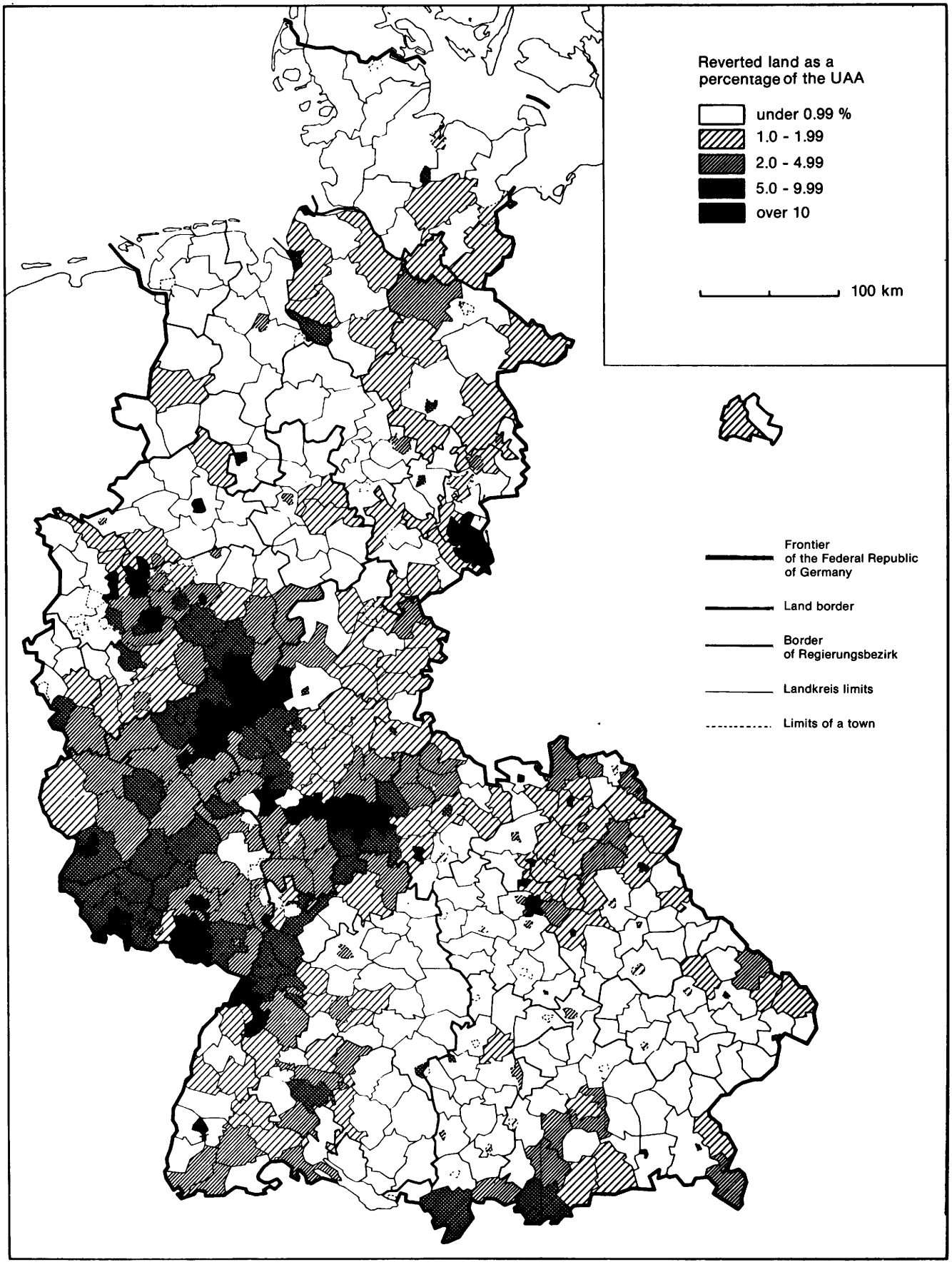
Examples of "Kreise" (districts) listed by Wachhorst (1972) as having a particularly high proportion of reverted land are as follows:

a.	Zellerfeld (Lower Saxony)	67.4% of UAA
b.	Dill (Hesse)	56.4% of UAA
c.	Rastatt (Baden-Württemberg)	37.5% of UAA

It is noticeable that districts containining a particularly high proportion of reverted land share the following common features (Neander 1973):

a. site conditions for agricultural production: the land is frequently in areas bordering on uplands with a high proportion of grassland;

Fig. 1: **Distribution and percentages of reverted land in the Federal Republic of Germany**



b. structure of agricultural production: part-time farming and considerable fragmentation of holdings predominate;
c. the possibilities for non-agricultural employment are characterized by a relatively high degree of industrialization or by convenient access to industrial regions.

Meisel (1975) differentiates the foci of reverted land on the basis of the following criteria:

a. division of family land between the heirs, small size of holdings, poor agricultural structure = structural reversion;
b. good earning potential in the vicinity = social reversion;
c. areas surrounding large towns (temporary fallow) = speculation reversion.

More detailed information on the significance of reverted land in the individual Länder is given in Annex 4 (p. 137).

Although in previous years the Federal Government also generally expected a fairly large increase in reversion areas, in its Agrarbericht 1976 it had to state that the extent of reverted land had increased less than expected; nor will there be any significant change in this trend in the future. In the drought year of 1976 in particular, a great many grassland areas which had already lain idle for some years were harvested once again owing to the shortage of fodder. Thus, the reversion was interrupted. It remains to be seen whether these areas will be worked again in the future.

On the basis of potential marginal land, Kolt (1971), Meisel (1972) and other authors reckon on a reverted land area of more than three million ha in the long term. Thiede (1971) takes the view that the forecast of 700 000 ha of fallow by 1985 originally made by the Federal Government certainly takes account of the land requirement for infrastructure measures but not of excess agricultural production within the Community. The reduction of production capacity which is urgently required could not be achieved with only this area being left idle.

Recently, the change in national economic conditions has caused the abandonment of agricultural units to slow doxn and resulted in a decrease in social reversion.

Forecasts made during a period of intensive economic growth lose their logical basis during recession and stagnation. The shortage of jobs outside agriculture is causing people to postpone making the economic and social decision which they would have made long ago if alternatives were available. This change in conditions means that the assumptions made up until now have to be re-examined. It is probable that the overall trend will continue more slowly than expected. In the long term, however, there will be no halt in the process of marginal soils reverting for economic reasons; the figures originally forecast will still be reached, albeit at a later date.

If the trend in the agricultural price/cost ratio is unfavourable and there are further economic growth rates, the tendency towards abandoning land used for agricultural purposes will become stronger (Zapf in IALB 1972). The proportion of marginal soils in danger of being left idle will also increase with increasing size of farms and increasing degree of mechanization (Rieder 1975). Arable land which presents difficulties, is located on sloping sites and is of uncertain productivity will also be left idle in the future, as will large tracts of permanent grassland (Neander 1972), with the result that agricultural production will be concentrated largely on high-yielding land (Thiede 1971).

As long as reverted land is regarded as morally reprehensible in the Federal Republic of Germany, many landowners will continue to manage land half-heartedly until such time as the burd"n becomes too great for them. Bauer et al (1975) therefore conjecture that there is a hidden damming up of potential reversion of considerable extent which will probably be left really idle once the moral pressure is removed. The first signs of change are already discernible.

3.2.3 Denmark

Bondo-Andersen (1977) explains that a distinction is made in Denmark between uncultivated areas and permanent grassland ("out of rotation").

Uncultivated land amounts to some 280 000 ha, or 6.5% of the total land area, and consists mainly of marshland, heathland, dunes, bogs and stony ground. Permanent grassland amounted to 266 000 ha in 1976, or 6.0% of the total land area of 4.3 million ha.

The tendency towards opening up uncultivated land for agricultural exploitation lasted until 1950. An indicator of this trend can be found in the increase in the average size of agricultural units in Denmark from 15.1 ha in 1950 to 22.9 ha in 1975. At that time, land suitable for agriculture amounted to some 3.1 million ha, or 73% of the total land area.

In the period between 1950 and 1976 a fairly constant proportion of 6 to 7% of the total land area was recorded as cultivated land. Although the area of permanent grassland remained at 316 000 ha in 1965 - 69, by 1976 it had dropped by 50 000 ha to 266 000 ha. No accurate statistics are available on the fate of these 50 000 ha, but it is estimated that approximately 5 - 10 000 ha have been left idle and the remainder has not been worked or has been used for building holiday homes.

The uncultivated land, mostly dunes and heathland, is located mainly in the west and north of Jutland.

No drastic change in land use is expected in the foreseeable future in Denmark.

Since Denmark has a good road system and the towns are well distributed over the entire country with a dense public transport network, there are no infrastructural or social reasons for the abandonment of agricultural operations. On the other hand, modern technology (including the large combine harvesters) naturally means that steep or very small parcels of land can no longer be worked.

In the grassland regions the prices for fattening cattle and milk are having an effect; some sandy soils have been abandoned here for economic reasons. Although the number of cattle in Denmark as a whole has remained largely constant, regional changes have taken place: some salt marshes in Zealand are no longer being used as pasture, and the herds in Jutland have therefore been built up.

Another reason why some regions are no longer used as pasture is the decrease in the numbers of sheep. In 1965-69 there were 105 000 sheep in Denmark, but by 1976 there were only 59 000.

Fallow land is so insignificant in Denmark that as yet there have been no discernible effects on soils, water conservation and the atmosphere. Since Denmark is situated in a maritime climatic zone, under the prevailing climatic conditions shrubs and trees spread very rapidly on pasture land which is left idle. In some types of countryside this development is an unwelcome one for ecological reasons, since:

a. the landscape is monotonous;
b. the herbaceous flora which has developed on pasture land over hundreds of years is suppressed by trees and shrubs;
c. geologically interesting formations become covered by vegetation;
d. for some bird species, important breeding areas in the marshes are destroyed by tall grass and shrubs.

Reverted areas are frequently regarded as a negative factor from the viewpoint of recreational use and leisure activities also. However, no information is available on adverse effects on the tourist trade or, indeed, the rural population (Bondo-Andersen 1977).

3.2.4 France

Any attempt to evaluate statistical records on the reverted land problem in France is beset again and again by the difficulties which arise from the lack of unambiguous definitions and classification criteria. For example, no clear boundary is given between reversion and under-use, nor do most of the figures provide any indication of whether land left idle as long ago as the middle of the last century is now recorded as forest, heathland or fallow. It is also impossible to differentiate in the French statistics between naturally reforested and afforested land.

The Ministère de l'Agriculture and Ministère de la Qualité de la Vie (1975) for example, indicate that there is no heading for non-agricultural and non-forestry land use in the official statistics. Nor does the statistical treatment of woodland and forests give any information on former reverted areas.

The breakdown into broadleaved, mixed and coniferous forests provides no data on either maquis formations (evergreen shrub thickets) or shrub-type or pioneer-type "garrigue" (evergreen low bush formations) or other poor-growth uneconomic stands of trees. And yet these constitute about 10% of the total forest area in France.

Any figures therefore indicate only broad trends, they do not give a reliable picture of how much agricultural land has actually been abandoned in recent decades.

In the south of France there are predominantly four regions which have a high proportion of reverted land, namely:

a. the Massif Central;
b. the Pyrénées;
c. the Mediterranean region, including Corsica;
d. the Alps.

This regionalization alone shows that the reverted areas are associated mainly with mountain and hill regions. It is here that the most marginal conditions prevail. In the past, difficult production conditions, frequent failure to operate farms successfully and the general unattractiveness of these problem regions prompted the migration of the agricultural population away from them.

Since there was no other manpower willing to take over the abandoned holdings; this migration inevitably resulted in the agricultural land being left idle. An additional factor in many cases is that the farmers who move away forgo the possibility of leasing out the land they have abandoned, out of a kind of pride of ownership.

The "Code Rural" of 1960 made provision for the management of reverted areas by neighbouring units, but this does not work in practice, owing to the non-uniformity of the arrangements made for boundary demarcation and also to the reluctance of the farmers to allow the land they have abandoned to be classified as reverted land. Another reason why some land holdings are left idle lies in the tenant farming system which is operated extensively in France; this frequently results in land reversion as soon as the tenants see some other preferable means of earning a living.

In the opinion of Faudry and Tauveron (1975), regions in which at least half of the arrondissements have less than 25 inhabitants per km^2 are in danger of reverting.

They include among these:

- Hautes Alpes
- areas on either side of the Rhone valley
- Drôme (eastern part)
- Alpes de Haute Provence
- Alpes maritimes (north-east part)
- Ardèche (western part)
- Haute Loire
- Lozère
- Gard (north-west part)
- Aveyron (eastern part)

and also parts of the Ardennes and Pyrénées.

A broad strip running from the Ardennes through the Massif Central as far as the Pyrénées and including projections towards the Southern Alps is characterized by:

a. low population density
b. negative birth rate
c. migration away from the land.

The south of the Massif Central is the zone in which all three negative criteria are present to a marked degree. In the south-west of the Massif Central there is a "deserted" zone where the decrease in the population appears to be irreversible. On the other hand, the Southern Alps (with the exception of Drôme and the south-east part of the Alpes de Haute Provence) have a positive population balance ("natural balance") and to some extent an influx of population. Migration away from the land is far less marked in the Southern Alps than in the "diagonal strip" (Ardennes - Pyrénées). For instance, the population density in Lozère is only 16 inhabitants per km^2.

According to Faudry and Tauveron (1975), in addition to the extensive reverted areas there are also the areas under non-intensive use ("under-grazing"), mainly in the Northern Alps and the Massif Central.

The central and western parts of the Massif Central, and also the Jura Mountains, appear to be at the start of a trend in which the problem of

permanent habitation goes hand in hand with an increase in the size of the remaining farms or forestry use of the abandoned land.

In the Northern Alps, there are inhabitants remaining only in the valleys near tourist centres.

In the region of the projections of the French Alps and Lower Alps on the Mediterranean coast (Côte d'Azur), the recent intensive growth in tourist traffic has resulted in the abandonment of many of the terraces which were previously farmed. Leaving these terraces to revert increases the threat of erosion.

Bontron and Mathieu (1975) give some figures on the proportion of reverted land known for "typical regions":

- Couronne Parisienne 2% of the total area
- Est 3% "
- Centre 3% "
- Massif Central 10% "
- Sud Ouest 8% "
- Mediterranée 15% "
- Montagne 9% "

Most authors confine themselves to making statements about their special region of study. Traubaud (1971) gives the following figures for the Département l'Hérault, as a percentage of the total area:

a.	land suitable for agriculture	38.4%
b.	land under housing	2.7%
c.	natural vegetation ("not under cultivation")	58.9%
d.	"Garrigues" (evergreen low bush formations), "landes" "secondary heath formation with evergreen under-shrubs and herbs , scrub, etc,"	16.2% (=103 000 ha)

According to Long (1975), in Bas-Languedoc "garrigue" can be put at 320 000 ha, which corresponds to some 10 to 15% of the entire region. ("Garrigue" is a degraded vegetation stage which to some extent dates back even to prehistoric times. In a few "cantons", "garrigue" is the predominant type of countryside.) Long quotes the population density at canton level in this case as two to 10 inhabitants per km^2.

In the Sologne and the gâtine (sterile marshland) of Touraine and Orléanais, "landes" (heathlands) occur extensively, probably owing to the poor quality of the soil (Caballe 1973). It may be surmised that these are old reverted areas. More recently reverted areas extend in strips along the Loire valley. In addition to these reverted areas, for which Caballe gives no precise indication of extent although they are located in his region of study, he calculates that there are a further 65 000 ha under non-intensive use. This

involves mainly floodland, which until the loire is controlled constitutes a land reserve.

Faudry and Tauveron (1975) make predictions on the foreseeable trend of development. They see the southern part of the Massif Central as being in the greatest danger. Whereas in other rural areas the fallow land problem is at most acute at arrondissement level, in this region the migration of the population is already disquieting. In the future this situation will spread to the western and northern parts of the Massif Central, where small areas will soon reach stages corresponding to present conditions in the Département of Lozère.

Extrapolation of the present trends results in population densities of 16 inhabitants per km^2 or less in the Massif Central and almost the whole of the Pyrénées region in the year 2000 (SOGREAH study).

In the alps, this trend of development is anticipated only in the east of Drôme and the south of Isère.

According to a BIPE study (Faudry and Tauveron 1975), if the existing trend continues, of the present 30 million ha of land suitable for agriculture (LN) in France, only 15.5 million ha of LN will still be worked by 1985, and only 14.0 million ha by the year 2000. The remaining agricultural land will then be situated mainly in the northern half of France.

Thiault (1970) makes the interesting observation that in the past in France there was certainly no systematic afforestation of agricultural land that had reverted, since the forest was valueless to the inhabitants. Today also, afforestation would be undertaken by outsiders or commercial companies.

It can be expected that more agricultural land will continue to revert in France in the future, and particularly so in the threatened regions in the south of France. This is due to the fact that it is always the small farmers who are affected first, since they very quickly reach the limit of profitable management. The consequences are a breakdown of the structure into part-time farming and, finally, complete abandonment of agricultural land, and these will continue unchanged in the future also (Thiault, 1970).

3.2.5 Ireland

In Ireland, it is not reverted land areas which are the real problem as yet, but rather the large number of marginal areas. Gardiner and Lee (1974) observe that technical development in Ireland has progressed more slowly on marginal soils than on the better soils. Farms on marginal areas are relatively small, incomes remain low, and additional capital for necessary improvements is not forthcoming. Furthermore, it is precisely in the problem regions that opportunities for employment outside agriculture are rare - in western Ireland, in particular, 55% of the employed work in agriculture. The result is a substantial decrease in the population caused by the drift of young people towards industrial areas and a breakdown of the structure of farming in the direction of non-intensive use of marginal land for grazing. A great many farmers are over 50 years of age and are without successors because most persons who leave agriculture are in the 15 to 45 age group. According to an estimate made by Gardiner and Lee (1974), marginal areas constitute about 3.0 million ha = 45% of Ireland.

These areas are largely identical with those categorized in Community Directive No 268 on handicapped regions. They comprise:

a. ca. 1.58 million ha (= 23% of Ireland) of hill country (above 150 m);
b. ca. 0.78 million ha (= 12% of Ireland) of moist mineral soils in the lowlands;
c. ca. 0.64 million ha (= 10% of Ireland) of lowland peat.

Land which is difficult to manage or naturally unfavourable exists chiefly in the provinces of Leitrim, Donegal, Kerry, Sligo and Mayo. The eight western counties inclue over 78% of the total area of marginal land (see Fig. 2, p. 22).

In the mountain and hill country, the adverse factors are wetness, slopes, rock outcrops, a shorter growing season owing to altitude and in some cases considerable difficulty of access. In West Donegal, for example, the size of 45% of the farms is less than 6 ha. The mountain and hill country is usable almost only for non-intensive grazing. The yield of winter fodder

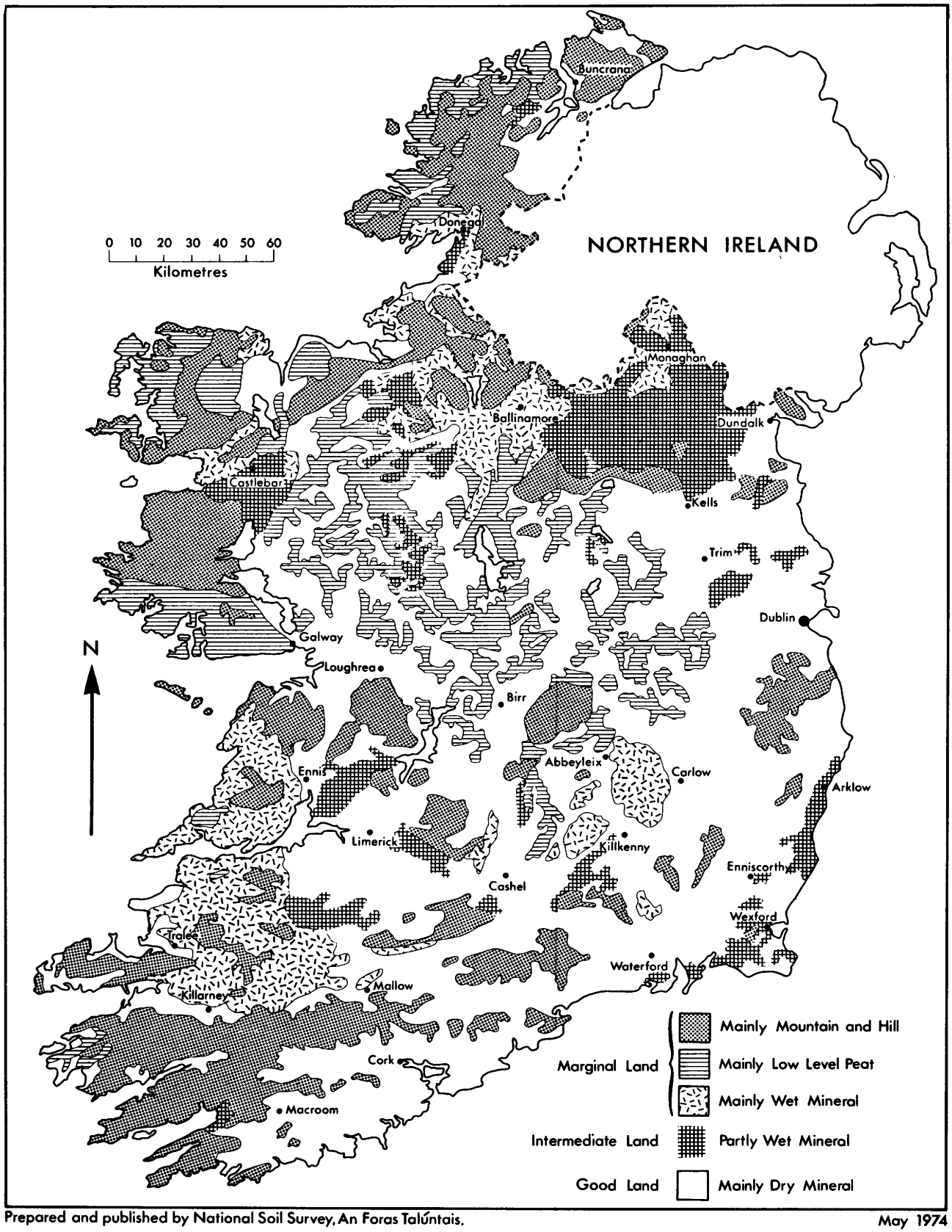


Fig. 2 : Ireland land resources

in the hill regions is so small that calves and lambs have to be sold in order to have enough fodder for cows and ewes through the winter. There is usually no money available to buy in winter fodder.

Research has shown that improved drainage and grazing measures can enable the livestock numbers on quite poor wet mineral soils to be increased 1.6 fold (Lee and Walsh 1973). Since farms are slamm, however, the income attainable from grazing stock is not sufficient to make any marked improvement in farming conditions. An economic comparison of agriculture and forestry has shown that income from forestry exceeds that from agriculture (Bulfin and Hickey 1977). On the basis of present farm sizes a forestry holding could not provide employment for so many people; compared with the employment offered by normal-sized farms, however, forestry offers more jobs than agriculture.

A report by the An Foras Taluntais (1975a) indicates that the number of small farms in Ireland is decreasing more rapidly than that of larger farms, since fewer and fewer newcomers (young farmers) are prepared to take over farms of less than 50 acres. Some 40 000 farmers (=22%) have additional income from outside agriculture; most of these run farms of less than 50 acres.

In many cases, part-time farmers earn higher incomes than full-time low-income farmers. Nevertheless, part-time farming is frequently only a temporary form of management which guarantees a steady or increased income for the time being, while the children are at home, for example. Once the children have grown up, the head of the family returns to full-time farming.

Despite the economic difficulties, there is no completely abandoned land in Ireland (Anonymous 1976); what is happening is that, as time goes by, a change-over is taking place in the form of management from intensive agriculture to non-intensive grazing. The reasons given for the fact that no land falls into complete disuse are as follows:

a. Ownership of land is a status symbol. It is characteristic of Irish farmers that they are eager to buy in more and more land. Land suitable for agriculture is abandoned since it is bought up by neighbours.

b. Since Ireland's entry into the European Economic Community, the importance of sheep, and consequently marginal areas, has increased.

c. The Department of Lands (comprising the Land Commission and the Forest and Wildlife Service sections) is empowered to buy up land and distribute it among small units or carry out afforestation.

On the basis of his investigations, Lee (1976) has become convinced that, given the existing agricultural structure in Ireland, the potential land for an expansion of sheep rearing would be sufficient for an increase of 66%.

In cases where cattle rearing is still being pursued under difficult conditions, tenant farms in particular are probably being neglected and drainage and ditching being left to deteriorate. If such a trend develops, further forms of deterioration can be expected in the future, resulting in an increasing area of land becoming overgrown by shrubs. This would mark the start of a process in Ireland also which resembles the phenomenon of reverted areas on the Continent.

3.2.6 Italy

A substantial proportion of the reverted areas is still relatively recent; agricluture underwent a rapid decline in the 1960's, when within the space of some eight to ten years the percentage of the employed who worked in agriculture dropped from 35% to approximately 15%. This surge of migration away from the land,which was imposed by economic factors, led to land reverting on a large scale. Problems associated with farming families having no successors and growing too old are additional reasons for agricultural land reverting.

The law on leasing land also exerts a certain influence on trends in agriculture and letting land revert; its effect means that in Italy it is by no means only marginal sites which are abandoned, but also areas with good soil and good production conditions.

One particular phenomenon which is evidently peculiar to Italy is periodic reversion, not to be confused with bare fallow as a recurring link in the crop rotation. This type of "relative" reversion occurred mainly as the result of temporary emigrations of workers to other countries as migrant workers, and seriously affected the vineyards and olive groves. However, recultivation measures were introduced very rapidly after the surge of returning emigrants began, when the land which had been left idle for a period of five to ten years was brought back into management.

The Central Statistical Institute of Italy (ISTAT) subdivides the land area of the country into two major categories:

a. unproductive areas (also including infertile land); and
b. agricultural and forest areas, which include, under the heading of "other land types", productive areas that are not being worked and also reverted land and land belonging to farms (roads, ditches, paths and buildings).

Figures on land areas can be found in the "Annual Reports on Agricultural Statistics" and in the "Censimenti generali dell'agricultura" (1961 and 1970), and the basic elements can be deduced from these sources, if only in outline.

Working on the basis of these data, and making additional estimates in a number of specific cases, the following differentiation can be established:

A. idle land external to the farming structure;
B. land which has simply been abandoned; and
C. land belonging to farms which is not being worked.

The phenomenon of abandoning agricultural land is characteristic of the last 25 years: previous to this, demographic pressure and a policy of self-sufficiency had encouraged expansion of crop cultivation and also extensive deforestation. The strong influence of the past is demonstrated by the "terraces" on hills and mountains and by the plantations of grass and trees at the upper limit of cultivation conditions.

Several analyses are available for the province of Veneto from which inductive assessments can be made of the phenomenon of reverted areas over the last hundred years (various authors 1961-1965 and Vanzetti 1965):

a. In the flat country of the central zone, there are no significant changes in the quality of agriculture between 1830 and 1951, whereas in the long coastal regions drastic modifications are detectable whose effect ranges from uncultivated land to crop production. In the province of Veneto the percentage of uncultivated land to crop production. In the province of Veneto the percentage of uncultivated land dropped from 45% to 5.5% of the utilized agricultural area.
b. In Rovigo the percentage of low-yield land drops from 20% to about 3%. After 1951 there was an increase in the number of "unproductive" areas over the whole of the flat country, which is attributable to substantial urbanization. In the mountains (particularly in the province of Belluno) the trend remained essentially constant throughout the 19th century and up to 1951. After this date, a considerable increase in the area under forest is discernible (from 38% to 46%) and a decrease in the area of pasture land in favour of unmanaged areas (which increased from 8.8% to 30.6%). Thus, almost all of those areas which had for some time been put only to minor use have been abandoned, in view of the potential of economically usable areas.

Studies dating from the start of the present century are available for several Lombard provinces bordering the Alps (Serpieri 1912) and can be compared with more recent data. Such an analysis (Polelli) shows that about 14% of the mountain pasture land and 9% of the area (involving mainly common pasture) have been abandoned. At 25% Como has the most abandoned land. It can be seen that in some places there was intensive cattle rearing here until 1950; from then on, a decline in cattle rearing is discernible, and this led to land falling fallow.

Another more recent investigation in some of the Lombard and Piedmontese provinces makes it possible to trace trends similar to those in the province of Veneto. A reduction in the area of agricultural land is in fact taking place in the flat country, as a result of urbanization: the only reverted areas are sites for building. Exceptions to this are found in the flat country and upland zones to the north of Milan and around Turin, where the soil is very poor.

Regions in hill country have been left idle for the same reason, but also because they are situated far away from towns or on steep sites. In the mountains there are many areas which are no longer used. This has mainly affected small pieces of land in the central mountain ranges which were formerly used for hay-cropping ("maggenghi") and are now being encroached by woodland. With cattle rearing on the decline, alpine pastures also show a reduction in area. There is a fairly recent study of these pastures (1974) which sets the proportion of their area that has reverted at 10-15%, and for some provinces as high as 20%.

At national level, since there is a lack of official data, estimates have been made from which it is possible to draw conclusions. These estimates are based on a fairly recent study made by the Irsev (1976) and in many instances have been confirmed at semi-official level. The data are derived from a comparison of statistics from the agricultural year-books and national censuses. In this case agricultural and forest land is regarded as having reverted if it is no longer managed.

Between 1950 and 1971 the area of agricultural and forest land in Italy decreased by 673 161 ha. For 1971, it is estimated that about two million ha of agricultural land (total area 27 million ha) were used for purposes outside agriculture, comprising about 620 000 ha as forest, about 400 000 ha as land designated for building, and one million ha which can be regarded as uncultivated land. Of the 25 million ha of land used within agriculture, 2.3 million ha were not cultivated, being made up of 1.3 million ha of areas bordering farms (buildings, roadways,etc) and one million ha of reverted land. This gives a total of about two million ha of reverted land and 400 000 ha of land designated for building external to agriculture.

Between 1961 and 1970, about 1.5 million ha were abandoned, mostly land outside agriculture. These figures were recently confirmed by ISTAT (1976) which breaks down a total of 2 293 000 ha of reverted land into 42.5% in hill country, 36.4% in the mountains and 21.1% in flat country. Hill country and flat country are located mainly in the central wones of southern Italy. The breakdown of reverted areas in Italy is shown in a 1977 report by the CNIA (Consorzia nazionale di iniziativa agricola).

(see also Fig. 3 p. 29)

Table 5: Extent of reverted land in Italy (CNIA, 1977)

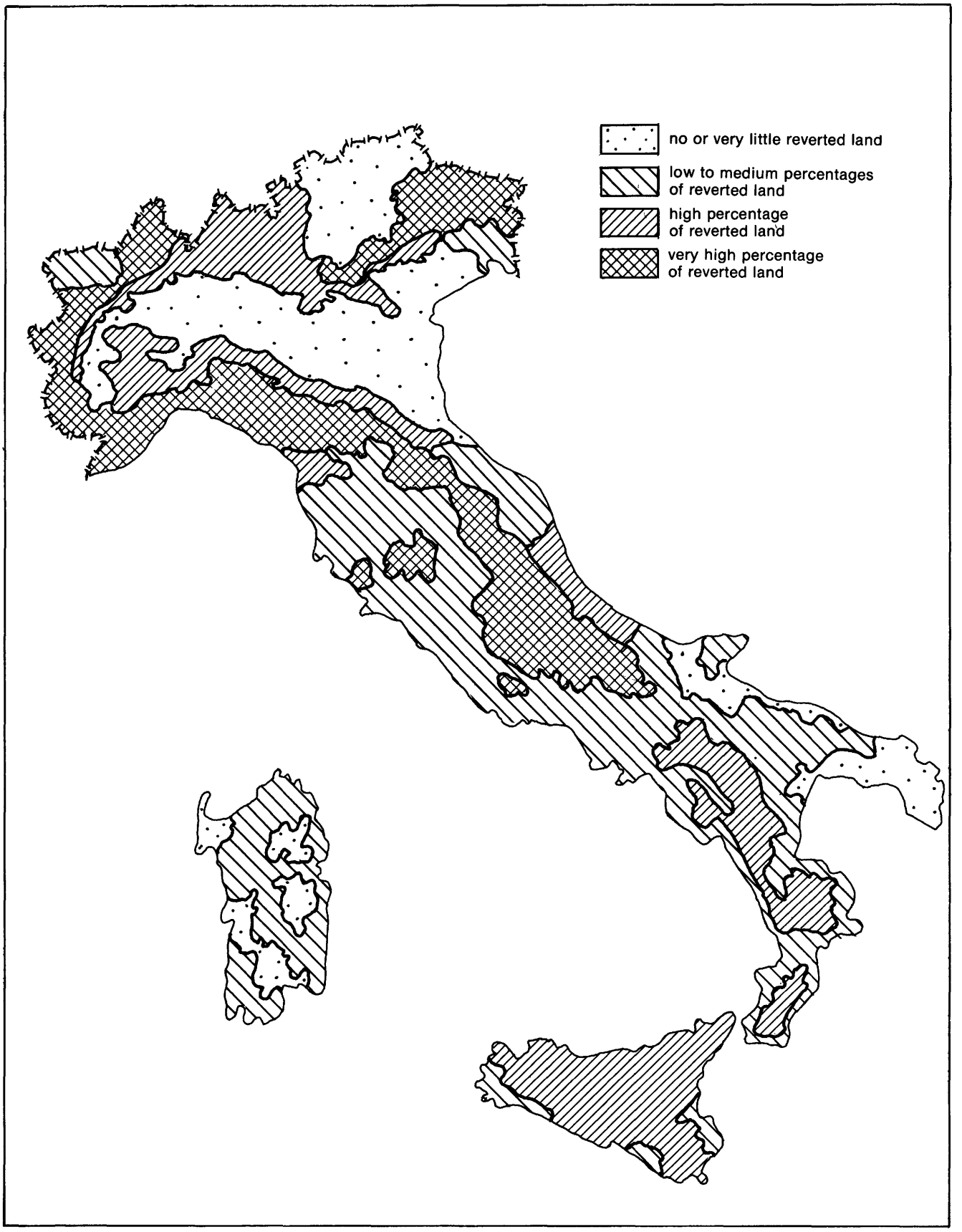
Province	Reverted land in ha.	% U A A
Liguria	90 252	18 66
Abruzzi	144 209	14 79
Friuli v.g.	88 716	14 74
Molise	56 512	14 00
Valle d'Aosta	27 528	13 19
Piemonte	221 049	10 17
Calabria	124 358	9 11
Marche	77 915	8 81
Umbria	66 693	8 78
Toscana	174 622	8 44
Campania	97 076	8 14
Basilicata	70 698	7 79
Lazio	115 728	7 76
Veneto	108 911	7 46
Emilia Romagna	133 540	6 96
Lombardia	114 917	6 21
Sicilia	138 999	6 12
Sardegna	104 929	4 74
Trentino a.a.	43 393	3 83
Puglia	55 210	3 17
	2 055 255	

The land being abandoned includes both marginal areas, ie areas which cannot be recultivated under the present price structure, and also areas which could be worked, given different forms of organization (larger units and other types of undertaking, contractual relations).

For the future, it is anticipated that more usable land will revert in the mountain regions, at least in those areas where the age structure of the rural population is more unfavourable, but above all if the existing law on leasing land remains in force (Lechi 1976).

Further information on regional reverted areas in Italy is given in Annex 5 (p. 142).

Fig. 3: **Reverted land in Italy**



3.2.7 Luxembourg

Although almost the entire land area of the Grand Duchy of Luxembourg falls within the category of handicapped regions in the sense of Community Directive 75/268, the phenomenon of reverted land crops up only very sporadically.

The south of Luxembourg is very heavily industrialized, although intensive agriculture is still carried on even here; the whole of the north is given over almost exclusively to very intensive agricultural use.

It was not possible to obtain statistical data on the precise extent of existing reverted areas in Luxembourg. All in all, however, it can be concluded that there is no reverted land problem of any significant extent in Luxembourg, nor is there likely to be an upward trend in reverted areas in the future.

3.2.8. Netherlands

Letting agricultural land revert is an exceptional circumstance in the Netherlands. There are some agricultural areas which can be classified as submarginal and which are not well suited to management with modern, mechanized methods of production, but they are still worked, since every hectare of the Netherlands is used as agricultural land. Experts from scientific institutions and official government bodies unanimously stress that the phenomenon of letting agricultural land revert does not exist in the Netherlands, nor, accordingly, its associated problems. Owing to the scarcity of land in the Netherlands, it is unlikely that agricultural land will revert to any notable extent in the future;

3.2.9 United Kingdom (UK)

Since the turn of the century, many farmers have moved away from agricultural problem regions in the United Kingdom, particularly from marginal areas. Today, the land thus abandoned is overgrown with "semi-natural" vegetation. However, this withdrawal from agricultural production, which mainly concerns upland areas, has certainly not resulted in agricultural land being left idle to any appreciable extent. What has happened is that in many cases this land is used for non-intensive grazing and is thus kept open.

Land has "intentionally" been left to revert since the middle of the 19th century in parts of the uplands, chiefly in the Pennines, for water conservation purposes. But this is an exception. Past practices of leaving land to revert have ceased to have any effects by now, since almost all of it has been brought back into agriculture. Today, there is no reverted land problem even in the upland areas; in the lowland areas, as far as can be ascertained from the literature available, the phenomenon of allowing land to revert has never existed to any notable extent.

Since 1945, the abandonment of land used for agricultural purposes has ceased almost completely. Rather, the area of agricultural land is still steadily increasing even nowadays. Recultivation measures are being carried out in many parts of the UK, and the demand for agricultural land is so great that there is little likelihood of land being left to revert.

Owing to their physical and socio-economic conditions, Devon, Cornwall, Wales, the Lake District and Scotland are potentially "reversion-susceptible" regions. Agricultural land which is abandoned anywhere in the country is bought up by the Nature Conservancy Council and the Forestry Commission, to be used either for nature conservation or else for afforestation. This prevents land from falling idle. In most cases farmers invest the proceeds from such sales in the remaining land on their farms, thereby stimulating productivity and so playing their own part in warding off the danger of land being left idle.

At most, there are a few reverted areas in the fringe zones of large towns; here, however, abandoning land for speculation reasons is merely a transitional stage preceding use for urban development. The Government's Green Belt

Policy takes a firm line on the phenomenon of speculation abandonment, in order to stop these trends.

The problem of permanent grassland being invaded by shrubs exists in England chiefly in cases:

a. where former pasture land has been converted to crop production and pieces of land are left on fairly steep slopes which cannot be cultivated with machines and on which cattle are no longer kept;
b. or where there has been a change-over from sheep to cattle rearing and cattle cannot be allowed to graze because of likely erosion damage (on steep slopes).

A study carried out by the Countryside Commission (1974a) on lowland areas in England advocates a reorganization of the landscape, which is being cleared flat to an increasing extent in the onward march of mechanization. The main contributing factor is the removal of roadside trees, small copses, shrub thickets and hedgerows, which formerly broke up the optical picture of a broad agricultural landscape and at the same time provided habitats for a wide variety of botanical and woological life. A small percentage of scattered areas lying idle with natural succession would be very welcome in these regions, but no reversion exists in this type of landscape under open-field management.

On the subject of the special problems of "fringe farmers" in urban fringe zones, the Countryside Commission (1976a) observes, inter alia:

a. many agricultural units are too small to be managed profitably;
b. there are more hobby farmers than on land in the open country, and more farmers who invest in land speculation;
c. the number of large farms is decreasing in the densely populated areas, and many farms are being abandoned completely; it is seldom possible to combine adjacent farms into viable management units;
d. farmland is often bought up with the intention of allowing it to lie idle as speculation reversion after a brief period of management (farming to quit);
e. fringe farmers are complaining more and more frequently about the losses they suffer as a result of trespassing, such as damage, theft and rubbish dumping; in many cases these problems result in frustration on the part of farmers and the abandonment of agricultural land;

f. in addition to this, there are the special taxes imposed under the Government's Green Belt Policy.

A series of studies made by the Ministry of Agriculture, Fisheries and Food (MAFF 1975) deals with particular problem regions, as follows:

a. North Riding Pennines. In this region the percentage of rented land is, on average, higher than in England as a whole (63% as against 46%). A substantial proportion of this rented land is rough grazing. The unfavourable age structure of the farmers gives some indication of the economic situation. Over 60% of the male population are more than 45 years old.

In 90% of cases sheep are left out on the grazing land during the winter. Only a few farmers can transport their animals to spend the winter in other regions.

A large proportion of farmers have additional income outside agriculture from renting out rooms, camping sites, hunting rights, etc; or run the agricultural unit on a part-time basis.

b. Yorkshire Pennines. Here too, the study reports that 60% of farmers are over the age of 45. The following figures illustrate the immobility of farmers:

i. 37% have been resident in the same district for less than 15 years;
ii. 21% have been resident in the same district for 16 - 30 years;
iii. 42% have been resident in the same district for more than 31 years.

62% of houses are described as modern, and 16% as unfit for habitation, ie they have neither electricity nor bathroom. In the area studied, only a few farmers (14%) consider renting out fields or buildings for tourists.

c. West Pennine Moors. Hill peat occurs extensively in this problem region. The soils, which are naturally acid and deficient in nutrients, have also been severely degraded by SO_2 pollution ("hundreds of tonnes of deposit per square mile per annum"). They have become marginal soils and even in 1900 presented a massive land problem. The effects of the high acid content in the rainfall are clearly visible in the landscape. Since the decrease in air pollution (since 1971), encouraging results have been obtained from the afforestation of protected mineral soils (Rural Land Use... Sub-Group 1976).

The Government White Paper entitled "Food from our own resources" (IV/1975) indicates the particular importance of grassland and upland production. The need for afforestation is also stressed, in order to make it possible to cover at least a small proportion of the demand for timber from domestic resources. At the same time, the difficulties and costs involved are also made clear.

The need for afforestation is readily understandable if the proportion of land under forest in the country as a whole, which is on average 7% of the total land area, is compared with that in South Lancashire (=1%) and that in Europe (= 20% of the total land area on average)(Rural Land Use ... Sub-Group 1976).

d. Scotland Kessler (1975) and Prolingheuer/Kolkmann (1975) report that more than half of the 8.5 million sheep in Scotland are reared in the Highlands. Six-month-old lambs and old ewes are brought down into the Lowlands for fattening ("stratification of the sheep industry"). The same applies to calf-rearing in more productive regions. Since land in the Highlands (west and central Scotland and the NW coast) is mostly (95%) suitable solely for rough grazing, with sheep densities (especially in the north-west) of from less than 0.25 sheep per acre of utilized agricultural area (UAA) to a maximum of 0.55 sheep/acre UAA, sheep farming is heavily subsidized. This system ensures that the less fertile regions are also managed and that the land is not withdrawn from production. The result is certainly an extremely non-intensive form of management, but not reversion.

e. Wales. The proportion of low-grade soils is very high in Wales also. The proportion of below-average soils (grades 4 and 5) here is 66% (=1.36 million ha), and hence considerably greater than in the north of England (= 900 000 ha). Approximately 14% of the UAA is suitable for use solely as rough grazing (MAFF 1974).

Contrary to the view represented in relevant specialized literature and official sources, that reverted land accounts for very little of the area of the United Kingdom, the results of the second land use survey point to different conclusions. This independent survey undertaken in the sixties

comes to the conclusion that 12.9% of England and Wales consists of under-used or fallow land. These areas can be broken down as follows:

Category	Hectares	Percentage
Semi-natural vegetation	1.744.700	11,5
Infested land	69.200	0.5
Degenerate land	108.500	0.7
Scrub land	31.500	0.2
TOTAL	1.953.900	12.9

These four categories can be differentiated as follows:

1. Semi-natural vegetation: land which is generally used for extensive grazing. Most of this land is in the areas of the lowest agricultural productivity. While more than half of this land covered by semi-natural vegetation is still usable for extensive grazing, about 760 000 hectares in this category are not used at all (e.g. dunes and marshland). Some of this land has clearly never been used for agriculture and would be classified elsewhere as "waste land".

2.-4. The terms "infested land", "degenerate land" and "scrub land" describe various types of succession areas which are slowly allowed to revert to a greater or lesser extent. These are mainly areas which have been abandoned recently. The phenomenon of "infested land" is comparable with marginal reversion because this is land which slowly falls into disuse under the influence of the economic situation. It would appear that marginal reversion has slowly increased in England and Wales in recent years after it was assumed for a time that it was constant or was decreasing.

"Degenerate land" is comparable with social reversion but appears mainly on the outskirts of towns.

The phenomenon relates essentially to the abandonment of whole farms as it is characteristic with social reversion (as opposed to the abandonment of unprofitable parts as is the case with marginal reversion).

The follow-up studies to the second land use survey indicated that the process of abandoning farms in this way has been increasing rapidly, especially in the seventies. The Ministry of Agriculture has perhaps not yet realised this because the land involved is rarely sold; the fact that the Green Belt Policy often prohibits any use other than agricultural for social reversion areas is in some cases regarded as unjust to owners.

The category "scrub land" is not attributable to any particular motive for abandoning land; as a relatively small statistical unit, it has various causes and describes only succession areas which have developed after being abandoned in the sixties and seventies.

On the basis of the results of the second land use survey, computer forecasts of the future pattern of allowing land to revert, in the form of linear trend extrapolations, show that England and Wales will, if the trend continues, have no utilized agricultural area in 200 years time. Even if these speculations are discounted, it must be expected on the basis of the results of the abovementioned second land use survey that an increasing area of land will become idle in Great Britain also.

The following map of reverted land shows which regions are most affected:

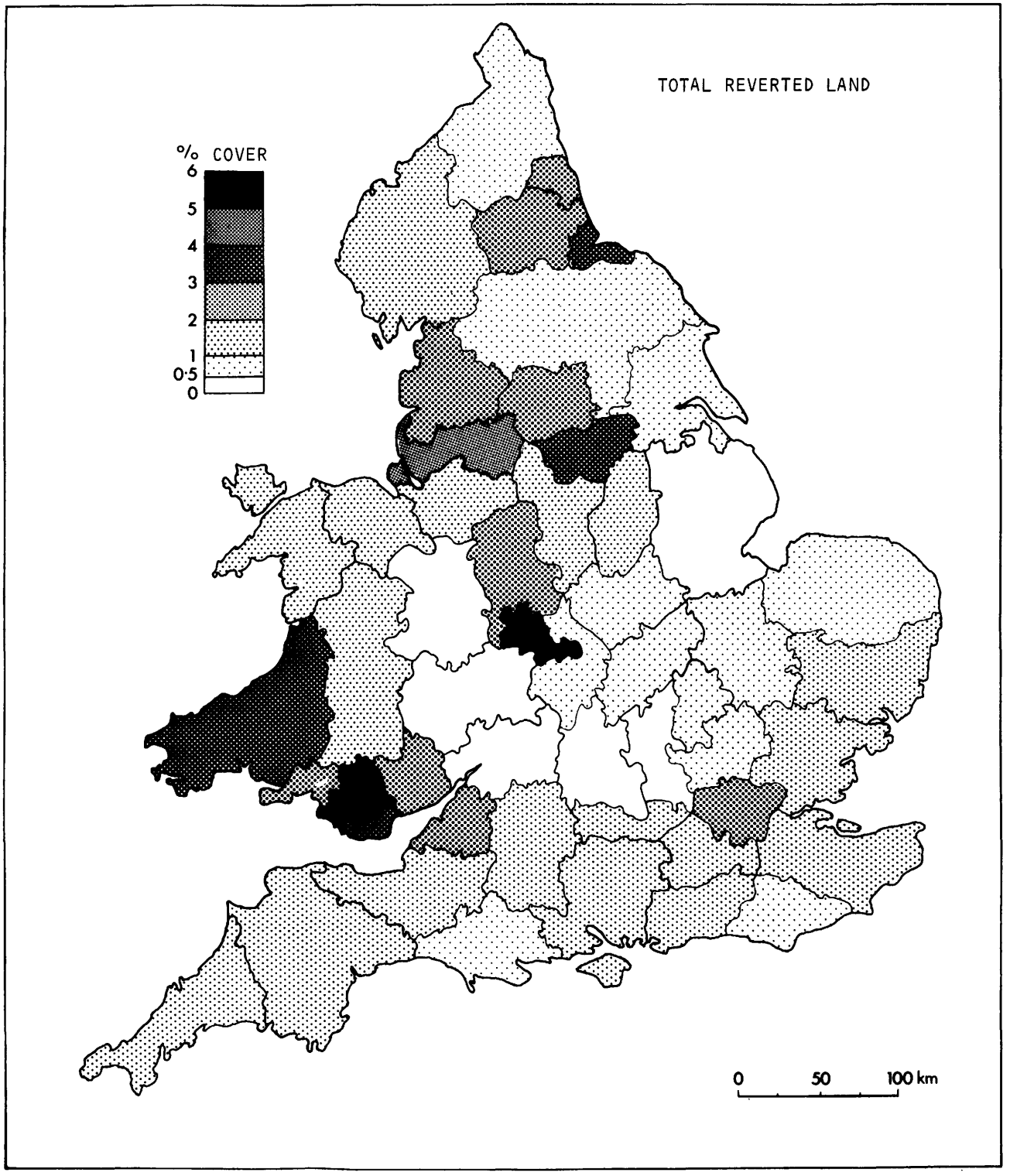


Fig. 4 : Regional distribution of reverted land in England and Wales

3.2.10 Summing-up

Letting agricultural land revert is not something which is peculiar just to our own times, but a phenomenon which can be observed over and over again in the history of agriculture. In the course of late medieval agricultural history, whole tracts of arable land or common land were repeatedly left idle. Some of the reasons for this were, of course, quite different from those that apply today, particularly since the economic and social conditions of the period were totally unlike those of the present time. "The late medieval phase of leaving land derelict during the 14th/15th century is merely one particularly striking example which is especially well known because of its supraregional importance" (Hard 1976).

For instance, "devestating" erosion is said to have occurred on bare fallow around 1800 in the change-over from the tilling-and-pasture system to the three-field system (Hard 1975). From about the middle of the 19th century, improved yields meant that a proportion of the available agricultural land was no longer needed. Some of the land withdrawn from production was afforested, and this process continued until the beginning of the 20th century.

Nowadays, the "reverted land problem" is of particular importance in the Federal Republic of Germany, France and Italy. Since the start of the 1950's the area of reverted land in these countries has reached a magnitude which makes it seem advisable to adopt countermeasures in certain crucial regions. In the other EEC Member States, reverted land is of almost no significance to the structure of agriculture.

The official statistical reports of the Commission of the European Communities contain a footnote advising against too detailed a comparison of "reverted land" and what is called "other land" between different Member States; since these categories have been recorded on the basis of differing concepts. In the case of the "reverted" category there is, in fact, a good degree of equivalence, since it is predominantly "bare fallow" that is entered here. The differences are considereably greater in the case of the heading "other land", which is subdivided into:

I = Land which is unused but is suitable for agriculture or forestry; and

II = Land other than agricultural or forest land.

The map illustrating the problem of abandoned land in the Member States of the European Community gives an idea of both the actual abandoned areas and areas liable to be abandoned. The key gives details.

On the basis of unofficial figures, according to the reports given above the following orders of magnitude can be quoted for the area of reverted land in individual countries:

Table 6: Extent of reverted land in the EC Member States

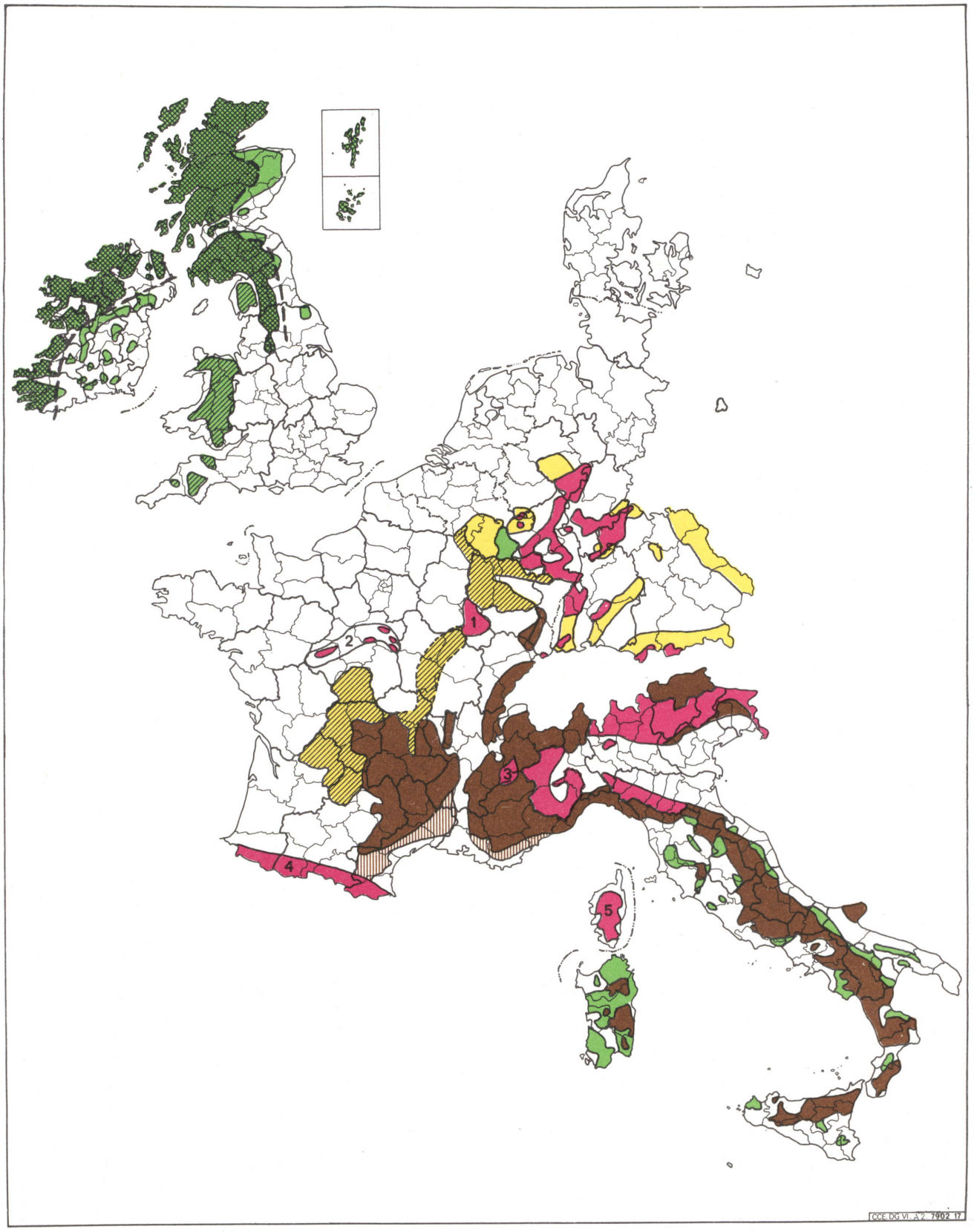
Country	Significance of reverted areas (excluding bare fallow)
Belgium	no reverted areas of any significance
Federal Republic of Germany	ca. 300 000 ha of reverted areas
Denmark	no reverted areas of any significance
France	ca. 1 500 000 ha
Ireland	no reverted land, but under-use of marginal areas
Italy	ca. 2 293 000 ha of reverted land
Luxembourg	no reverted areas of any significance
Netherlands	no reverted areas of any significance
United Kingdom	no reverted land, but under-use of marginal areas

In the Benelux countries and Denmark, there is no danger of any sizeable areas of agricultural land being left to revert in the foreseeable future. In Ireland and the United Kingdom, on the other hand, marginal areas which have hitherto been used under non-intensive management could easily pass into a natural succession if cattle and sheep farming were to decline still farther as a result of social regroupings.

The following map (No 5) shows the reverted and potential reversion areas in the European Community.

4)

Fig. 5: **Reverted or potential reversion areas in the European Community**



MAP OF ACTUAL OR POTENTIAL REVERTED AREAS WITHIN THE TERRITORY OF THE EUROPEAN ECONOMIC COMMUNITY

Notes

1. REGIONS WITH A HIGH PROPORTION OF REVERTED LAND

1.1 Federal Republic of Germany:

1.1.1 Reverted areas according to Meisel/Melzer (1972) and own data. ≥ 10% of the agricultural land (UAA) has reverted.

1.2 France

1 1.2.1 Region 1 according to Henke (1961)

2 1.2.2 Region 2 according to A.D.A.M. (1975)

3 1.2.3 Region 3 according to Caballé (1973)

4 1.2.4 Region 4 according to Rey (1976)

5 1.2.5 Region 5 according to own data (Schrieber)

1.3 Italy

1.3.1 Verified through Lechi (1976)
(The information on the distribution of reverted land Italy and France is incomplete because access to the literature is difficult and in many cases accidental).

2. PROBLEM AREAS

Areas of the European Economic Community in which, owing to unfavourable natural conditions and/or shortcomings in the structure of agriculture, it is likely that (more) agricultural land will revert.

2.1 Belgium

2.1.1 Areas with a low population density, higher proportions of reverted land anticipated (eg Ardennes), according to Surber et al (1973)

2.2 Federal Republic of Germany

2.2.1 Areas where, according to Meisel/Melzer (1972), reverted land constitutes ≥ 2% of the agricultural land (UAA).

2.3 France

2.3.1 Less-favoured areas as defined in article 3(3) of Directive 75/268/EEC (Official Journal No L 128 of 19.5.1975)
The following categories of area are therefore grouped together:

a. areas which already have a fairly high proportion of reverted land, although this cannot be verified through the literature;

b. marginal areas, where a fairly high proportion of land is likely to revert;

c. areas with a high rate of population migration away from the land.

2.3.2 Areas with an appreciable proportion of reverted or waste land (according to Schreiber; they correspond essentially to the information given in the "Atlas de Languedoc: Végétation actuelle").

2.3.3 Areas with a very low population density, for which it is assumed that they either already have fairly high proportions of reverted land or will have in the future (supplementary note to article 3(3) of Directive 75/268/EEC). (According to Faudry/Tauveron 1975; broken line not precisely transferable)

2.4. United Kingdom

"Less-favoured areas" as defined in Directive 75/268/EEC, "Depopulation" and own data (Schreiber). These are marginal areas which, although for the most part have not reverted are managed only on a very non-intensive basis

2.4.1 predominantly fresh to dry, low-fertility soils, usually podzolized (according to Schreiber)

2.4.2 predominantly moist, boggy soils (blanket bogs) or shallow upland soils (according to Schreiber)

2.4.3 Marginal soils on account of different regional conditions (soil depth, moisture)

2.5 Ireland

Marginal soils according to Dee (1976; they correspond essentially to the "less-favoured areas" as defined in Directive 75/268/EEC of 28.4.1975, §3.3)

2.5.1 predominantly dry soils (according to Mitchell 1976), probably usually podzolized

2.5.2 predominantly moist, boggy soils (blanket bogs) (according to Mitchell 1976)

2.6 Italy

Less favoured areas as defined in Directive 75/268/EEC of 28.4.1975

2.6.1 "mountain areas" Directive 75/268/EEC (Art. 3(3)

2.6.2 "Depopulation" Directive 75/268/EEC (Art. 3(4)

2.7 Luxembourg

2.7.1 "Depopulation" Directive 75/268/EEC (Art. 3(4)

3.3 Natural and socio-economic factors involved

3.3.1 Preliminary remarks

As a rule, the reasons and circumstances which lead to large areas of agricultural land being left to revert are of a complex nature and seldom monocausal. Possible reasons within this complex may be (Surber et al 1973):

a. topographical
b. ecological
c. structural - farm management
   - transport facilities
d. speculative (land designated for building)
e. sociological (division of land between heirs)
f. economic - market
   - mechanisation
   - profitability
   - rationalization

Wendling (1965) groups together two sets of reasons:

a) reasons for social regrouping (causal factors of the overall association of reasons);
b) reasons for different types of reaction to such changes.

He also draws attention to the fact that letting agricultural land fall idle is only one measure amongst other possible ones, and names the following measures:

a) conversion to grassland,
b) change-over to intensive cereals or root-crop cultivation,
c) afforestation.

According to Riemann et al (1971), it is usually not individual factors which promote the occurrence of social reversion, but causal chains. It is almost impossible to quantify the influence of individual factors. Wiegelmann (1957) also holds the view that:

a. the general economic situation (difference in wages between agriculture and industry);
b. a change in outlook on life (which does not necessarily have to run parallel to economic circumstances); and
c. social circumstances and processes;

exert their influence in complex interaction. For this reason, he would not even define "purely social reversion", "purely economic reversion" or "purely conjunctural reversion".

5)

Hard also cites:

a. motives and convictions held by individuals and specific to groups;
b. as well as overall socio-economic conditions and pressures exerted by the system.

The classification given by Hauser (1975) also seems useful for an analysis of the reasons for land falling idle:

a) unfavourable natural conditions,
b) unfavourable land structure (division into lots, fragmentation of holdings, small size of farms, etc);
c) good opportunities for employment outside agriculture in the vicinity;
d) too few farms managed on a full-time basis with the resources for expansion;
e) attitude of the owners, who do not sell the land.

Despite the complex nature of the causes, they will be dealt with systematically here, starting with the natural reasons and then passing on to the economic and social criteria.

3.3.2 Natural reasons

The literature on the subject deals with the economic and social aspects in far greater detail than the natural factors which influence reversion. It can, however, be assumed that what are called marginal sites and potential reverted areas are one and the same thing. Since some Länder in the Federal Republic of Germany have arranged for marginal areas to be mapped, reference can be made to the classification criteria used to do this. The reverse process, ie studying areas which have already reverted some time ago and working backwards to the natural factors that contributed to this, would not really achieve its object because the causes would not be clearly identifiable.

The instructions on land classification for the purposes of this mapping, which in some cases are very comprehensive, are mostly based on the official records from the national land survey of 1936. On this basis, arable land and grassland are classified into specific land-use groups; to do this, in addition to the arable land or soil number and grassland or grassland area number an evaluation is made of the slope and climatic data. The limiting values used in each case can differ very widely, as can also the methods used to determine them and the definitions of what are called marginal sites;

Limiting values for marginal sites in different Länder of the Federal Republic and definitions of marginal sites:

Table 7: Limiting values and definitions of marginal sites

Land	Gradient in % arable land	Gradient in % grassland	Definition of marginal sites
Hesse	18	24	barely suitable (unsuitable)
Rhineland-Palatinate	18	24	borderline sites for agricultural land use
Baden-Württemberg	18	30	not worth cultivating
Saar	18	24	barely suitable (unsuitable)
Bavaria	18	24	agricultural land with unfavourable production conditions

Almost all methods of classification give appropriate consideration to the aspect of the land, especially in the case of sloping grassland. Whereas northern slopes are unfavourable for arable land, in the case of grassland it is southern slopes which are disadvantageous. The slope of the ground is not only of interest in relation to suitability for mechanized cultivation and to the local climate, but is also an indicator of the danger of erosion.

In addition to soil type, formation, condition and relief, climatic factors are important in evaluating natural suitability for agricultural use. A mean annual rainfall of less than 500 mm and a growing season (mean daily temperature +5°c) of less than 200 days are also taken as indicators of marginal sites in the conditions prevailing in the Federal Republic of Germany. Lastly, moisture conditions in the soil (stored water, inflow of additional water, drop in the water table, main drainage channels) and flatness and stoniness have to be taken into account. The presence of one or more of these natural factors can exert a very considerable effect in reducing yields and turn a site into a marginal site (Bühnemann 1976a).

Moos and Herot (1972) were able to establish that, in the Alps, the tendency for land to revert increases with increasing gradient. In the

Vogelsberg and Rhön Mountains, V. Borstel (1974) found that almost all marginal grassland sites had reverted, and Surber et al (1973) identified gradient, microrelief, topography and shady situation on northern slopes as the principal reasons for reversion. Hard (1975) adds climate and soil condition to this list.

According to Schreiber (1974), another reason for land falling fallow which is a natural one, although it is governed largely by human influences, occurs as a result of non-intensive use for grazing. Using west and north-west Scotland as an example, he demonstrates how non-intensive grazing has led to increasing deforestation and excess water, and hence extensive bog formation.

3.3.3 Economic reasons (technology, market, cost-benefit relation)

Owing to the complexity of the factors influencing reversion, which has already been mentioned, their systematic division into natural, economic and social factors is, inevitably, purely academic. Strictly speaking, the criteria for defining marginal sites are economic, since the marginal yield can be determined only on the basis of management economics, not nature: it is the yield governed by natural factors, measured with an economic yardstick. There are, however, a number of additional factors which can be included in the concept of "economic reasons".

Voppel (1958) named the following as reasons for reverted areas in the Saar:

a) unfavourable natural conditions,
b) farms of too small a size,
c) unfavourably situated holdings,
d) nearby industrial employment opportunities.

Ten years later, Lamerdin (1968) recognized clearly that competition was keener within the European Economic Community and quoted the following as reasons for social reversion:

a) division of land into holdings,
b) keener competitive conditions within Community territory,
c) no transfer of land to full-time farmers owing to land speculation,
d) common land,
e) abandonment of cattle rearing: grassland becomes reverted land.

Riemann et al (1971) placed particular emphasis on shortcomings in the agricultural structure, listing the following as reasons for reversion:

a) small size of famrs,
b) difficulties of management imposed by terrain when mechanization is introduced,
c) removal of incentive to manage less productive areas or land which is difficult to work, by employment opportunities outside agriculture.

In their opinion, the failure of active agricultural use to continue in the face of the causes of social reversion is due in particular to the fact that an increase in the number of farms with the resources for expansion is not possible and the farms affected in the regions in question are frequently too small in areas.

Lastly, the reasons described by Surber et al (1973) should also be listed:

a) rationalization,
b) mechanization,
c) isolation of pieces of land by transport routes, etc,
d) profitability - areas of land are too small,
   - adequate revenue from other areas,
   - distance of fields from the farm,
e) land designated for building.

These four lists include almost all of the economic causes which have resulted in the past in extensive areas of land reverting within the European Economic Community and which will do so in the future. The increased area of agricultural land which is reverting as a result of competitive pressure within the Community is, by definition, not social reversion but marginal land which is no longer competitive on the basis of the price/costs ratio (V. Papp 1974). Perhaps the most important cause, which makes reversion a "conspicuous" problem, is the extremely small degree of land mobility (Deneke 1973).

As Kolt (1976) found in the Lahn-Dill region and the Taunus Mountains, the fragmentation of the land into small-sized holdings precludes the possibility of there being any farms managed on a full-time basis having the resources for expansion, which could create a demand for renting land. The same statement can also be applied to other regions. Unfortunately, the demand for land outside agriculture can only very rarely be diverted towards areas of potential reversion.

In densely populated regions, the speculative increase in land values explodes any calculations based on farm management; agricultural use of the land becomes a secondary consideration (Deneke 1973 and Moos and Herdt 1972). Indeed; land designated for building is in many cases no longer in the hands of farmers, and communes and voluntary house-building associations hold responsibility for reverted areas (Merforth 1973a).

Andreae (1974) summarizes the trend followed in the past in this fashion:
1. increased efforts towards organization in agricultural units;
2. subsequent change-over to a higher degree of production efficiency;
3. consequently, building-up of the unit and/or reduction in the number of workers (= increase in value production per worker);
4. and finally, increase in specific intensity (= higher output per ha or per animal).

As a logical extension of this trend, the concentration of sites and withdrawal of marginal areas from active use appears to be the appropriate measure. The "hectare-yield explosion" in crop cultivation and increased production in cattle farming (Thiede 1971) mean that production is rising faster than sales potential (Meisel 1972). Although increased yields are not solely the cause of reversion, as the over-simplified view held by Gekle (1976) would have it, it is certainly true that the rise in labour costs resulting from economic growth and the drop in real prices for agricultural products due to growing agricultural surpluses (Merforth 1973a) are the main causes.

Spatz 1975 , states that, in judging whether or not farming pays, for a long time now farmers have been using hourly wages outside agriculture as their yardstick, and this factor must be added - insofar as acceptable alternatives are open to them.

3.3.4 Social reasons

As the concept of "social reversion" indicates clearly, factors of a predominantly social nature play a part in land being left to revert. In fact, land falling idle is merely the negative by-product of a general social and economic trend which has to be regarded as positive in other respects (Andreae 1974). Zschocke (1958) even sees "conversion to grassland, conversion to cereals and afforestation" as results of the same social processes as those which result in social reversion.

In his day, Hartke (1956) observed the process of land falling idle chiefly in places where rural villages near industrial centres became mixed communities of industrial and agricultural populations, ie where regions were in close contact with the social influences of industrialization. In past years this process has spread over entire Länder, with the result that now a means of livelihood is no longer guaranteed and even regions far removed from industry are being abandoned, as Keimer (1975) reports from Bavaria.

After the Second World War, changes in the value placed on existing professional groups led to a social regrouping process; this undoubtedly gave the first impetus to the trend towards social reversion. Nowadays, industry offers everything by way of social security which was formerly guaranteed by the ownership of land. Economic prosperity enabled a great many farmers to switch to a different occupation, something which in the space of only 20 years previously had been completely unsuspected.

In his enquiries into part-time farming, Weber (1972) found that willingness to abandon land varied according to professional groups. The better the personal economic position of the people being questioned, the more readily land previously used for agricultural purposes was abandoned.

As a rule, it is people who are not as well placed economically, such as housewives and widows, for whom the continuance of part-time agricultural activities on their own land is a necessity and an essential in order to safeguard their livelihood. In contrast to employees and officials, those professional groups who had been unable to improve their financial situation during the period of study (five years) did not give up their farming.

Even when agricultural activities are discontinued, the land in question is very rarely sold, since it still represents a form of insurance for the owner, just as it did before (Riemann et al 1971). Anxiety about times of crisis prompts people to leave land idle rather than sell it or put it to some other use (Rathjens 1958 and Niggemann 1970).

It is mostly in the case of small and very small units that the practice of letting land revert occurs, whereas in that of large farming units the simultaneous trends are towards consolidation and building up (Rathjens 1958). However, the resultant reverted areas also exert influences on the decisions of those farmers who wish to continue their agricultural activities: in many cases they are unable to buy or rent land for this, since the owners of reverted areas wish to keep their land as "insurance against a rainy day". Thus, an opportunity to expand units which have the resources for development is frequently blocked; what is more, encroachment upon agricultural land by adjacent reverted areas overgrown with weeds may occur. This situation can sometimes lead to further abandonment of agricultural activities, since a privately held idea of doing so is put into effect simply because of being "goaded into action" (Schlephorst 1975).

Meisel (1973) believes that high proportions of reverted land are related less closely to poor site quality than to unfavourable conditions as regards agricultural structure. The decisive issue for the abandonment of land management seldom lies in site unfavourability or difficulty of cultivation alone.

Hartke (1956) makes the same observation: if there is industry in the vicinity even land with registration values of DM 2000/ ha is left idle, whereas in other regions far poorer land is still worked if there is no industry nearby.

The following list shows, in key-word form, some of the many social causes mentioned in the literature:

a. shortage of labour;
b. drift away from agriculture into industry and tourist trade;
c. More profitable seasonal work (eg tourism);
d. migration to the city;

e. negative attitude towards agriculture:
   i. on the part of the farmer himself;
   ii. on the part of the rest of the population;
   (Moos and Herdt 1972)
f. decrease in population;
g. concentration of residential communities;
h. economic difficulties and market crises;
   (Hardt 1975 L + S)
i. nearby opportunities for employment outside agriculture;
j. higher wages with more regular working hours, leisure and social security;
k. little motive for owning land;
l. lack of interest in agriculture;
   (Niggemann 1970)
m. too small an income from land management;
n. being tied to the farm; especially under the pressure of cattle farming, is found to be a burden;
o. reverted land imposes no unreasonable burdens;
   (Hoerster 1974);
p. increased work load for wives of part-time farmers, since the farmer becomes increasingly indispensable in his new occupation;
q. difficulty for the younger generation to find a marriage partner when they are tied to farming;
   (Riemann et al 1971).

An interesting item in this list is Hoerster's reasoning that reverted land would not impose any unreasonable burdens. This illustrates a remarkable psychological phenomenon. The owners of idle land need not expect any direct disadvantages to result from the fact that they no longer manage their land. Accordingly, as long as the income from activities outside agriculture is adequate there is no motivation towards managing the land.

3.3.5 Summing-up

Natural and socio-economic factors involved

The statements made in section 3.3 have shown that a bewilderingly large number of causes and circumstances can result in land formerly used for agricultural purposes being left idle, although not necessarily so;

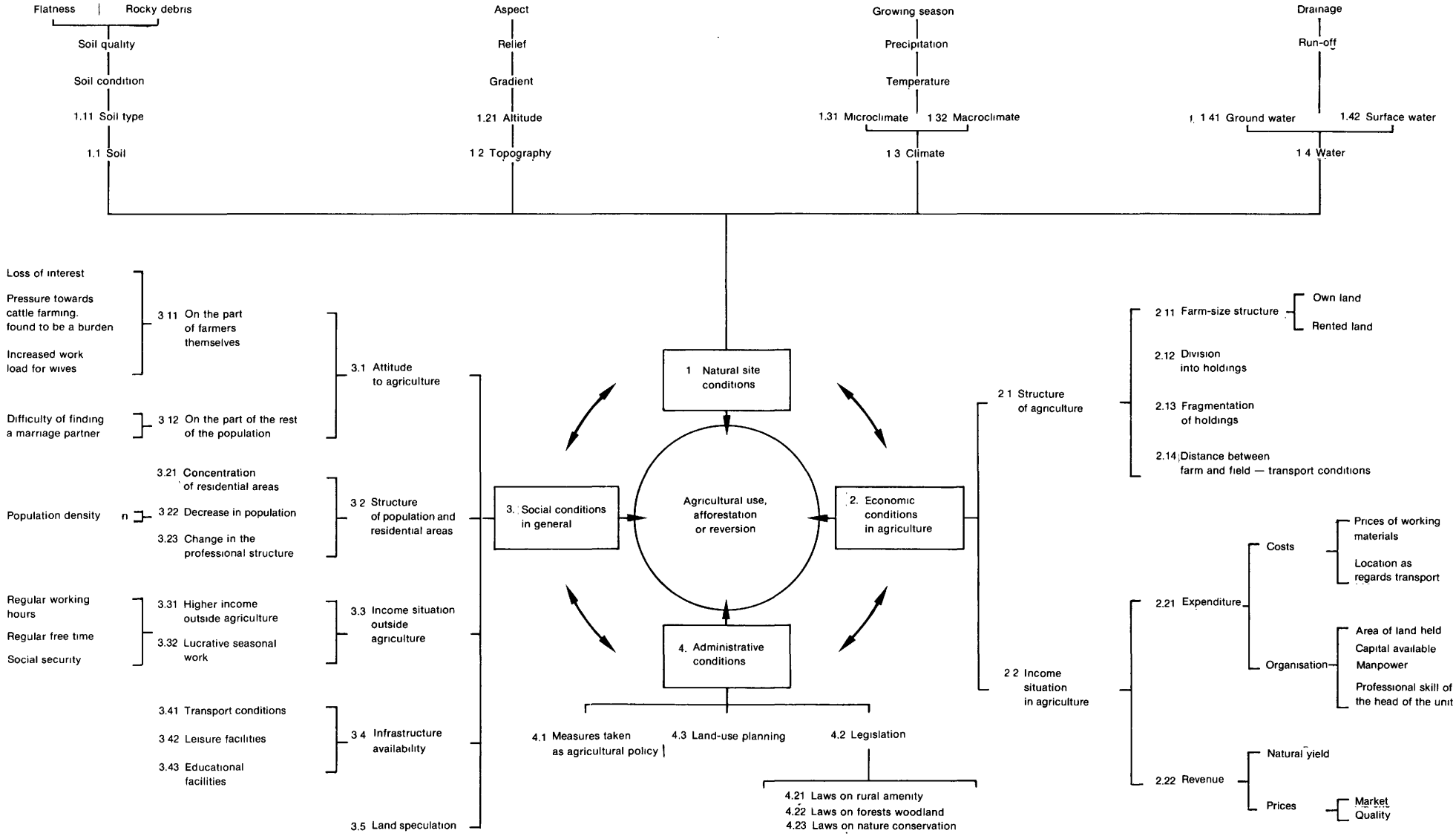
a. various combinations of these controlling factors can be the cause of reversion;
b. but it can happen that in the presence of the same controlling factors, in one case land management will be continued whilst in another case the land will revert.

This fact (cf Fig 6, p. 53) means that it is not possible to formulate an equation of the "what happens, if... " type. For this reason, an attempt is made here to give a summary representation of the many reasons and circumstances which can result in agricultural land being left to revert. For technical reasons, only a partial indication of the multi-dimensional dependence and interrelationships involved can be given in this general survey.

To supplement fig.6, a table in Annex 6 (p.145) gives details of certain threshold values and conditions; if these values are not fulfilled, or if the conditions exist, there is a danger of land reverting. Since it is usually not individual factors but causal chains which promote the occurrence of reversion, the danger increases with an increasing number of these conditions present in combination. The various factors involved have been given the same numbering in both fig.6 and the table in order to make it easier to trace concepts through the system as a whole.

Fig. 6: **Reasons and circumstances which can result in agricultural land reverting**

(See also table entitled "Threshold values and conditions", Annex 6, p. 145)



3.4 Positive and negative effects of letting land revert

3.4.1 On the environment

3.4.1.1 Soil

a. Arable Land left to revert

Although there is widespread agreement on the causes of reversion, opinions on the effects of letting land revert differ very widely.

Not all authors base their published work on reliable scientific data: in some cases they adopt the unfounded statements made by others. It is not, of course, always easy to distinguish between wishful thinking and hard fact, especially since biological processes also follow a different course on different sites. Any system of grouping and classification is arbitrary and leaves unresolved the problem of limiting values or limiting conditions. Unfortunately many authors fail to indicate precisely which are the sites where their assertions are valid. It is consequently necessary to guard against what are all too sweeping generalizations in their reports.

One popular example used for the negative effects of reverted land is the alleged danger of erosion on alpine summer pastures that have been left to revert.

Some authors maintain that cattle do more damage than could be caused by reverted areas, while others think that only reverted land promotes snow-slip and hence indirect erosion. All varieties probably occur in nature, because the alpine summer pasture system has not always been capable of preventing erosion in the past. According to Laatsch (1972), both over-grazing and the discontinuance of grazing promote soil-slip. Forms of erosion occur both with and without human intervention.

On level sites,where no steep slopes promote erosion by water, ice and snow, reverted land still causes certain changes in the soil which have been studied by a number of authors. Since there are still few scientific data available on the chemical and physical processes in soil after land is left to revert, some institutes are carrying out long-term studies and observations and the results from these should provide further data (cf. Annex 13, experiments in landscape management in reverted areas).

On arable land left to revert, a slight increase in organic substances is observed in the uppermost soil layer (Stählin et al 1972). The C content of the soil also increases in the case of fairly old reverted land (V. Bortsel 1974), which indicates humus enrichment (Faber 1975). Moist reverted arable soil is similar to grassland soils as regards content of organic substances, form of humus and pore volume (Hard 1976). Büring (1970) was unable to establish any relationships between the C/N ratio and the age of arable reversion. As a rule, letting land revert is also accompanied by a deterioration in water removal and drainage, with the result that reduction conditions are created, and, consequently, increasing mobility of the heavy metal ions. In the case of base-deficient soils, acidification sets in as a result of further base loss promoted by vegetation supplying raw humus (Kuntze and Schwaar 1972).

On moist soils, the humus content can also increase owing to the fact that organic substances are readily decomposed in meadowsweet stands. According to Büring (1970), letting land revert does not cause any direct disadvantages for the soil - it is only the deterioration of main drainage channels as a secondary phenomenon which is negative.

Schmidt (1974) also reports increased mobility of the heavy metal ions as a result of accumulated water and hence further acidification of the soil.

Stählin et al (1972 and 1975b) describe a luxuriant growth of vegetation on moist reverted sites which covers the soil to varying thicknesses. Since this organic layer impedes evaporation, the exchange of air between soil and atmosphere is decreased and evaporation further reduced. This creates a reduction horizon with anaerobic fermentation, which leads to acidification, formation of hydrogen sulphide and humic acids and release of metallic ions and thus forms raw humus zones with gley formation.

On dry sites, on the other hand, there are not really any changes in moisture conditions. The content of organic substances and the soil reaction start to fluctuate. Mild nutrient humus forms under the plant cover which acts as a protection against erosion. No significant change in nutrient content, or even "steppe formation", would occur.

On nutrient-deficient soils that reverted many years ago, on the other hand, Meisel (1972) observed a slight deterioration in nutrient content. Nitrogen inflow is relatively high under reverted land. Schmidt (1974) also reports fairly large discharges of nutrients on reverted areas. It is true that there is less leaching out of NO_3-nitrogen, but environmental pollution on sites near the water table is still higher (by a roundabout route). Although all other nutrients are leached out on reverted land to a lesser or the same extent as on arable land or grassland, the discharge of phosphorus is 30% higher and that of potash 70% higher. On sites far from the water table, nitrification as such is optimum but since there is no removal by cultivated crops the ground water is polluted more heavily.

According to V. Bortsel (1974), even in a study period of some 30 years site changes under reverted land play only a "subordinate role". He did, however, observe a significant decrease in K_2O/P_2O_5, volume values, pH values and disintegrable nutrients (K_2/CaO) on reverted arable land with increasing age of reversion. But on the basis of a division into nutrient supply classes, all the soils were categorised as "high". The reasons for the decrease are therefore perhaps not increasing deficiency with increasing age but the cessation of regular fertilizing or a selective choice of arable areas left to revert.

Kuntze and Schwaar (1972) also point out that, in the case of soils (as in the lowlands of north-west Germany), which:

a. were heavily fertilized over long periods;
b. and whose water balance was continuously controlled;

the positive effects have to be called into question. Chemically triggered changes will be reflected in reverse trends that are physically measurable only over fairly long periods of time.. Gley formation and podzolization are relatively long-term processes!

Wohlrab (1974) sees a danger of erosion as a result of land being left to revert on steep slopes and also, when the gradient is more than 8%, on loose stones apt to silt up and weathering crusts as a result of gully formation. Only erosion occurs on flat arable land.

b. Grassland reversion

The effect on the soil under reverted grassland is different from that on reverted arable land. According to Meisel (1973), in the case of reverted grassland to tolerant plants can become established, since the supply of nutrients is smaller after the land has reverted and the sites concerned are usually ones which had to be fertilized before they could be brought to a fairly high nutrient level, which gradually starts to fluctuate back towards its natural values.

In the case of reverted meadow which is many years old, increases in density can occur in the soil which cause more intensive denitrification and hence the escape of gaseous nitrogen into the atmosphere. This nitrogen can be returned to the soil and the surface water via precipitation; however, it is extremely difficult to quantify.

All in all, changes in the soil under reverted land are minor, and they are certainly not irreversible changes. The natural potential of the land is maintained (Meisel 1973).

Schreiber (1974) also draws attention to "tendencies towards heath formation" on acid soils under certain climatic influences. He also refers to the signs of karst formation on dry, sparsely vegetated slopes in the semi-humid climate of Central Europe as a result of browsing and trampling.

When extensively utilized areas revert the extent of erosion is reduced. In exactly the same way as on reverted arable land, the deterioration in the mechanism of water removal can, of course, also result in waterlogging in the case of reverted meadow, since the "biological pumps" are missing.

In meadowsweet areas, water accumulation and soil acidification cause the formation of patches of gley and hydrogen sulphide to an extent which is sometimes greater than under reverted arable land (Stählin et al 1972).

Büring (1970) observes that on reverted meadow with "uncontrolled drainage" the pore volume increases as a function of the age of reversion; the pores fill up with water, and the spongy soil drives out the meadow plants which were originally present. Otherwise, on average the investigations do not reveal any dependence between age of reversion and soil pH value. With a generally higher content of organic substances, even a positive influence of age of reversion is observed on high nitrogen, potash and exchangeable metal cation values. In the case of reverted meadow, the largest C/N ratio is found on the oldest areas, with little difference between the absolute values.

On the basis of his research results, Büring (1970) sees no direct relationships between:

a. age of reversion and total nitrogen;
b. age of reversion or vegetation succession and lactate-soluble nutrients (P and K);
c. age of reversion and the exchangeable metal cation value (S-values).

Bauer et al (1975) observed the first signs of hill peat formation on fairly old reverted meadow valley (20 years) at altitudes of more than 600 m above sea-level.

c. Reverted vineyards and reverted land in Mediterranean terrace farming areas.

In abandoned vineyards, increased erosion is to be expected as a result of the removal of buttresses and water channels (Wendling 1966 and Costa 1973). In hilly and mountainous areas in Mediterranean regions terraces were made with the aid of buttresses. When such terraces are abandoned, there is an increased danger of erosion by heavy winter rainfall.

3.4.1.2 Water Balance

Some references to the importance of the water balance have already had to be made in the above discussion of the effects of reversion on the soil. In relation to this specific problem also, it is essential to differentiate between advocates and opponents of reversion. Even something which is a negative effect of reversion in one person's view can still be interpreted as positive by somebody else.

For example, Meisel (1973) holds the view that from an ecological standpoint it is an advantage if moist biotopes are re-established. The possibilities for new biotope formation are, in fact, better on wet sites than on dry and fresh sites. Meisel (1973) ascribes the blame for sites becoming moist on gley soils not to reverted vegetation but to the deterioration in drainage mechanisms. Thus, site conditions after reversion are quite different from what they were before.

In the view of Stutzer (1974), fairly extensive, enclosed tracts of reverted land in mountain valleys with a large amount of precipitation could acquire particular importance for storing water, since the natural plant cover without exploitation consumes relatively little water. In addition, the cessation of fertilizing would mean fewer problems in protecting water against pollution. Unfortunately, Stutzer can provide just as little factual evidence on which to base his assumptions as can the many authors who fear precisely the opposite from the low water consumption of reverted vegetation.

According to Schreiber (1974), the water consumption of reverted land is smaller than that of forest. This ranking is confirmed by some authors, while others arrive at contradictory rankings.

Sperber(1971), Buchwald (1971) and Perreiter of the IALB (1972) regard permanent reverted land as an eminently suitable way of improving the quatity of drinking water, since surface run-off takes place gradually and, as regards cleanness and abundance, the water from reverted areas which have not been fertilized for many years is superior even to that of the forest.

Kuntze and Schwaar (1972) view the situation quite differently: as soon as land use ceases, evapotranspiration alters in accordance with the vegetation. Social reverted land has a lower rate of transpiration than arable land. If letting the land revert means that the drainage mechanisms are also removed, the water table rises, and the wet phase increases in waterlogged soils. As a result, the water-retaining capacity of the soil drops.

6)

The infiltration rate of non-exploited soils will also decrease, in so far as no water distribution takes place. This means that there is a danger that the amounts of water received during heavy rainfall can no longer be stored. There will be adverse effects on the drainage of a catchment area in proportion to the "percentage of waste land of this kind". The growing need for high-water retaining basins is cited as a measure of this change in run-off conditions. It may, however, be asked whether it is not in fact only when run-off is accelerated because the drainage mechanisms have been removed that the need for high-water retaining basins arises.

Stählin et al (1975b) give the following descriptions:

When land reverts, the drainage mechanisms are also removed. This means that hydrological conditions change and the supply of water becomes concentrated on a few areas. The result is the formation of new springs and boggy areas, and when there is heavy rainfall the saturated storage capacity of the soil can lead to flood disasters:

a) no increase in the annual contribution from run-off can be expected, especially not in the case of natural reforestation;
b) the quality and distribution of water through the year are more favourable on reverted land than on agricultural land, expecially in the case of arable land;
c) reverted areas with luxuriant vegetation growth remain wet longer, owing to the reduction in evaporation. The soil is enriched with organic matter which gives off hardly any water and is always saturated. This results in greater fluctuations in the inflow of water into lower watercourse;
d) owing to the increased content of humic acids (in wet periods), the quality of water is greatly impaired.

Schwerdtfeger (1975) also sees a danger of waterlogged meadow valleys and bogs no longer being able to store water, since they no longer possess any retaining capacity, with the result that heavy rainfall and snow-melt could cause flood disasters. For this reason, water conservation measures should be continued in all cases; otherwise, run-off could assume immense proportions and make it necessary to carry out "unbelievably extensive hydrological measures" in lower watercourse regions.

Spatz (1975) confirms that evapotranspiration is not significantly higher on intensive pasture than on non-intensive pasture (and reverted land), but that peaks in run-off and hence the danger of erosion are smaller on productive or intensive pasture than on non-intensive pasture, where root penetration is not usually as good and there are generally few gaps in the vegetation.

Wohlrab (1974) anticipates an increase in the yield of water after land reverts to be followed by a drop when the land starts to be invaded by shrubs.

Owing to the large number of different and in some cases contradictory opinions, it is not easy for the neutral observer to gain a clear picture of the effect of reversion on the quality and quantity of the water balance, particularly as in most cases no reliable research results are available, only conjectures.

The negative assertions and conclusions seem in many cases to be invented. It is difficult to see why nature, when left more free from the influences of man, should in the long term take a course disadvantageous to the general necessities of life. It is hoped that current and future research results will also afford more positive statements on the influence of reversion on the water balance.

3.4.1.3 Climate

In addition to the effect on soil and water balance, the influence of reversion on the climate is mentioned repeatedly as a positive or negative secondary phenomenon. Whereas Geiersberger (1971) sees even in "letting land revert advisedly" a threat to essential oxygen production in the long run, Meisel (1973) states, on the same subject, that the factor of oxygen production carries hardly any weight in relation to reversion, ie that the efficiency of reverted land vegetation in this respect is neither more nor less than that of vegetation on managed land. In fact, from the purely numerical point of view, differences in oxygen production on a few areas makes no difference to the total oxygen balance (Hard 1976).

Most authors discuss the formation of cold air and its dispersion. Buchwald (1971) designates reverted arable- and grassland as the major producers of cold air and therefore recommends that in planning the siting of reverted areas care should be taken to safeguard special crops which are sensitive.

Faber (1975) gives the following ranking as regards formation of cold air:
(+) forest - arable land - grassland/reverted land (-)

Riemann et al (1971) give the same ranking.

In well-wooded regions, therefore, the occurrence of extensive reverted areas is a negative factor, since it promotes the development of a moist-cool climate with fog formation and cold air. (In dry, sparsely-wooded regions natural reforestation could result in an improvement in climate - Bauer et al 1975).

Stählin et al (1972, 1973 and 1975b) examine the influence of reverted land on the climate in several publications:

a. In a region with more than 60% forested area, reverted land causes a deterioration in climate. Since social and marginal reversion are usually located in well-wooded districts, their development is unfavourable to natural forest from the climatic point of view.

b. If spurs of woodland across narrow valleys impede the exchange of air, cold-air pockets and heat traps can be expected. Heat traps can lead to outbreaks of insects in summer; cold-air pockets contribute to fog formation, are dangerous for traffic and promote early and late frosts.

c. Every stage of cooling associated with reverted areas also means a deterioration in the microclimate.

d. when nearby land becomes completely overgrown with woodland, in certain circumstances the amount of sunlight received by residential areas may be reduced.

3.4.1.4 Flora

The effect of reversion on the flora which develops after land is left idle is not quite as simple as many authors would suggest. It is maintained, for example, that the phenomenon of "plant succession" is properly

understood, and even that it is possible to predict the duration of each of the development phases leading up to forest formation and also to make an accurate forecast of their floristic composition (EEC Commission, 1974).

Some scientists carry out observations on specified areas and record all the changes in the plant cover which are seen to occur in the course of time. The disadvantage of this method is that the conclusions apply only to a limited period of time, and it is still not known what will happen in the more distant future. Other scientists, therefore, start by observing reverted areas which are already of different ages and attempt to draw inferences in this way on a trend of development in time. The second method is better suited to providing long-term conclusions, but it does also carry with it a greater danger of making false interpretations.

Hitherto, series have been reconstructed almost exclusively on the basis of inferences from adjacency in space to sequence in time. It is only in this way that even the scheme of succession:

weeds - grass - shrubs - forest

could have wrongly gained widespread acceptance (Hard 1976).

Hard (1972, 1975 and 1976) observed that the colonization of a new plant cover has its nature fixed by a number of important controlling factors and can follow a widely varying course as a function of these factors:

a. Distance effect: The floristic composition of reverted land vegetation is a fairly accurate reflexion of the bordering vegetation. Woody species occur only within a radius of 50 to 150 m (according to tree species) and decrease with the square of the distance. If there are no shrubs, hedges and tree species in the immediate vicinity, these play no part whatever in the first few decades.

b. Persistence effect: The pioneer species have a fundamental competitive advantage over plants which follow them. The "Initial Floristic Composition" (IFC) model states that:

   i. the stages which insolve on reverted areas are those whose species have been able to invade in the initial phase;

   ii. if these are species of "later" stages (e.g. trees), the

"earlier" stages (herbaceous perennials, grass) are skipped; woodland can form immediately;

iii. if, on the other hand, a grassy stage has become established, the "later" species have great difficulty for a time in invading the area; a certain permanent stage sets in.

c. Final management: The condition in which the area is left at the time when it reverts is decisive for its subsequent development. The barer the soil, the greater the likelihood of its being invaded by shrubs. Even a field of stubble "suppresses" woody seeds.

i. In large areas of central Europe, conditions on reverted land favour the formation of light-demanding pioneer woodland with birch (Betula sp.), Scots pine (Pinus silvestris) and goat willow (Salix caprea). If there are seed trees in the vicinity, a sudden advance of light-demanding tree species is to be expected on arable land which is left idle. After only three to four years at the most, suppression by grass and weeds begins. Thus, it is not a question of an "advance" of woodland, but of a single, abrupt occupation of the abandoned area.

The number of species (in the fifth year) on reverted arable land is more than twice that on other types of reverted land. A "conversion to grassland" of abandoned arable occurs most easily on moist to wet and also dry and nutrient-deficient sites.

ii. The development of vegetation on reverted grassland takes place in different stages, since the migration of species is directed towards continuously occurring gaps. Just as the process of succession can be blocked on abandoned arable by the large-scale occurrence of certain species, tracts of grassland can hold themselves stable for decades after being left idle. A closed grass cover prevents the self-sowing of woody species, for which the soil has to be "wounded".

Spots and patches occur endogenously as a result of the continous extension of species which need to spread out from where their initial colonization sites happened to be. Some species spread partly by means of their root suckers.

Most shrub, heath and turf communities are, however, highly stable; no changes of species occur, merely shifts in dominance at the most.

d. Site: Site influences on the development of reverted vegetation must not, of course, be underestimated. Soil formation, soil type, soil condition, climate, weathering processes, water supply, water movement, aspect and other site factors act in combination with the other controlling factors and form the biotope.

e. Soil wounding: Lastly, Hard also mentions external intervention after the land has reverted as an important criterion for the subsequent development of the reversionary vegetation. Wounding of the soil is caused mainly by human influences, but animal burrows, footprints and erosion phenomena (e.g. snow-creep) make it possible for airborne seeds to penetrate the soil surface and germinate.

On at least 81% of the reverted arable areas studied by Hard (1975), development was disrupted by mowing, burning and the like. Also, invasion by shrubs after the land had been abandoned was greater on dry turf and rough pasture than on better sites because there were more gaps in the grass cover.

On short-grass bramble areas (limestone pasture) there was a true "explosion of natural regeneration" after the abandonment of grazing. Equally, it was observed that development of park-like forest-forming species even on abandoned mountain pasture occurred successfully only at disturbed (wounded) places.

Distance effect, persistance effect, final management, site (influences) and soil wounding are also mentioned as factors affecting the development of vegetation on abandoned areas by other scientists in addition to Hard, but not in such close detail.

No absolute figures can be given on the timing of the individual stages of succession, but only on the minimum duration of each stage, at best (Büring 1970). This means that it is also impossible to predict the period of time that elapses before reforestation is likely (Meisel and Hübschmann 1973). Tüxen (1970) surmises a "regularized" reversion to a natural final

community (climax), but the paths of development and periods of time taken to reach it are not known. He observed grassland stages which in some cases remained without woody species for more than 25 years, whereas moist meadows very rapidly reached a stage with abundant alder or birch.

Long periods of dry weather in the Mediterranean region lead to extensive withering of the plant cover on idle land. Frequent fires can contribute to the destruction of the vegetation level and hence to the suppression of certain species.

3.4.1.5 Fauna

Widely varying assessments are also made of the effects on the fauna when land is left to revert. Some people warn of the threat to the indigenous fauna which results from leaving the land to "return to the wild state", while others welcome the re-establishment of biotopes that had formerly disappeared.

A popular example of the dangers of reversion is the observation in the Saar of a sudden, large-scale outbreak of millipedes (Julidae), which invaded houses in unpleasantly large numbers from nearby reverted areas. The frequent occurrence of mice (Muridae), rabbits (Oryctolagus cuniculus) and vipers (Vipera berus) (in France) on unused meadows also prompts warnings against "multiplication and outbreaks of epidemic proportions (if they remain uncontrolled)" (Surber et al 1973 and Stählin et al 1975b).

Kuntze and Schwaar (1972) point out that the maintenance of drainage systems also serves as a form of biological pest control, since insect plagues are avoided.

Lohrmann (1962) observed that litter meadows left idle in the "Federsee" nature reserve in Baden-Württemberg developed into "bog virgin forest" within fifty years, thereby depriving ground-hatching birds such as the moor-hen (Lyrurus tetrix) and curlew (Numenius arquata) of their habitat. He therefore recommends that the land in question should be kept open.

Kolt (1976) reports that reverted areas reduce the game population, since grass growth is suppressed by shrub invasion. After the resumption of cultivation measures, the game population doubled within six years. The Deutsche Jagdschutzverband (Anonymous, Unser Wald [Our Forest] 1971) also suspects that reverted areas are used by game for browsing and mating only in the first year after they have been left idle, and cease to be used after this because they have "completely reverted to the wild state". Reverted areas should therefore be ploughed over every two years and used as game reserves.

Kahlhöfer (1971) cites Jahn-Deesbach and Kappes, according to whom leaving land to revert to the wild state results in very considerable botanical and zoological impoverishment. In the initial stage of social reversion, hares (Leporidae) will increase to begin with, but in later stages there is a drop in the numbers of hares and roe deer (Capreolus capreolus), although a slight rise in those of pheasants (Phasianus colchicus) and partridges (Perdix perdix).

The overwhelming majority of authors see the increase in the extent of reverted land as an enrichment of our fauna.

Bierhals (1976) stresses that the danger of mass outbreaks of individual pests on reverted areas is as good as unheard of. In particular, the value of moist reverted land after the drainage channels have gone is so great that the fauna should no longer be deprived of it.

Bierhals (1976) gives the following ranking on the basis of potential number of mammal species:

arable land < grassland < reverted without woody species < reverted land with woody species \ field hedgerows < forest.

a. For many mammals (Mammalia), reverted land is more beneficial than agricultural land.
b. For insect-eaters (Insectivora), reverted land which is not sprayed offers better feeding conditions.
c. Woody biotopes on reverted land are potentially the richest in animal species.

Of 220 bird species indigenous to the Federal Republic of Germany some 100 are affected positively by reversion (35 of which are on the "danger list") in that it offers:

a. a suitable biotope;
b. lower biocide pollution levels;
c. less disturbance.

Of 90 endangered bird species in the Federal Republic, 40 are adversely affected by drainage. Moist reverted land, in particular, provides them in some cases with the necessary habitat (Thielcke 1973). The reversion of moist regions to the natural state provides a great many birds (Aves) and reptiles (Reptilia) with new opportunities for survival (Bauer et al 1975).

For certain species, such as the stone curlew (Burhinus oedicnemus), little-ringed plover (Charadrius dubius) and sand martin (Riparia riparia), waste land and ruderal areas are the only permanent habitats. Erz (1971) therefore recommends that certain reverted areas and tracts of waste land should not be recultivated or afforested but kept from the colonization and conservation of these species.

Reverted land can become a sanctuary which provides the reverted land fauna with a first opportunity of survival. Examples of this are the quail (Coturnix coturnix) and hoopoe (Upupa epops) (Ant 1972).

Reverted areas provide a habitat for species which have no chance of survival on agricultural land. In the strip of no-man's-land along the frontiers of Czechoslovakia and the German Democratic Republic, for instance, sanctuaries have become established for the black grouse (Lyrurus tetrix), which is being almost completely wiped out in the agricultural landscape (Sperber 1971).

Arable and grassland reversion also represent "ecological units" for the regeneration of many butterflies (Papilionoidea/Hesperioidea). The number of butterfly species on reverted areas is four times that on meadows and fields and about three times that in broadleaved forest. The number of individuals is about twenty times that on agricultural land and about five times that in broadleaved forest, so that even afforestation with broad-leaved forest would not be more valuable than reverted land from the ecological point of view (Reichholf 1973).

The range of animal species of the various types of reversion differs fundamentally from that of arable land or forest; afforestation of reverted areas would therefore be fatal for some species, even though forest carries more species from the numerical point of view (Bierhals 1976).

In the Mediterranean region frequent fires during the brooding time are a particular danger to ground-hatching birds.

In our agricultural landscape, in which the drainage of agricultural land and the use of herbicides, pesticides and other substances are an important requirement for an increase in yields that is made necessary by economic considerations, many animal species are threatened with extinction. In the interests of the preservation of species, support should therefore be given to the recommendation made by Frank (1975) that 2 to 3% of the land area should be maintained as a "refuge of what is natural".

3.4.2 On the countryside and recreation

For Hard (1975), an assessment of the effect of reversion on the countryside and recreation has to be based on two different viewpoints:

1. in relation to different types of reverted land;
2. in relation to different types of user and hence judge.

He contends that the qualities of reverted land in "making an impression on the feelings" will be reconciled with considerations related to social history and that opinion on reverted areas in the landscape can change with an increase in general understanding.

The wide divergence of opinion on the scenic value of reverted land prompted Nohl (1976) to observe that prevailing taste on what the country side should look like is imposed by the dominant faction, i.e. the intellectual middle class and its "experts".

This means that reverted land will be viewed on the basis of certain idealogically predisposed criteria (e.g. orderliness). Its assessment and evaluation must therefore be carried out not by experts but by the majority of the population. Measures against reverted land, which cost money into the bargain, should be introduced only in accordance with the ideas of people in general.

In fact, ideas differ radically on whether reverted land should be judged as fundamentally positive or negative. Only a few authors differentiate attitude to this problem. In most cases, reverted land is either condemned as a destructive factor or welcomed as a restorative element.

Of the two extreme assertions, namely that recreation is only possible either in a cultivated agricultural landscape or in total wilderness, neither is tenable, of course.

It is true that leaving the countryside entirely to its own devices does not meet all the needs of society, and it is from this consideration alone that the arguments against an increase in reverted areas originate; on the other hand, variety in the landscape also has to be evaluated as a positive factor in shaping the human environment (Buchwald 1971).

In point of fact, the evaluation of the landscape depends upon the "user programme". What is more, and this has emerged clearly in the preceding sections, the assessment has to take account of differences between sites:

a. reverted land on wet and moist sites is not really of any use for recreation;
b. reverted land on fresh and dry sites can be used for leisure activities throughout almost the entire year, which can certainly not be said of tracts of arable land and meadows (Bierhals and Scharpf 1971 and Stählin et al 1975).

In a distinctively cultivated landscape, scattered reverted areas provide a stimulus for leisure activities, which are not restricted by road routing and land use. In well-wooded regions, on the other hand, an increase in the area of reverted land can impair their suitability for recreation, since the optical impression of the landscape and (in extreme cases) the physical possibility of access are no longer available. But clumps of trees and shrubs very rarely impede those in search of recreation.

The demands made on the landscape by hiking and cycling are different from those made by camping and ball games. The suitability of a landscape for recreation is therefore dependent upon the type of recreation (Keimer 1975).

Since the impression made by reverted land on car drivers is different from that made on hikers, its evaluation will also inevitably be different (Bierhals and Scharpf 1971). Not only the relief of the actual terrain but also the shape of the vegetation is an essential factor before an impression can be gained of a valley as such. The alternation of forest and open country determine, inter alia, the diversity value of a landscape (according to Kiemstedt) and hence also its suitability for recreation (Balzer and Gessner 1970).

Keimer (1975) writes that it is wrong to make a direct comparison of agricultural landscape, cultivated landscape and recreational landscape and to make lump subsidies to agriculture for land management in order to avoid the occurrence of reverted areas:

a. The suitability of a landscape for recreation is dependent upon the form of recreation. The alternatives are therefore not whether it is cultivated or uncultivated but "whether or not it is accessible, suitable for playing games and usable". On the basis of these criteria, reverted areas frequently come off better than agricultural land.

b. People still think that they can take their recreation only in "orderly" countryside. It is still not realized that less "orderliness" means more "freedome of movement". Reverted areas, with the freedom of movement that they offer, are therefore a good balance to the hemming in by official regulations that prevails in urban areas.

Surface and underground engineering and other human interventions in nature frequently alter the "specific nature of the countryside" more rapidly and more radically than reverted areas which develop naturally. Unfortunately, it is difficult to make aesthetic criteria really objective (Gierer and Gregor 1975).

The argument that reverted land is not always available to those seeking recreation owing to the state of its vegetation is not a valid one, since agricultural land is certainly not accessible (Bauer et al 1975).

A great many authors subscribe to the opinion that reverted land represents an ecological and aesthetic enrichment of the landscape: (Lob 1973, Merforth 1973a, Bauer et al 1975, Riemann et al 1971, Spatz 1975 and Keimer 1975).

Provided that there is not too large a proportion of forest and undergrowth, the value of a landscape can be increased by areas of reverted land. Any truly negative effects need to be expected only where the variety of the landscape is reduced in regions used intensively by tourists (Block 1974).

3.4.3 On agriculture

It has already been observed in the section on "natural and socio-economic factors involved" that natural and economic reasons can cause agriculture to abandon land formerly used for agricultural purposes. This means that agriculture is the true originator of the resultant reversion. However, since not all the farms suddenly abandon all the land in a district, but individual farmers start one after another to leave their land uncultivated, in some cases involving only small areas, adverse effects emanating from these reverted areas spread to neighbouring land which is still being worked. A number of authors have dealt with these negative effects on land management:

a. During the development of vegetation on reverted areas, phases occur in which adjoining arable land is endangered by:

   a) airborne weed seeds;
   b) the fact that reverted vegetation acts as an intermediate host to crop pests (EEC Comm., Vol. 137, 1974).

b. "Invasion by weeds" from nearby reverted land is a danger only in the first few years until the weeds and grass stage is past and that of shrub colonization sets in (Block 1974).

c. The pressure of weed seeds emanating from reverted areas can lead to impairment of neighbouring land as a result of encroachment by weeds and hence to economic disadvantages for neighbouring farmers (Meisel & Bürger 1972 and Meisel 1975).

d. Wooded areas of reverted land which border on arable land cause production losses as a result of shading effects. On marginal areas, this can lead to abandonment of the arable land (Stählin et al 1973).

e. Reversion has negative effects if it occurs unsystematically on very small areas between tracts of agricultural land, when pest infestation and weed invasion occur (Obermann 1974).

f. As reverted land becomes waterlogged, this also affects field paths, which sometimes become impassable (Stählin et al 1972) and neighbouring plots of land (Wagner 1970).

g. Advocates of intensive cultivation of reverted areas include damage neighbouring land among the reasons they cite (Keimer 1975).

h. Even fairly small reverted areas can carry substantial disadvantages for neighbouring farmers as a result of invasion by weeds, encroachment by hedgerows, waterlogging, etc. (Wagner 1970)

A few authors see positive aspects also in having reverted land in the middle of land used for agricultural purposes:

a. Scattered reverted areas in the agricultural landscape can be destructive, but they can also act as refuges within the agricultural land from the safety of which certain animal species contribute to pest control (Bauer et al 1975).

b. Regeneration areas are especially valuable for bee-keepers (and hence for bees, which are so important to some agricultural crops)(Sperber 1971).

Taking everything into consideration, the negative effects of scattered reverted areas on neighbouring agricultural land do in fact outweigh any positive effects insofar as the purely biological side of the problem is concerned. In principle, however, it is desirable from the point of view of agricultural policy to withdraw areas of agricultural land from production (V. Papp 1974). It is, in point of fact, economic forces which turn a piece of arable land or a meadow into a marginal site or cause the creation of social reversion.

Relieving the pressure on the agricultural market by letting fairly large areas of agricultural land within the European Economic Community fall idle is welcomed from one point of view (Wagner 1970), but from the other point of view it creates serious problems for social policy in those regions where there are no alternative opportunities outside agriculture available to the population.

For this reason, the Ministerium für Landwirtschaft, Weinbau und Forsten Rheinland-Pfalz 1966) / Rhineland-Palatinate 1966 /) states that social reversion cannot be recommended as a means of solving the structural problems in upland regions. "Areas of social reversion create new problems. They impair not only the function of these regions as recreational landscapes for people from densely populated areas but also the quality of life and living conditions of the local population. If they reach fairly large proportions, they constitute a serious threat to the objective of stimulating increased economic activity in these regions".

In the central mountain regions and the Alps region in particular, where the population lived almost exclusively off agriculture, growing migration away from the land and an increasing area of marginal reversion have reduced the population density in some places to a level where it is becoming seriously questionable whether infrastructural services (schools, transport, public utilities, etc.) can be maintained. A trend of development which originated in agriculture itself is now exerting a negative effect on the remaining agricultural population.

3.4.4 Summing-up

Positive and negative effects of letting land revert

The effects of reversion on the environment have not yet been studied sufficiently, and this means that for the most part there are still no reliable data available on the consequences of reversion for soils, water conservation, climate and the flora and fauna. Statements made by some authors are repeated by other authors even though they are not supported by reliable evidence. The effects and consequences are, in principle, dependent upon such a large number of parameters that it is not possible to give a comprehensive review in summary form even of the present state of knowledge. Furthermore, even given the same amount of knowledge available, opinions on whether an effect should be judged as positive or negative are widely divergent.

Despite these reservations, an attempt is made in the summary table overleaf ("Effects of letting land revert") to provide a systematic analysis on the basis of the text given here. A distinction is made between dry and moist sites for both reverted arable and meadow; Mediterranean conditions are also dealt with.

The process of succession on reverted areas is governed by the following factors:

a. distance from bordering vegetation;
b. floristic composition of the bordering vegetation;
c. condition of the land after it has reverted;
d. weathering processes after the land has been left to revert;
e. floristic composition of the pioneer reversionary vegetation;

f. natural site factors in general;
g. external intervention after the land has reverted.

As a rule, natural reforestation does not occur until after several decades, and will not necessarily occur on all reverted areas.

The synopsis entitled "Types of reverted lad and various different reverted sites "given in Annex 7 (p. 148) indicates the various different criteria used in evaluating the phenomenon of reversion and the types of reverted land derived on the basis of these criteria. Completely different judgements are arrived at, depending on the viewpoint and mental attitude of the authors concerned. This partly explains the diversity of the theories and scientific judgements put forward on the effects of reversion and its evaluation.

7)

Fig. 7: Effects of letting land revert

Site	Arable reversion		Meadow reversion		Vineyard reversion
	dry	moist	dry	moist	
Soil	plant cover forms mild nutrient humus - discharge of nutrients - danger of erosion on steep slopes	increase in humus content - gley formation - solidification - formation of a reduction horizon	only minor soil changes	waterlogging owing to removal of drainage systems - formation of gley patches - discharge of nutrients	increased danger of erosion owing to removal of buttresses
Water balance	pollution of ground water as a result of nutrient discharge -	low rate of evaporation	less leaching-out of N than on arable fallow	less leaching-out of N than on forest fallow	
	with the cessation of fertilizing, lower nutrient discharge level in the long term and hence less danger of eutrophy - lower rates of evapotranspiration than on arable land, but reduced storage capacity in the long term				
Climate	only minor influence on climate	cold air production and fog formation	only minor influence on climate	cold air production and fog formation	
Flora	development dependent upon site, former use, bordering vegetation and other factors: maximum number of species, luxuriant vegetation, stable tracts of grassland over fairly long periods of time				
	formation of grassland in some cases - slow colonization by shrubs - possible formation of woodland after some decades	formation of grassland in some cases - more rapid colonization by shrubs	very slow colonization by shrubs - possible formation of woodland after some decades	slow colonization by shrubs	
Fauna	increase in the number of species, woody biotope on reverted land potentially the richest in animal species ! low level of pollution by biocides, little disturbance, refuges for rare species				
Countryside and recreation	evaluation of effect dependent upon the user programme !				
	usable for leisure activities throughout almost the entire year	not really usable for recreation	usable for leisure activities throughout almost the entire year	not really usable for recreation	loss of the typical character of the landscape can be a disadvantage
Agriculture	weed seeds airborne from fallow areas on to neighbouring agricultural land				
	danger of weed invasion from airborne seeds only in the case of scattered patches of fallow	danger of waterlogging carries disadvantages for neighbouring agricultural land and field paths		danger of waterlogging carries disadvantages for neighbouring agricultural land and field paths	
	relief of pressure on agricultural markets by letting fairly large areas of agricultural land fall idle				

3.5 Statutory regulations and measures for preventing reversions and caring for reverted areas, and relevant experience gained

3.5.1 Objectives of regulations and measures in general

The main aims of measures to prevent reversion and to take care of reverted land are the maintenance of (agricultural) productivity and also (Gekle 1976) keeping the countryside open and the preservation of a pleasing landscape. While agriculture does indeed have a vested interest in keeping the balance of nature intact, its primary concern is earning an adequate income. Rural amenity management and the preservation of what is called the civilized landscape are secondary, if not minor, objectives as far as agriculture is concerned.

The call made upon farmers to act as managers of the countryside is by far the loudest in those regions where submarginal production conditions are causing land management to be discontinued and fairly extensive areas are being withdrawn from agricultural use. It is true that the demand for countryside management that will maintain productivity comes just as strongly from the agriculture side of the fence as it does from the other. However, no profession can continue to operate for long without any prospect of making a profit. As long as ecological requirements have no market price, economic conditions will dictate the course of development. Only when people are prepared to pay the price for social benefits, as for other commodities, will it be possible for a "market-oriented" approach to be made subordinate.

Since it would be unworldly to expect that it will be possible in the forseeable future to prevent every area of reverted land from occurring or to make adequate resources available to take care of all the areas which have reverted, those areas which are to be kept open have to be defined and classified in accordance with a planned objective. Fischer and Lothhammer (1972) have attempted to make a systematic analysis of initial factors, planning instruments and planned objectives in a "List of objectives and instruments for controlling reverted land problems" (cf diagram overleaf). The measures (planning instruments) to be given consideration differ according to whether precedence is given to improving environmental conditions, increasing recreational value, controlling the productivity

Fig. 8: List of objectives and instruments for controlling problems of reverted land

INITIAL FACTORS	Site located in the vicinity of an urban area	Site located in peripheral regions	Low proportion of forest formation	High proportion of forest formation	Division into small plots	Low-grade soil, steep gradient	Fairly good soil, fairly favourable climatic conditions
PLANNED INSTRUMENTS	Afforestation		Acceptance of reverted land	Leisure activities		Non-intensive agricultural use	Taking care of reverted land
PLANNED OBJECTIVES: Improvement of environmental conditions	+		+	- if no extensive supervised recreational areas are provided		±	+ if no chemical methods are used to keep the landscape open
PLANNED OBJECTIVES: Increase in recreational value	+ if no pure spruce plantations are established and if meadow valleys and high ground with pleasing views are kept open		+ unless there are any extreme opposing viewpoints	+ if disruptive types of development are successfully avoided		- unless backed up by additional development measures	+
PLANNED OBJECTIVES: Increase in the productivity of the land	±		+	+		+	+
PLANNED OBJECTIVES: Acceptable financial cost	- (DM 5000/ha)		+	± (development costs)		±	- - (DM 250/ha)

of the land or keeping within acceptable financial limits. Theoretical demands are unrealistic and get us no farther forward. Planning objectives other than those listed are possible.

Assessing measures for preventing the occurrence of reversion within the territory of the European Economic Community in relation to the objectives that have been fixed is made more difficult by the fact that it is very often social objectives which are uppermost, without this being clearly evident.

For example, the Community programme for hill farmers (Council Directive on mountain and hill farming and farming in certain less-favoured areas) is based predominantly on ecological considerations (of various publications of the Commission of the European Communities on this subject), although it is not so much a question of the preservation of typical landscapes and erosion control as of the social security of the people living and working in these regions. Measures aimed at achieving economic objectives can usually be assessed on the basis of their monetary results. Yardsticks for assessing social measures can be found only with some difficulty. It is, however, of the utmost difficulty to do so when it is a case of assessing ecological results for which there is as yet no general agreement as to their significance and purpose and/or they cannot be quantified at present.

It is therefore hardly surprising that the European literature so far contains few reports on what has been achieved by means of statutory regulations and measures for preventing the occurrence of reversion and taking care of areas that have reverted. The review given below is therefore confined essentially to a brief account of existing regulations and measures in Member States.

3.5.2 Statutory regulations and measures in Member States

3.5.2.1 Belgium

The proportion of the total land area represented by reverted land in Belgium is infinitesimally small and there is no identifiable reverted land problem as such, nor do any relevant statutory regulations or measures exist for preventing or dealing with reverted land.

Laws on land management in general do, however, stipulate that each district should prepare a land use or development plan. The danger of land being left idle, chiefly on marginal areas, can be averted in these plans by the clear assignment of land use.

3.5.2.2 Federal Republic of Germany

In the Federal Republic of Germany, owing to the particular importance of land and soil for the security of food supplies and for the national culture they are subject to a great many restrictions on disposition and moral obligations. The most important of these are rooted in the following laws, which apply to the Federal Republic as a whole:

a. Law on commerce in land.
b. Law on the consolidation of holdings.
c. National law on building development.
d. Law on the leasing of land.
e. Federal forest law.
f. Federal law on nature conservation.

There are also additional laws in the Länder which link an obligation for use or consent to the land and soil:

a. Laws of entail.
b. Laws on neighbours' rights.
c. Forest laws.
d. Nature conservation laws.
e. Laws on land or countryside management and the landscape.

In discussions of the reverted land problems, repeated mention is made of the social obligation of ownership as established in article 14, paragraph 2 of the land law:

"The obligation lies with ownership. Its application must also serve the common good."

According to Hoppenstedt (1974), two possible forms are conceivable for achieving public interest in taking care of the land:

a. as an obligation to take care of the land (obligation to cultivate) on the part of the landowner, essentially devolving upon him the obligation to take action; or

b. as an obligation to consent to care of the land, which is then carried out by the public authorities.

These two concrete forms of obligation have already been incorporated into the legislation of the Federal Republic and the Länder. Since most laws of this type are of fairly recent date and, in particular, the necessary regulations for implementation and completion are still lacking in some cases, no definitive evaluation can be made at present of the advantages and disadvantages of the two forms listed. Attitudes to the obligation to consent or cultivate are subject, as are opinions on reverted land itself, to the changing times. The difficulties involved in the operation of the obligation to cultivate range from its practical implementation on the ground to informing the owner (Kolt 1976a).

Experience in upholding earlier police regulations on the control of harmful plants, for example, suggests that a considerable change in convictions is still needed before the aims of the new laws can be achieved.

Examples of measures in some of the Länder are given in Annex 8 (p. 150).

3.5.2.3 Denmark

The Danish Conservation of Nature Act empowers the State to commit private land, in certain circumstances, to special servitudes which allow the public authorities to keep the land free of trees if the owners do not do so themselves. Use is also made of this possibility in the case of reverted land.

The Danish Conservation of Nature Act also authorizes the purchase or maintenance of reverted or submarginal land. These measures will undoubtedly be applied in the future also, especially in the west and north of Jutland but also on the island of Bornholm and on the marshes of Zealand.

3.5.2.4 France

Legislative measures for preventing reversion of land in France are essentially confined to Articles 39 and 40 of the "Code Rural" of 1960. These authorize farmers, if their land borders on agricultural land which has reverted, to manage these reverted areas. Until now, however, these articles have hardly ever been applied in practice, since no precise legal definition of reverted land exists and farmers who were willing to manage the land did not wish to take it over without legal justification.

A new draft law relates to both these Articles of the "Code Rural". The proposed rules are designed to facilitate recultivation of reverted land by either:

(a) broadening the scope for taking over land (not only neighbouring farmers but any natural or legal person is to be able to take over reverted land for recultivation); or

(b) simplification of the legal and administrative procedures.

The proposed amendments to this legislation enable both small areas of reverted agricultural land and quite large reverted areas of local or regional importance to be recultivated.

Various other efforts have been undertaken to update legislation as regards reverted land. For a time the introduction of a "reverted land tax" was considered, chargeable to farmers who let their agricultural land fall idle. Such a law is, however, far from realization.

3.5.2.5 Ireland

Statutory regulations and measures aimed at preventing reversion or at an organized maintenance of agricultural production in Ireland are implemented and upheld through the activities of the Land Commission.

The Irish Land Commission has vested in it rights which enable it to acquire land for the purposes of reforms related to the agricultural structure. These rights of acquisition held by the Land Commission chiefly concern unused land and rented land which is inadequately managed. In practice, the activities of the Land Commission mainly involve the abandoned agricultural land of farmers who have drifted away from the land or the inadequately managed land of hobby farmers from the towns. The Land Commission can also allocate common land for a purpose it deems appropriate. In some cases, marginal land is bought up by the forestry authorities for the purposes of afforestation.

3.5.2.6 Italy

There is a law (DL 19 October 1944, no. 279) dating from 1944 which relates to the leasing of decontrolled land "if it is unmanaged or inadequately managed in relation to its quality, to local agricultural conditions and the requirements of land cultivation in relation to the needs of national agricultural production". Since this definition is not really specific, the law has not been put to any widespread use. In the absence of other national laws, only a small number of districts have used the law of 1944 as a basis for regional laws (Marche L. 38/1974; Abruzzi L. 13/1975; Campania L. 23/1975; Puglia L. 17/1974).

Law DL no. 89 of 6 September 1946 is also imprecise in its definition, but Law L. 10 August 1962, no. 1368 appears to be more explicit on the expropriation and acquisition of abandoned land in mountain regions, since it defines such land as land "which either has already been used for crop cultivation or is unplanted or overgrown with shrubs or also wooded to some extent and which for at least three years has ceased to be worked or put to normal use".

Recent draft bills relate to privately owned, unmanaged agricultural land (in 1974). According to an updated pro forma of the ministerial proposal,

"unmanaged land" includes, for example, land which has been designated as such by the owner in his declaration of income or land for which no means of production or labour have been purchased and from which no products have been sold.

There are other proposals which provide more detailed definitions (article 2 of draft bill no. 677 of 28 October 1976 of the House of Representatives): the provinces will see that a census is taken of the population of unmanaged or inadequately managed areas of land, the classification criteria for this being based on homogeneous agricultural zones, i.e. in relation to agricultural planning priorities, minimum average production, yields per hectare, number of working days per hectare of agricultural land, average investment of working capital per hectare, special features of the terrain, quality of the forested land under agricultural ownership, types of production, and the requirements of agricultural units and of regional and national agricultural production.

Since this legislation is also intended to include "inadequately managed" land, it makes no clear distinction between managed land and reverted land.

A list of laws and draft bills on the treatment of reverted land in Italy can be found in Annex 9 (p. 153).

3.5.2.7 Luxembourg

There is no knowledge of any statutory regulations, measures or provisions in the Grand Duchy of Luxembourg relating to the treatment or avoidance of reverted land. The absence of relevant regulations can, however, be explained by the absence of any real reverted land problem as such.

3.5.2.8 Netherlands

Since the problem of reverted areas does not exist at all in the Netherlands, no statutory regulations or measures for avoiding or treating reverted land have so far been adopted. In a note from the Netherlands Ministry of Agriculture and Fisheries (dated 8 December 1976), it is stressed that no consideration is given to the phenomenon of letting land revert either in administrative measures or in the general policy sector, at national or regional level.

Management agreements ("beeheersoverinkomsten" and "onderhoudsoverinkomsten") which are applicable in agriculture bear no direct reference to reverted land.

3.5.2.9 United Kingdom (UK)

In the case of the United Kingdom, there are no known statutory regulations and measures which relate directly to the phenomenon of reverted land. In general, however, the government has laid down, within the scope of the Green Belt Policy, basic principles which can in the main check any development of speculation reverted land by way of high tax levies for unused land.

From a different angle, the Ministry of Agriculture, Fisheries and Food supports the activities of the Forestry Commission in buying up marginal land for the purposes of afforestation. In addition to this, the laws on nature conservation enable the Nature Conservancy Council to protect ecologically valuable areas.

Since agriculture in the UK as a whole is highly intensive, no direct regulations on reverted land exist.

3.6 Possibilities and costs of caring for or recultivating reverted areas

3.6.1 Possible uses of reverted areas in general

As shown in fig. 8 "list of objectives and instruments for controlling reverted land problems" on page 78, the possible uses of reverted areas are many and varied. In many cases, however, only certain measures and/or uses are practicable, depending upon the prevailing site conditions (initial factors). Riemann (1971) has compiled the following "List of possible uses for reverted areas" :

1. Agricultural use

a. Leasing of favourably located reverted areas to nearby full-time farmers.
b. Combination of fragmentary plots into holdings large enough for rational management.
c. Establishment of central farming units for the management (as extensive as possible) of combined areas.
d. Selection of good fertile soils to form central farming units.
e. Use of poor-grade land for non-intensive pasture management - e.g. for free-roaming sheep.
f. Implementation of cost-favourable land improvement measures.

2. Forestry use

a. Afforestation of suitable reverted areas to improve the field/forest boundary.
b. Afforestation of sufficiently large areas of continuous extent.

(Implementation of the proposals given under 1. and 2. can be aided, inter alia, by the formation of leasing cooperatives, especially in regions where estates have been divided between the heirs).

3. Use for recreation - leisure - sport

a. Installation of stretches of water (e.g. valley reservoirs for drinking and service water, retaining basins, fishponds and fishing-grounds).

b. Establishment of weekend and holiday home developments, camping sites.
c. Establishment of extensive sports facilities (e.g. golf courses, glider flying areas, motor-sport tracks).
d. Creation of game reserves.
e. Facilities for horse-riding.
f. Tending of areas required for specific purposes.

4. Leaving reverted land to its own resources (natural succession)

This list could perhaps be extended to include other possible uses such as drinking water collection. The use of reverted land for this purpose would be possible mainly in low-lying areas, whereas on high ground woodland is preferable for water catchment, to protect against erosion.

Converting reverted areas to other forms of use is not only difficult for financial reasons but also has to comply with the ideas of the owners of the land. The various different forms of use for recreation, leisure activities and sport are possible only on a few obviously suitable sites. They are by no means patent solutions for extensive areas of reverted land. In the majority of cases the only possibility left is forestry use or, if natural succession is undesirable on the basis of rural amenity considerations, tending the areas without using them.

Zundel (1972) developed a scheme (see figure below) for evaluating afforestation projects from the point of view of rural amenity. In our opinion, this scheme, which analyses the effect of the forest on the balance of nature and its suitability for recreation, can also be used for evaluating reverted areas from the point of view of rural amenity.

In the last few years a wide range of methods has been developed and studied for tending reverted areas. In the German literature in particular, there is a substantial amount of information on possible methods of tending reverted land which cannot be reviewed in brief here. In many cases the methods are discussed in a very biased fashion, i.e. either the biological effects are consequences are not taken into account or the costs of the measures are disregarded.

Fig. 9: Evaluation of reverted land on a rural amenity basis (adapted from Zundel 1972)

Effect on			
Balance of nature		Recreational value	
Countryside management	Biological diversity	Usability	Beauty
Water	Flora	Freedom of movement	Familiarity
distribution of run-off			
quality of water	Fauna	hiking	Harmony
total amount of run-off, etc		botanizing	
	game	resting	
	birds	playing games	cleanness
Soil	bees	winter sports, etc	no smelting works
	butterflies		no power cables, etc
protection against	other useful and		
falling stones	beneficial insects, etc	Bioclimate	
ablation		sun screen	
landslides		wind	Diversity
avalanches, etc		purity of air	
		absence of noise	colours
		smells, etc	shapes
Climate			light/shade
			views
humidity			valley vistas,
temperatures			etc
cold air, etc			

Leaving aside the question of their necessity, tending methods can be classified systematically as follows:

Methods of tending reverted land

1. Mechanical methods
   a. mulching and mowing
   b. fire
2. Biological methods
   a. keeping livestock
   b. establishing and tending plants
3. Chemical methods
4. Combined methods
5. Afforestation

3.6.2 Mechanical methods

3.6.2.1 Mowing and mulching

The purpose of tending reverted land is always to create a "cultivated landscape", or a landscape which simulates the impression of agricultural use.

This impression can be achieved either by mowing the natural growth and carrying it away or by merely cutting it short or cutting it back and leaving it on the land. The former method is referred to as "mowing", and the latter as "mulching".

The question of which of these two methods can be considered is determined in the first instance by the initial circumstances:

a. size of piece of land
b. shape
c. state of cultivation
d. obstacles
e. gradient
f. load-bearing capacity of the soil
g. natural decomposability of the mulch material produced
h. association with methods to be used subsequently
i. facilities for carrying away the material.

Cutter bars, twin-cutter mowers and rotary mowers are very susceptible to breakdown and are therefore suitable only in cases where the vegetation is not too luxuriant and initial conditions in other respects are more or less optimum. Long mowings form a thick covering layer (swath effect). For this reason, the area is usually cleared of mowed material.

The most important characteristic values of mechanical tending, namely:

a. working time requirement
b. machine costs
c. quality of work
d. limits of use

are determined largely by the technical equipment available (Gekle 1976).

Kolt (1972) calculates 500 ha to be the annual working capacity for a tractor with a mulching attachment, given an average area output of ca. 0.5 ha/hour and a total usage of 1200 hours/year and also assuming that 20% of the area has to be mulched twice a year.

On the basis of this calculation, he arrives at costs of between DM 39.70/ha and DM 63.50/ha for mulching.

Gekle (1976) gives costs of between DM 44.00/ha and DM 167.00/ha (cf. Table 9). On average, his figures are less than DM 100.00/ha.

Arens (1974b) points out that the high costs of between DM 200.00/ha and DM 300.00/ha relate only to the special case of initial mulching under difficult conditions, and that for routine mulching even DM 50.00/ha would be a high estimate. Neander (1973) gives mulching costs of around DM 70.00/ha and Kromer (1975) holds the view that the tractor/mulching attachment combination can be used for as little as DM 35.00/ha if:

a. the areas involved are large enough;
b. suitable equipment is chosen;
c. no additional payments for holidays and long journeys are necessary;
d. no unusually difficult conditions of use are involved;
e. no reductions for repeated mulching are necessary.

If prevailing circumstances make the work difficult, the costs per hectare rise.

Gierer and Gregor (1975) report on the results of tending trials on reverted land in Spessart and, on the basis of their practical experience over several years, reach the following conclusions:

Extreme sites impose special tractor specifications:

a. tractor power not less than 75 hp;
b. solid construction reinforced at critical points;
c. four wheels of equal size, possibly with double tyres;
d. adequate comfort for driving (driver's cabin protected against overturning);
e. additionally equipped with cable winch, etc.

Since their wear and tear are less and they deposit the mulch material evently, beater mowers are preferable to sickle mowers.

The area outputs achieved (80 hp, mulching width 2.30 m) were as follows:

a.	initial mulching, thick undergrowth	0.2 - 0.3 ha/hour
b.	wet sites	0.2 - 0.4 ha/hour
c.	follow-up mulching on dry sites	0.5 - 0.8 ha/hour
d.	follow-up mulching on wet sites	0.4 - 0.6 ha/hour
e.	top mulching on pasture	0.8 - 1.3 ha/hour

With twice-yearly mulching, the best times for mulching were found to be those days on which grass was also mown for intensive hay-cropping.

According to Kolt (1972), the best time is the period after full flowering of the entire vegetation stand in July/August in the case of once-yearly mulching, and June and August in the case of twice-yearly mulching. An autumn or winter mowing is also possible if a detailed plan of cutting sequence is worked out for individual areas.

As a rule, recommendations on the best times for cutting are made from the viewpoint of the development of the vegetation; unfortunately, little consideration is given to the conservation of animal species living on these areas.

Bauer (1971) and Perreiter in IALB (1972) see the possibility of creating a park-like landscape with clumps of trees and bushes by carrying out only partial mulching over several years. This sporadic intervention in the natural succession would be much less costly than annual mulching (especially on wet sites which are difficult to work) and would result in an interesting landscape.

On the question of whether mowings left on the land have unfavourable effects on the vegetation and the landscape, Nüsslein (1972), Kolt (1972), Gekle (1976) and other authors are unanimously of the opinion that this is not so. It is not necessary to remove the mulch material (except on a few "thick-growth" sites), since no turf mat or peat formation was observed, the organic matter being quickly decomposed and absorbed. Even comminuting the mowings had no effect on regrowth, although a thick layer of green material does cause suppression of the grasses beneath (Gekle 1976).

However, on the basis of his initial research results Schreiber (1977) indicates that there is likely to be an accumulation of organic matter and humus formation as a result of inadequate decomposition, especially on moist and wet sites.

The less pleasing aesthetic appearance of mulched areas lasts only for a short time.

The advantages of mulching reverted areas can be summarized as follows:

Mulching:

a. is good value for money;
b. it is flexible;
c. it puts no pressure on the agricultural market;
d. it provides farmers with additional income when they are paid for it (over a certain period)(Kolt 1973).

For the sake of completeness, it should also be mentioned that the tractor/mulching attachment combination can also be used for other purposes in addition to tending reverted land:

a. rough pasture, mulching down of unwanted deteriorating fodder;
b. road verges and slopes;
c. areas for leisure use, e.g. open spaces in national parks;
d. game browsing areas.

In many cases local districts hire the use of suitable mulching equipment. Allocating the mulching operations to subcontractors is more economical for local districts than buying their own equipment only if no use can be made of a tractor outside the mulching period (about three months)(Kolt 1976b).

Additional information about technical equipment, costs of mowing and mulching and about the best time for cutting is given in Annex 10 (p. 154).

3.6.2.2. Fire

Fire can also be counted among the mechanical methods. In recent times, consideration of the use of fire in countryside management has been gaining more and more ground. The use of controlled burning comes under discussion in cases "where certain plant communities (e.g. on litter meadows,

heathland, dry grassland and Scots pine forests) need to be preserved or re-established by means of human intervention, and where for technical reasons (e.g. in moist regions) or because of financial considerations other methods (e.g. mowing, grazing) appear to be disadvantageous" (Riess 1976).

The technique of controlled burning has been used successfully in America for a long time. In the Federal Republic of Germany a number of investigations are in progress on burning techniques, the correct time for burning and the ecological effects. So far, opinions on the effectiveness of burning are still very divided.

Zellfelder (1974) judges burning-off negatively, since:

a. it involves high risks for man and animals;
b. there is a danger of pollution from smoke formation;
c. current laws in most countries prohibit it.

Stählin et al (1973 and 1975b) suspect that, with repeated burning, the destruction of organic matter causes soil depletion and disrupts the entire biocoenosis. Furthermore, allowance has to be made for the following effects:

a. brambles (Rubus spp.) and nettles (chiefly Urtica dioica) re-establish themselves after one year;
b. invasion by ruderal plants occurs;
c. there is a danger of erosion on slopes;
d. the spread of fire to woody plants causes aesthetic damage;
e. unpleasant smells are produced, and fairly prolonged air pollution;
f. the tract of land is unattractive in appearance for weeks afterwards;
g. many species, e.g. butterflies, are burnt to death.

Imhoff (in Kolt 1976) reports on burning trials in Hesse. No satisfactory results at all were obtained with controlled burning:

a. autumn burning is difficult;
b. spring burning is greatly dependent upon weather conditions: only dead material was burnt;
c. burnt shrubs are unattractive in appearance;

d. the use of burning is difficult to control over large areas;

on the other hand

a. there were no disadvantageous effects on birds and other fauna.

Imhoff comes to the conclusion that on wet sites, for example, burning can sometimes be a useful tending method.

An interesting observation is reported by Hailer (1973b). When shrubs that had been cut down were being burnt, the fire accidentally ran along a short distance through the dead ground cover. Under this ground fire, the thin snow cover did not even melt!

Schreiber (1974 and 1976) sets forth negative and positive aspects of regular burning.

Negative: a. danger of erosion on slopes;
b. in the case of several years' burning, excessive layer thickness, and hence excessive heat and damage to flora and fauna;
c. CO_2 release, dust formation, pollution by smells,
d. loss of organic matter;

positive: a. with correct use, good litter clearance; the trend of development may possibly be in the direction of communities containing fewer high grasses.

Hard (1975) also sets forth the positive aspects of burning:

a. burning polycormics often results in a gradual "self-cleaning" of reverted areas from pioneer shrubs;
b. with carefully directed burning, a "regressive succession" from arable reversion to grassy reversion is achieved;
c. thick-growth mesobrometes, whose low-growing species are easily suppressed, can be maintained with their floristic composition intact by means of burning.

Westhoff (1975) writes that burning is not the only satisfactory method of tending reversed land, but is far better than the use of herbicides in that it is a natural method. In nature conservation areas in the Netherlands, heathland is burnt off in February/March every 12 years without any harmful effects on insects and small animals having been observed.

However, no final judgement can be made until the recently initiated trials with pyrotechnically timed controlled burning on various different sites have been completed.

3.6.3 Biological methods

3.6.3.1 Keeping livestock

Our analysis of the development of reverted areas in Member States has shown that, in the United Kingdom and Ireland in particular, a reverted land problem affecting large areas does not exist as it does in the Federal Republic of Germany, France and Italy, because use of the land (albeit very non-intensive) by cattle and sheep is still being maintained. What could therefore be more logical than an attempt to restore areas that have already fallen fallow to a tended state by means of non-intensive livestock rearing?

In point of fact, a great many trials with non-intensive livestock rearing have been carried out and evaluated, mainly in more recent times. The results obtained differ in this case also, although to varying degrees. Taken as a whole, however, they cannot be regarded as encouraging. The chief reasons for this are as follows:

a. In the climatic conditions of central Europe, winter grazing for cows and sheep is not possible.

b. The rougher the pasture is, the smaller the proportion of fodder grasses is (the proportion of "weeds" being correspondingly higher). Grazing on these areas can eventually lead to the formation of pure weed stands, which make grazing impossible.

c. There are no robust, undemanding breeds of cattle and sheep on the Continent which are able to subsist on low-grade fodder and, by and large, withstand the rigours of the weather, as there are in the British Isles.

Keeping the landscape open by means of grazing animals is possible only with "suitable" numbers of livestock, but even this requires adequate quantities of fodder and storage space for the winter, as well as the availability of sufficient capital.

The profitability of livestock rearing is low even when site conditions are favourable. In upland locations and on marginal sites, circumstances are even worse for productivity. The pressure towards intensification runs counter to the idea of inexpensive countryside management:

a. the use of extensive areas for grazing reduces the recreational value of the landscape (meadows for hiking, playing games and relaxing);

b. moist valley and woodland meadows are usually not suitable for grazing (Arens 1974a).

According to Gekle (1976), the most important characteristic values for biological tending of reverted land are as follows:

a. proportion of winter fodder available, depending on:

   i. climate;

   ii. ratio of the number of animals to the proportion of winter fodder;

b. state of domestic farming as regards technical methods;

c. intensity of land use;

d. effect of the work time requirement on tending costs.

All calculations of its economic management yield results showing that there is no form of organization for livestock rearing in problem regions which provides full-time agricultural units with the means of earning an "agreed income". No definite figures can be given on the amount of subsidies required; they are dependent on too many circumstances which vary from one location to another.

The results of model calculations published by Neander (1973) are given in Annex 11 (p. 157) as an example.

Practical experience confirms that the management of the countryside is very closely associated with the operation of part-time agriculture. Hobby farms, ranging from breeders of small animals to horse-owners, contribute directly or indirectly to countryside management through their own use of land or through the purchase of hay for their animals (Ammer 1973). Calculations for these are based on different economic management criteria than those used for full-time farms. They are not shown as earning 100% of

their income from land use or livestock rearing. On the contrary, many hobby farms invest income from outside agriculture into agricultural operations and thus contribute towards maintaining agriculture on marginal sites.

In addition to the "non-intensive" rearing of:

a. sheep (as penned, herded or free-roaming sheep);
b. goats;
c. cows (also without stalls);
d. lean livestock;
e. cattle (as boarded cattle during the grazing season, heifer rearing);
f. horses (adult horses and ponies); and
g. fish (in fishponds and reservoirs);

it is even recommended that fallow deer (Dama dama), red deer (Cervus elaphus), mouflon (Ovis ammon musimon) and reindeer (Rangifer spp.) should be kept (Piotrowski 1970, Reinken 1977).

So far, only the experience gained with fallow deer can be judged as positive, since this species of game copes best with diseases and parasites. With other game species, relatively high population densities lead to casualties and losses, and profitable management is unlikely. However, further research results are needed before any generally applicable conclusions can be reached. What also needs to be checked, in particular, is the nature of likely effects on the flora and the landscape potential as a whole. The negative experience with goat rearing in Mediterranean countries should act as a reminder of the need for caution (danger of erosion)!

3.6.3.2 Establishing and tending plants

This enumeration of biological methods would be incomplete if mention were not also made of the possibilities of establishing certain plant species. In the Federal Republic of Germany, Jahn-Deesbach (1970) in particular has studied the establishment of frost-resistent varieties of rape and cabbage on what is called "winter pasture". These trials have already proved extremely successful for game browse management. Stands of winter rape/winter vetch (Brassica napus/Vicia sp.) provide a good, frost-hardy winter fodder with second growth in early spring, and improve the

possibilities for non-intensive rearing of fattening cattle, sheep and game species. A combination of various different pasture systems with frost-resistant growth could enable the animals to find fodder even when there is a moderate snow cover.

To establish winter grazing stands, methods are being tested which exclude mechanized soil cultivation, such as spraying to kill the foliage plant stand or spraying with fertilizer and additional sowing of useful plants. Trials with woody fodder plants for winter pasture are also in progress.

Hard (1975) recommends keeping reverted arable land open by sowing in grass during the final soil-working, i.e. before the land reverts. The grass suppresses colonization by woody plants immediately (cf. section 3.4.1.4., "Flora"). Conversely, colonization by woody plants can be encouraged by deliberate soil wounding on meadow fallow and also be considered as a measure for countryside management.

Imhoff (in Kolt 1976) holds the view that, as a rule, sowing plant communities that require little tending on areas that have already reverted is too expensive. This would also support carrying out sowing before the land reverts, at least on arable land.

Whereas non-intensive use of grassland is generally regarded as unprofitable, non-intensive cereals cultivation on arable areas appears to present fewer problems. At all events, distinguished scientists such as Neander (1971), Zapf (1972), Steinhauser (1974) and Hauser (1975) regard non-intensive crop cultivation as theoretically possible under certain conditions. The conditions cited are as follows:

a. large areas of continuous extent, on sites which are not too sloping;
b. optimum use of equipment with full utilization of capacities;
c. maintenance of certain crop rotations;
d. facilities for employment outside the unit during the slack seasons.

3.6.4. Chemical methods

According to an enquiry made by Keimer (1975), the consumption of chemical preparations used in tending reverted land is astonishingly high, although there is still heated controversy in the literature regarding the merits of these preparations. (The statement that 27% of all measures employ chemical preparations probably relates to Bavaria).

The journal Natur und Landschaft (3/1973) published a declaration by independent scientists "Against poison in the countryside". These scientists declare themselves against the use of chemical weed control agents, since not enough information has yet been obtained on the long-term consequence of applications of growth regulators and herbicides. Their use is hazardous in any case, since it seriously disrupts the natural biocoenoses.

Bauer et al (1975) also oppose the use of chemicals for keeping reverted areas open. The "chemicalization" of the countryside has already progressed too far. Furthermore, the advantage with reversion is precisely that it is not necessary to use chemical fertilizers and chemical weedkillers and pesticides.

Westhoff (1975) calls the use of herbicides a "dangerous business" which should never be proposed as a general solution to the reversion problem. Tüxen (1973) urges that the use of chemical preparations should be confined to the smallest area possible, since the effect on the entire biocoenosis cannot be overlooked. Imhoff (in Kolt 1976) reports on trials in which the effect of chemicals was also tested. In principle, he also would like to see the use of herbicides in countryside management confined to only specially reserved exceptional cases. He makes the following observations, inter alia:

a. the use of herbicides for killing trees and shrubs and certain weeds has not proved its worth, because:

   i. the costs are relatively high;
   ii. the result is not permanent, and repeated use is necessary;
   iii. the appearance of treated trees and shrubs is unattractive;
   iv. herbicides are "unnatural" and "hostile to the environment";

b. growth inhibitors do not work satisfactorily, and when they are used over large areas the costs are too high. A "weed" in agriculture is not the same thing as a "weed" in countryside management!

Schreiber (1974) summarized the reports given in the phytopathological literature that the damage to the microflora after the use of herbicides is merely temporary, but draws attention to a reduction in the numbers of earthworms (Lumbricidae) after the application of sprays. He also stresses that not enough research has yet been done on the long-term workings of the metabolism in the soil and the influence of herbicides on the ground water.

Stählin et al (1973 and 1975) do not reject the chemical treatment of reverted land in general. In their opinion, in many cases the use of herbicides is a simple, usually effective and (provided that the correct preparation and dosage are selected) beneficial intervention in the biocoenoses. Although herbicides are called "poisons", they are not in fact among the substances which are toxic for man. The majority of herbicides are rapidly transformed into completely harmless "natural" substances. However, chemical intervention becomes justifiable only if the conditions necessary to the existence of the species to be killed are also destroyed and the chemical intervention therefore does not turn out to be a permanent measure.

With very few exceptions (e.g. Stählin et al 1975b), chemical methods are described as being too costly. Hallermann/Neander/Piotrowski (1974) quote DM 100.00 to DM 200.00 per hectare, and Faber (1975) also quotes ca. DM 200.00 per hectare. The latter sees the positive side of the use of herbicides in the possibility of their careful localized application. On all other counts he too adopts a highly critical attitidue to chemical methods.

It is understandable that the chemical industry is trying to expand the market represented by the chemical tending of reverted land. The number of products available is now almost too large to comprehend. A great many tests and investigations, some of them supported or financed by the chemical industry, have not yet been evaluated conclusively. For reasons

deriving from environmental policy, and since not enough is known as yet about the interaction of effects, in every case a thorough study should be made not only of the direct effects on man and weed but also of the consequences for the biocoenosis as a whole. While our knowledge of the long-term effects of these preparations is so incomplete, the chemical tending of reverted land must be approached with considerable reservations.

Details of trials with chemical methods are given in Annex 12 (p. 159).

3.6.5 Combined methods

The advantages and disadvantages of individual methods of tending reverted land, coupled with differences in site conditions, have frequently led in practice to the use of a combination of mechanical, biological and chemical methods. The best known of these is the combination of sheep-rearing and mulching.

Long (1975) carried out trials in the French "garrigue" [evergreen low bush formation]. By mulching the garrigue (18 tonnes/ha of dry matter in a 16-year-old stand) and mowing and fertilizing the area repeatedly, without ploughing or sowing grasses he obtained a plant stand in which grasses are dominant and which is capable of carrying five sheep per hectare per year.

Countryside management trials in Bavaria and Hesse showed that the pasture provided by fairly old reverted areas in upland districts with heavy rainfall is not sufficient. The sheep-farmers were therefore obliged to mulch the areas as well. In many cases one mulching at two-yearly intervals was enough to keep the areas in the condition required (Kolt 1976).

Arens (1974b) sees the combination of sheep grazing and mulching as the optimum tending of reverted land:

a. since grazing reduces the costs of mulching;
b. and mulching provides fresh fodder after the regrowth has been grazed.

Owing to the "selective feeding" of sheep, other authors also recommend a follow-up mulching every one to two years. Tüxen (1973) observes that grazing by moorland sheep (Heidschnucken = a breed of sheep in North

Germany) is not enough on its own as a tending measure; instead, turf pricking or burning is necessary from time to time. Regeneration of the growth is also sometimes carried out by means of ploughing, cutting or harrowing and possibly sowing of Calluna.

The combination of mechanical and chemical methods has already been discussed (cf. section 3.6.4).

Most examples of forms of non-intensive use which are effective from both the agricultural and countryside management viewpoints are individual cases which have proved their worth on individual sites and in individual units but are not suitable for general application (Spitzer 1972). Countryside management employing agricultural measures is dependent upon so many different factors that model trials cannot really be generalized (Menzinger in Kolt 1976). The advantages of the mechanical tending methods of mowing and mulching are that they do no harm to the environment and that, as opposed to biological methods, the costs can be calculated precisely (Arens 1974).

Gekle (1976) has worked out a comparison of mechanical and biological methods in countryside management and agriculture. He deliberately excluded chemical methods from the comparison for "reasons deriving from environmental policy" (cf. figure 10).

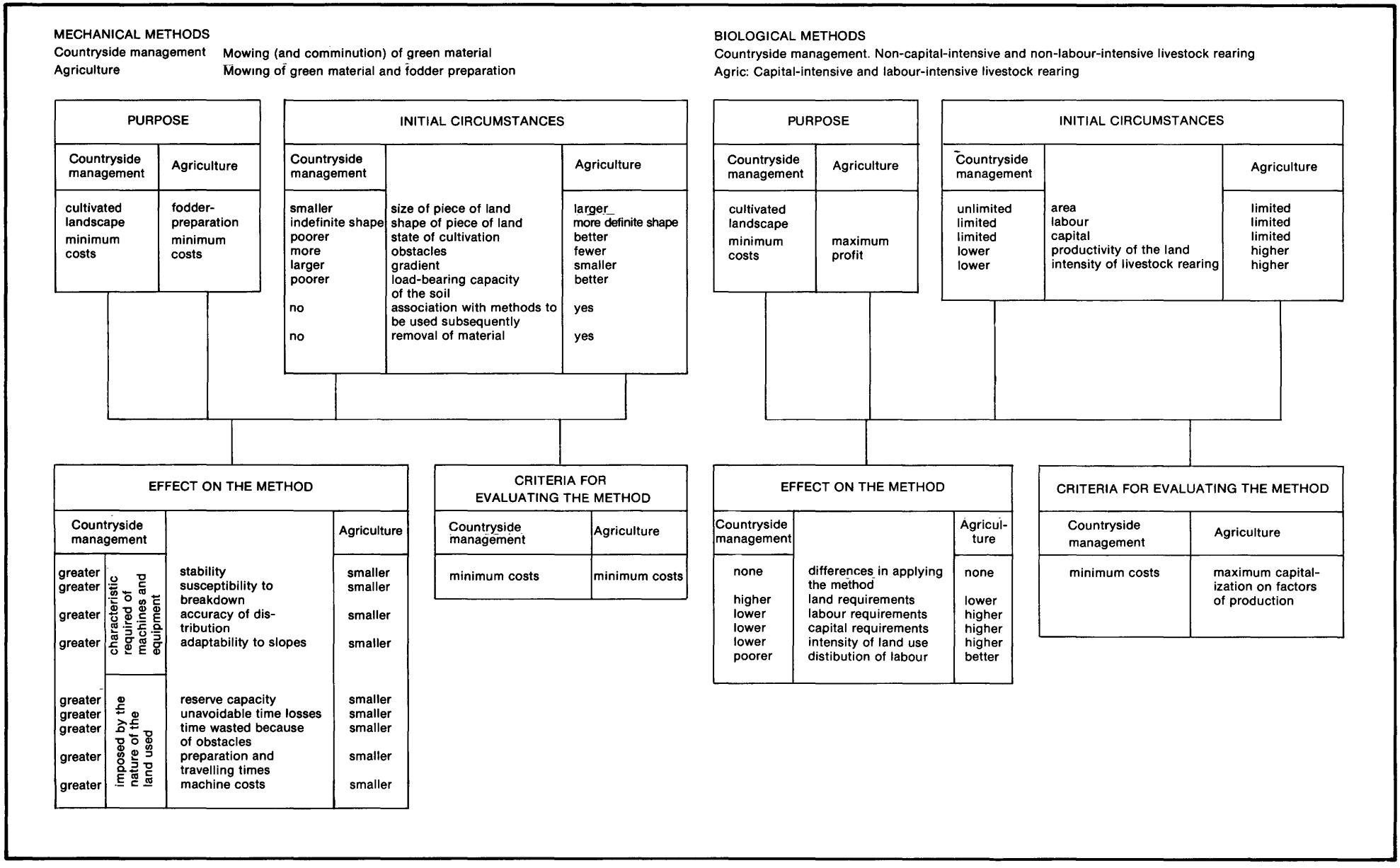
For economy of labour and ecological reasons, methods of tending reverted land should be as versatile as possible (Schreiber 1974).

Figures cannot be given for the profitability of combined methods because no detailed cost calculations are available.

3.6.6 Recultivation

In most cases, the resumption of agricultural use on reverted areas, i.e. their recultivation, is possible in principle; however, whether it makes good economic sense is dependent upon a whole range of factors, some of which cannot be influenced. It is certainly true that only in very rare cases will it be likely that yields will be higher after the recultivation

Fig. 10: **Comparison of mechanical and biological methods in countryside management and agriculture**



Source: Genkle, 1976.

the recultivation of these soils than before the land was reverted: as a rule, marginal soils remain marginal soils. On the other hand, in normal cases no more rapid degradation takes place under reverted land than under intensive agricultural use (Stählin et al 1972).

The restoration of reverted areas to a condition suitable for grazing corresponds, in practice, to initial mulching. What this represents is the borderline case between "recultivation" and non-intensive agricultural use.

In actual fact, our present-day agricultural land has for the most part been forest or reverted land in historical times. The boundary of agricultural use has changed continuously in the course of generations, depending upon the need of the existing population for a livehihood. In our day also, for example, after the economic boom in the Federal Republic of Germany had slumped there were increased indications for the re-cultivation of what has been called prosperity reversion (Wilke 1975).

It is also reported from Italy that immigrant workers returning home from abroad have resumed management of land lying idle.

Long (1975) is of the opinion that at least 50% of the area of "garrigue" in Bas-Languedoc could be revalorized and used at "moderate cost".

The amount of capital required for subsequent recultivation depends, inter alia, upon whether grassland-like reverted land can develop as a result of occasional cutting or whether dense shrub formation or even woodland formation takes place as a result of uninterrupted natural succession. Büring (1970) therefore suggests that, in regions severely affected by reversion, there should be a system of identifying what he calls "reclaimed reversions" where appropriate tending measures will make recultivation possible at any time and at reasonable cost.

The clearance of dense growth formed by plants which spread by means of rhizomes or root suckers and by woody plants is particularly expensive (Stählin and Büring 1971).

Although reverted arable land can usually be recultivated without any further treatment, the recultivation of reverted grassland that has become waterlogged presents special difficulties. Not only is it necessary to

correct the drainage conditions, but also, particularly in soils with a high clay content, there is an increased risk of soil deterioration which is difficult to eliminate (Stählin et al 1972 and 1975), resulting from the formation of reduction conditions in the region of saturation.

As a rule, sites that have become wet are of little value as forest sites.

In the case of vineyards also, recultivation after as little as three years is frequently possible only at considerable cost, or even no longer possible at all; in these cases abandoned vineyard sites have lost their value completely (Wendling 1966). This is attributable chiefly to the removal of the buttresses and the severe damage by erosion.

Tending reverted land without putting it to any use maintains, as it were, its "readiness for production". The tending of reverted land should therefore be seen from the viewpoint of an insurance against crises: it facilitates rapid recultivation. In the drought summer of 1976 a great many reverted areas were cropped by farmers from neighbouring districts in order to increase their own stocks of hay, which would not have been possible if the areas had reverted totally to the wild state (Kolt 1976).

3.6.7 Afforestation

The most traditional type of use for reverted areas is planting them with forest trees. Afforestation is a method which:

a. involves little expenditure of labour;
b. requires little tending over a long period;
c. has no adverse effects on the countryside;
d. offers certain predictable yields;
e. is a capital investment with interest.

(Fischer in Kolt 1976).

According to the Federal Government's Agrarbericht 1971, in the Federal Republic of Germany there are 360 000 ha of marginal soils and 180 000 ha of waste land which are potential candidates for afforestation. Meadow valleys and regions with a high proportion of wooded area should not be afforested and are not included in these figures.

It would be unrealistic to wish to maintain the present forest-field boundary. In particular, the afforestation of agricultural marginal areas and reverted areas on sloping sites should be judged as positive:

a. owing to the even distribution of water and good quality of water;
b. owing to the reduction of erosion damage;
c. as protection against wind;
d. as protection against pollution;
e. because it impedes the discharge of cold air.

The lower the proportion of wooded area in a region, the more favourable the effect of afforestation is on the landscape and ecological conditions (Zundel 1968).

In principle, the afforestation of individual plots of land presents problems from the point of view of forest management, since in forestry also certain sizes of stand are a necessary condition of economic management. For this reason, in most Länder in the Federal Republic of Germany all afforestation projects are subject to permit. Afforestation permits are granted on the basis of attempting to join new forest areas on to existing forest stands or ensuring that specified minimum areas for individual tracts of forest are observed.

Calculations of the economic viability of afforestation projects show that:

a. coniferous forest is far more economic than broadleaved forest;
b. afforestation with mixed forest presents problems, because browsing by game necessitates more expensive protection measures. The cost of afforestation with broadleaved species is several times greater than that of afforestation with spruce (see table 8).

From the point of view of countryside management, the need for a "healthy ratio" between coniferous and broadleaved forest is being stressed more and more, since in recent decades the fact that spruce plantations are less costly has shifted the ratio too far in the direction of coniferous forest.

It is true that afforestation with "mixed plantations suited to the site" requires a great deal of tending and hence higher expenditure than in the case of spruce plantations, but on the other hand it does create a pleasing landscape with a high recreational value (Surber et al 1973).

Table 8: Summary table: Costs of the afforestation of reverted areas

Author	Tree species or site	DM/ha
Hallerman et al (1974)	spruce	2 000
	broadleaved species	8 000
Neander (1973)	spruce	1 500 - 3 000
	broadleaved species	8 000
Fischer (in Kolt 1976)	spruce	2 000
	broadleaved species	8 000
Klauer (1969) according to Gaas	on areas free from shrubs	3 134
	on areas moderately overgrown:	
	by thorn scrub	4 261
	on areas completely overgrown:	
	by thorn scrub	7 396
Hesler et al (1971)	on "clean areas"	3 000 - 6 000
	on reverted areas	5 000 - 8 000

Since the afforestation of areas that have already reverted and become overgrown always involves a fairly high expenditure, it is advisable to carry out planting at the earliest possible moment or to sow Scots pine seed, for example, before the land is abandoned. Substantial cost savings could be achieved in the afforestation of reverted areas if potential reverted areas were identified and recorded at an early stage and judicious afforestation could be introduced in good time.

However, if reverted areas are to be afforested for the most part solely with coniferous species in the future also, leaving reverted land entirely to its own devices is under certain circumstances more valuable for ecological (faunal) reasons and should therefore be given priority over afforestation in certain regions (Bierhals 1976).

3.6.8 Summing-up

Possibilities and costs of caring for or recultivating reverted areas

The possibilities of using or tending reverted land are many and varied. They are presented once again, this time in systematic form, in figure 11. A form of use becomes a possibility once the rate of production is so high

9)

that an equilibrium in the production of biological matter can be achieved. In the case of agricultural use, a distinction has to be made between reverted land on what are marginal areas in relation to agricultural production, and social reversion on higher-grade soils. On submarginal areas, biological tending is in fact the only possible consideration. Whereas non-intensive agricultural use is practised predominantly in the part-time sector, in the case of full-time farming units the trend is towards intensive use, since an adequate income can be earned from agriculture only through high labour and capital productivity. Under European conditions, this generally also leads to a system which is area-intensive to some extent.

On most reverted areas, natural reforestation would take too long. This means that, in areas where woodland is desired, immediate afforestation is a likely course of action. The costs of afforestation are justified by the fact that forest use starts at an earlier date.

If the case of tending methods, i.e. where considerations of rural amenity make it desirable to keep the landscape open, mulching is the most economical method. The highest costs are likely to be incurred where marginal areas are to be tended with the aid of livestock rearing. Under certain climatic circumstances, combined tending methods are necessary, such as sheep-farming and mulching. The inclusion of controlled burning in combined methods also looks quite promising.

For reasons of environmental protection, the use of chemical methods of tending reverted land is highly controversial.

Table 9 entitled "Costs of tending reverted land in DM/ha" groups together the figures given by individual authors.

Fig. 11 Possibilities of using or tending reverted land

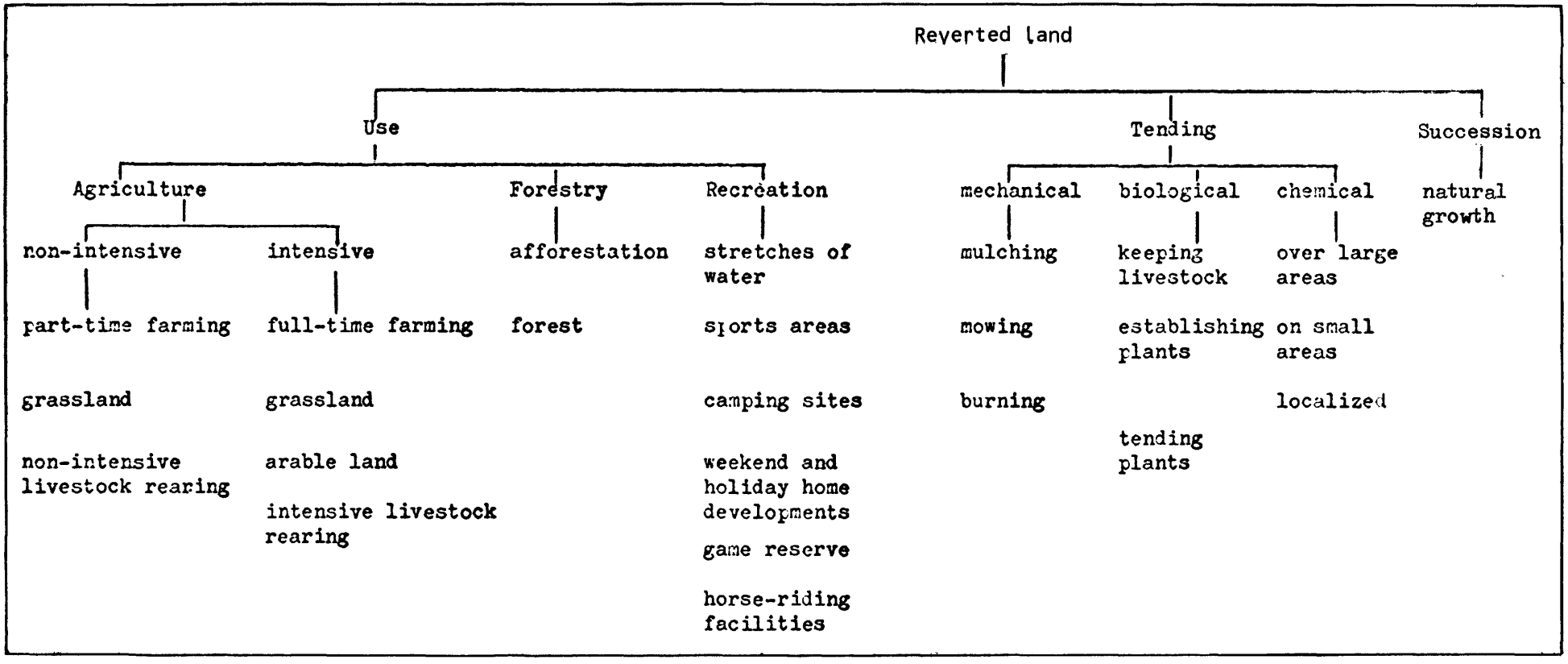


Table 9: Costs of tending reverted land in DM/ha

Author	Continuous mulching	Mowing 1 x yearly	Keeping livestock on marginal sites	Chemical methods
Gekle (1976)	44 - 167	58 - 171[1]	cattle 116 - 1005 sheep 50 - 670	
Nüsslein (1972)		136 - 435[2]		
Kolt (1972)	39 - 63			200
Arens (1974b)	50			
Neander (1973)	70		100 - 490	
Kromer (1975)	35			
Hallermann et al (1974)				100 - 200
Faber (1975)				200
Gierer and Gregor (1975)				250 - 410
Hailer (1973a)				160[3]

[1] depending upon gradient
[2] dry to wet meadows
[3] for localized application

4. CONCLUSIONS AND RECOMMENDATIONS AT COMMUNITY LEVEL; CONSIDERATION OF SUITABLE MEASURES AT EEC LEVEL

4.1 Evaluation of reverted land and the tending of reverted land in the literature

Wohlraab (1974), for example, assesses the value of reverted areas and agricultural land on the basis of the useful tasks they perform as ecosystems:

a. interception of environmental pollution;
b. transforming ability for the conversion of harmful substances;
c. productive efficiency in relation to important nutrients and water;
d. certain effects on the environment.

Stählin et al (1973) consider the value of reverted land from the "function" aspect. Since in their opinion reverted land fulfils no function for the population, they see no place in central Europe for land left entirely to its own devices.

According to Meisel and Hübschmann (1973), the negative attitude to reverted land obviously has its roots in the conviction that "order" must prevail. Since areas of land which are theoretically usable are not cultivated "in an orderly fashion" but are left idle and revert to a wild state, there are many people who certainly set no store whatsoever by "order". Many Europeans see reverted land as "run wild" in a negative sense without being able to produce any valid reasons for their condemnation. For this reason, Thielcke (1973) regards the "unpopular transitional phases" in particular as a problem of general enlightenment.

In the opinion of Hoffmann (1973), the explosive nature of the general concern about letting land revert has its cause in the "blast effect" which is to be feared from the disorder alleged to be the likely consequence of reversion. From long habit, most people are mentally programmed to expect order in the landscape as elsewhere. Since until only very recently there was still general opposition to the cultivation of the last few remaining sites that are close to nature, Hoffmann now sees in reverted land beginnings and possibilities for a "reparation".

The only negative aspect of letting land revert is that so far it almost always happens in an uncontrolled fashion (Ammer 1973).

Riemann et al (1971) found that the fact that the criteria for a solution to the reverted land problem are plain for all to see in the districts affected has meant that its discussion among the population has been debunked and brought to the real point. Many owners of reverted areas would make their land available for use by others or even exchange or sell it.

Merforth (1973a) presents arguments to show that the reverted land problem is overrated, whereas it is essentially only on aesthetic and moral grounds that reverted land can be criticized. Certain groups of individuals see letting land revert as "shameful" and "ungrateful" or "a betrayal by the present generation of the labour of their forefathers". Here, reverted land is giving us the opportunity of keeping the rural landscape tolerable and shaping it into something better. Bierhals and Scharpf (1971) observe that reverted land still does not constitute any harm to the countryside a priori, but only in cases where the reverted vegetation impairs or prevents other use requirements. According to an analysis of use value which they worked out, reverted land stands in second place behind forest and far ahead of arable land and grassland.

Moser (1971) criticizes the ranking based on landscape ecology given by Bierhals and Scharpf: if "landscape aesthetics" were included in the equation (which in his opinion is necessary), the ranking would be changed greatly in favour of land used for agricultural purposes. Moser has apparently misunderstood Bierhals and Scharpf, because thier one and only aim was an objective evaluation of various different "forms of use" from the ecological aspect. The purpose of their analysis of use value was to avoid the very thing that Moser has done yet again, namely, arguing only with opinions and indefinable value judgements instead of with material, measurable and provable facts.

Lohmann (1972) points out that, in the reverted land debate, contentions such as "The recreational and compensatory functions of the countryside are becoming more important, and unused agricultural land reduces these functions " are replacing the analyses that need to be made and thereby

preventing them, and that to some extent even data already in existence are being pushed to one side by opposing contentions.

Block (1974), Jahn (1973), Meisel (1973), Zieren (1973) and many other authors see no fundamental disadvantage in reverted land and want measures aimed at preventing land reverting to be confined to certain areas only. Letting land revert, particularly on marginal areas, is welcomed for the following reasons:

a. reasons deriving from policy on structure;
b. as a rule it means more efficient use of labour and capital and hence an increase in the gross national product (Block 1974);
c. leaving reverted areas entirely to their own devices creates stable ecosystems (Jahn 1973b)
d. leaving reverted areas entirely to their own devices works counter to the standardization and species impoverishment of the landscape;
e. intensive grassland use in regions threatened by reverted land is senseless in the long run because the investments are too high (Perreiter in IALB 1972);
f. reverted areas do not create any ecological problems, but rather reduce them (Zieren 1973).

Zieren even supports the view that afforestation projects using the wrong tree species on the wrong sites are the only negative aspects of reversion from the rural amenity point of view.

For lack of space, this review of the evaluation of reverted land in the literature has to be confined to these few examples. A characteristic feature of the reasoning put forward by the opponents and advocates of tending reverted land is the fact that, with an extremely small number of exceptions, it is not based on any scientifically established data but consists predominantly of aesthetic and moral arguments. If any unambiguous, scientifically proven data existed on harm or disadvantages resulting from reverted land, the opponents of reverted land would surely avail themselves of such data without hesitation.

4.2 Consideration of suitable measures for dealing with the reverted land problem: suggestions made by various authors

There are a great many proposals in the literature on how to deal with reverted land. Some authors pass over the questions of suitability and the costs incurred without a word, and merely recommend sweeping measures to avoid or do away with reverted areas. There are, however, also studies which are specifically concerned with the amount of expenditure necessary and discuss possible sources of funding.

Keimer (1975) rightly points out that it is doubtful whether irrational and total condemnation of reverted land is in any way associated with the need for tending over extensive areas and hence financial aid and subsidy.

All measures cost money, and since the money will come mainly from the non-agricultural population their objectives will decide the issue, i.e. the shaping of the landscape will be based on the properly founded statements of the environmentalists and the recreation industry, and not axiomatically on the value judgements of the farmers (Perreiter in IALB 1972b).

Ganser (1971) describes the example of Wolfrathshausen near Munich: in the event of "maintaining the cultivated landscape", in theory every weekend visitor to the district would have had to pay DM 2.50 to 3.00 per visit, if the costs of conservation were to be apportioned not to the taxpayer but to the countryside user. However, only 20 to 30% of visitors stay in the areas which are used for agricultural purposes or tended. In this case the principle of the constitutional state would not be operating if the costs of the tending were passed on to the general public, since only 30% of weekend visitors use the "preserved" countryside. Ganser concludes that, before subsidies for preserving the cultivated landscape are paid by the general public in the name of the leisure requirements of town dwellers, great care should be taken to see just exactly who it is who will benefit from these public funds.

All agricultural forms of use whose continuance is dependent upon subsidies should be examined critically, if not sceptically. Not all social costs

and social benefits can be quantified. This means that it is not possible to pay subsidies amounting to the hypothetical value of a form of countryside. Since nobody is able to allocate the correct index value to the innumerable forms of use outside agriculture, Zapf (in IALB 1972) urges that for the next 10 to 20 years agriculture should still take precedence even in problem regions, since its economic and ecological effects are known. The question of the advisability of management subsidies could then be raised again when there is more information available on the effects of letting land revert.

Merforth (1973a) calculates that, with 600 000 ha of reverted land and tending costs of 50.00 to 200.00 DM/ha, the government would have to raise 30 - 120 million DM annually for tending reverted land. "Who could happily justify this expenditure when there is a need everywhere for nursery schools, old people's homes and, for lack of capital assets, a proper pension scheme for farmers and their families!"

Merforth refers to the examples in the Hartz Mountains, Black Forest, Westerwald and Spessart, where some tourist districts charge their visitors a small "rural amenity fee" when a more cultivated landscape is desired.

Thiede (1971) draws attention to the proposal of the Vedel Committee, according to which in France alone between 7 and 12 million ha of agricultural land are to be left to revert because of an expected rise in production. In the face of the magnitude of these figures, there is no room for any serious discussion of whether the state cannot see its way to buying up the land in question in order to make some better arrangements.

Amongst many others, Fischer and Lothhammer (1972) also make this suggestion: all land which has reverted or about to revert could be bought up by the state without any consequences for production and use. "The costs would be several times lower than expenditure by the private sector on afforestation or conversion". For rational countryside management, housing development policy and effective environmental protection could operate only if reverted areas are brought under common ownership.

In actual fact, these sweeping ideas do not lead anywhere. A number of proposals therefore employ individual solutions, for which a preliminary land survey is necessary. Land-use planners should be realists and develop only projects which are feasible, i.e. which can be financed, urges Kolt (1973). This means that keeping land open constitutes a feasible option in land-use planning only for a relatively small proportion of marginal and reverted land.

Obermann (1974) also rejects general measures, such as obligatory tending, obligatory consent to tending at state expense, subsidizing of non-intensive land use, afforestation, etc. He would like countryside management measures to be differentiated and planned on a regional basis.

Hard (1975) lists the difficulties with which land-use planning has to contend if it is to take account of differing interests:

a. the attractiveness and usability of the countryside have to be preserved;
b. tending measures have to be economical to implement;
c. the measures have to comply with ecological considerations.

On the basis of his experience in Hesse, Kolt (1972) gives some pointers to determining measures relating to reverted areas on a land-use planning basis:

a. identification of areas on the basis of site factors such as soil quality and vegetation development;
b. identification of the ownership structure;
c. identification of building and development plans within districts;
d. identification of the provisions of higher-level planning for the future development of the region and districts;
e. determination of land suitable for agricultural use;
f. determination of the tending results to be achieved and the tending measures;
g. calculation of the costs involved;
h. determination of who is to bear the cost.

According to Nohl (1976), in considering the tending of reverted land it is extremely important to know something about future users. The main thing

is really to discover the wishes of the younger generation, since they would go on more frequent excursions and be seeking more "wilderness, difficult terrain", etc.

Agricultural consultants, officials and the like express only very biased views. It is, however, unlikely that there will be all that much agreement between expert representatives and potential users of the countryside as regards the value of reverted land.

According to Nobel (1975), a solution to the reverted land problem can be achieved only with the aid of an overall concept of environmental protection. For this, ecology and economics have to work together and not against each other. Nobel recommends the following as steps towards a solution:

a. assessment on the basis of landscape ecology and countryside management;
b. evaluation of priorities;
c. determination of measures specific to the land in question.

Gardiner and Lee (1974) also indicate the necessity of land-use planning. This must take into consideration not only economic (agricultural and forestry) interests but also the sectors of recreation, beauty of the landscape, etc.

In addition to planning, the suggestions made chiefly concern statutory regulations. The legislator must create circumstances which make it quite impossible for reverted areas to arise from the outset. These include, for example, the amendment of the existing laws of entail and land lease in Italy, or those which permit interventions in existing conditions, such as consent to use and compulsory leasing in France, for example. If necessary, rulings should be made to require owners to underwrite the costs of tending.

Kolt (1972b) recommends a law in accordance with which a "change of use" can be enforced, to make it easier to allocate land between forestry, agriculture, natural succession and tended areas for other use requirements.

Deneke (1973) sees in the revision of the Land Law a chance to increase the mobility of land with the aim of achieving optimum use of areas suitable for management in accordance with existing soil grades.

An essential prerequisite for preserving long-term agricultural use of the excessively small management units which exist in many European countries in their combination into sufficiently large areas. The consolidation of holdings is therefore among the foremost of the measures for avoiding social reversion. The rearrangement of land necessitates further measures for avoiding reversion. Bauer (1971) lists the following:

a. payment by the public authorities of up to 100% of the costs of consolidation of holdings;
b. funding of ownership co-operatives for machines and tools;
c. funding of national cultural measures;
d. afforestation subsidies of up to 80% of the costs.

Bock (1970) adds to this list:

a. encouragement of long-term leasing on a bonus basis;
b. encouragement of voluntary exchange of land;
c. advice for heads of units in individual cases.

Hatzmann (in Kolt 1976) mentions:

a. elimination in general of shortcomings in the structure of agriculture;
b. encouragement of the formation of leasing associations;
c. establishment of centralized units;

and delivers a plea for symbiosis between full-time and part-time agricultural units. This is desirable from the aspect of regional economic development and from the social policy aspect of a broad spectrum of ownership as well as the maintenance of an adequate population density in rural areas. Hoerster (1974) draws attention to the need for the general education and enlightenment of the population before implementing the land use developed in a countryside management plan.

The proposed measures for maintaining land use cannot relate to submarginal or marginal areas. In cases where land management yields no returns, the only action that will help consists of specially selected individual measures, for which it also has to be decided who is to pay the costs. To a large extent tending measures on marginal areas can really be considered

only in cases where a quite specific use requirement is imposed on the land, such as leisure activities and recreation, or where harm to the national economy can be minimized, as with the serious danger of avalanches and erosion in the Alps.

Schreiber (1970) suggests the construction of "mower/mulcher crawler tractors" (similar to runway clearing tractors), in order to be able to keep reverted areas beneath the tree line open for skiing and to tend the areas. Reintroduction of the "mountain pasture scourer" is also suggested by Hard (1976).

In the English literature, there is repeated mention of the need to afforest in order to be able to cover at least part of the timber requirements from indigenous resources. Despite this, air pollution in the South Pennines is so serious that as yet (while there are no prospects of success) scarcely any national resources are being invested in the afforestation of this region (Rural Land Use ... Sub Group 1976). In this case responsibility for measures should be laid back at the door of the originators of the air pollution! The guarantee of profits from forestry, for which general government consent is under discussion, would greatly encourage the afforestation of reverted areas (Anonymous, Allg.Forst-Z. 1971).

Afforestation could be considered even in southern France; the costs would certainly be relatively high owing to the necessary fertilizing, tending and, possibly, irrigation, but in comparison with other Mediterranean countries the conditions can still be regarded as good (Long 1975). Godron (1970) suggests planting mixed forests using species which can tolerate shade in their early stages (such as Douglas fir, silver fir, chestnut), so that they can regenerate naturally without clear-felling.

Other proposals for the use of reverted land outside agriculture include the establishment of biotopes, nature reserves, and the creation of stretches of water for various different forms of use.

According to Munzel (1976), artificially flooded areas can be treated without incurring high costs by removing the main drainage channels and constructing barrages. Thielcke (1973) recommends co-ordination between

drainage measures on the one hand and the re-creation of moist regions for species conservation on the other. Schultz (1973) regards it as very important to create extensive bog and pond areas in order to preserve the typical flora and fauna. The creation of wet sites of this kind would have a positive effect on the overall balance of the countryside (Munzel 1976).

Golm (1970), Neander (1973) and others suggest that weekend and holiday homes simply and solely for leisure use should be built on marginal areas. This kind of development of marginal land should not be condemned as spoiling the countryside and scattering housing development, but encouraged as a way of changing the function of the countryside available. The danger of scattering development over the countryside becomes meaningless where there is surplus countryside. Areas that have become valueless can find a new function in private hobby use in the form of leisure homes (Riemann 1972).

There is, of course, no lack of voices who fear a "selling-off of the countryside" and warn against its being built up with weekend houses or camping and caravan sites (Grebe 1968, Hanstein 1972). Here too, the important thing is certainly a classification of sites on a planning basis, so that a number of conditions can be observed.

The lowest costs for tending marginal areas are likely when there is a lower possibility than ever of a sudden surge of land reversion. It is reported from Sweden that for this reason:

a. agreements are concluded with farmers for the continuance of any form of use at all of these areas;
b. in order to maintain management of the areas for grazing, the costs of transporting animals to the pasture are paid;
c. local communities are responsible for management of the land;
d. the public authorities appoint farmers to carry out tending (Anonymous 1971b).

Geiersberger (1971) also recommends the introduction of a "free rail tariff" for transporting livestock from agricultural zones to summer grazing regions, and a livestock rearing system based on the division of labour.

In Ireland and other traditional regions of livestock rearing, profitability can be improved by means of special measures:

a. the introduction of more productive breeds;
b. sowing more nutritious varieties of grass;
c. the improvement of production and marketing management;
d. and the use of better technology.

Measures such as these have successfully avoided the danger of reversion for a long time (Lee and Diamond 1972).

The present policy of the SAFER (Soc. d'Aménagement Foncier et Rural) in "garrigue" regions, which is to support the traditional form of livestock rearing, is criticized by Long (1975) because it does not conform to the real requirements of agriculture in these regions. Long thinks that a "ranching system" of sheep-farming is more suitable. However, Thiault (1970) does not regard even sheep-farming in a "ranching system" for meat production as the ideal solution for checking the drift away from the land in France. To achieve this would require a whole range of measures, most of which would have to be implemented outside the agricultural sector.

A proposal made by Brocard (1975) runs as follows:

a. reverted land should be defined precisely;
b. all reverted areas should be identified as such by communal land and estate committees, owners being accorded a right of veto;
c. the owners of reverted areas should recultivate them themselves, but have the right to request financial assistance for doing so;
d. or they should make a declaration of their willingness to lease the areas. A "reverted land agency" would procure lessees;
e. if the owners of reverted areas are not willing either to sell or to lease them, they must pay a tending tax for the maintenance of the land; this tax should be higher than the actual tending costs and should increase with increasing quality of the land.

This proposal made by Brocard (France) is perfectly logical in its presentation, but on closer inspection the feasibility of these measures has to be questioned. Owners of marginal reverted areas who are otherwise poor cannot raise the money for the tax which they would have to pay. This means that the state would have to buy up the areas. However, since they are usually submarginal areas, leasing is not possible. The state would therefore end up by paying not only the purchase price but also the tending costs. Which European parliament would give its consent to this?

4.3 Consideration of appropriate measures for dealing with the problem of reverted land: authors' proposals

After studying certain aspects of a problem, individual writers can come up with quite different proposals for dealing with individual problems. The question of what can be done about reverted land as a whole and what measures are available for dealing with it cannot be answered here because of the size and degree of obstruction of the present study; this would have to be done in individual studies.

The aim in the following pages is therefore to submit recommendations of a general nature; it should be borne in mind that all measures must fit in with a sensible overall concept and be confined to areas which are found after conscientious examination to be suitable for individual activities. The local, natural and sociological conditions vary too much for general conclusions to be meaningful and economically viable. Not all reverted areas can be left to natural succession nor can all reverted areas be afforested or kept open with the aid of subsidies. The measure to be adopted in the individual case can be decided on only after detailed examination of the conditions prevailing. The role of the State must be to draw up guidelines and submit overall plans.

For these reasons the compilers' proposals are confined to measures of a supra-regional type at European Economic Community level. The recommendations relate to the following:

1. Definitions

The phenomenon of reverted land has a wide variety of causes and its significance and consequences similarly vary. There are therefore a considerable number of descriptions and definitions of one and the same case in different Community countries. The terms of reference in individual Member States make comparisons virtually impossible. This

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linguistic incompatibility results in a lack of mutual understanding in the study and treatment of the problem of reverted land in the Community.

Conclusion: A working party consisting of representatives from the fields of science, administration, statistics and agriculture, should study the ideas and definitions connected with reverted land. A list of criteria should be drawn up with a view to classifying the various forms of reverted land and agreeing on designations for each one, e.g. social reversion, marginal reversion, etc. This set of definitions should be binding.

2. Statistics

The available statistics on land utilization in the Member States are based on completely different criteria and are therefore not comparable. Since reverted land is still regarded (mainly for economic reasons) as a type of "negative miscellaneous category", the extent of reverted land is often not really quantified. This leads to uncertainties in the assessment of the phenomenon, particularly as regards planning the use of these areas. Comparable statistical data on land use are an absolute necessity, given also the need for policy measures.

Conclusion: The standardization of land use statistics should be carried out. In this context the results of the work on definitions have to be taken into account so that different types of reverted land could be treated appropriately. Criteria for drafting land use statistics should be clarified.

3. Scientific basis

At present the bulk of the investigations into matters of reverted land in the EC Member States are concerned with tending measures and succession studies; i.e. with changes in species composition. Hardly any data are available in the natural sciences field on the influences of reverted land on the balance of nature (water conservation, nutrient balance, humus balance, movement of substances, productivity, etc.) and on the reaction to various types of intervention.

Conclusion: The scientific, coordinated and systematic investigation of the effects of reverted land on the environment should be incorporated into national and Community research programmes. These investigations should be undertaken in different countries and on differently structured sites. Care should be taken to select standard methods so that the findings can be compared and applied in other cases. This research programme should as far as possible be related to other research activities of the Community, e.g. ecological site mapping.

4. Socio-psychological motives

As regards the socio-psychological reasons for abandoning cultivated land, not enough differentiated information is available, particularly as far as regional characteristics are concerned. Above all, questions of attitude to uncultivated land and elements in the mentality of residents of individual regions have not yet been studied in sufficient detail. If a decision is to be taken as to the measures to be adopted to deal with or even to prevent land reverting, such knowledge is imperative.

Conclusion: Investigations into regional characteristics of the socio-psychological factors causing reversion of cultivated land should be developed and implemented. Research work should concentrate not on the

overall socio-economic factors which are already largely known, but on the attitude and mentality of the residents of individual regions. Individual studies could be centrally coordinated by institutes which are familiar with local characteristics.

5. Legislation and measures

Legislation and measures designed to prevent the reversion of land or to promote cultivation of reverted areas have in very few cases achieved their aims. This is partly because the implementation of legal possibilities comes up against institutional and organizational (possibilities of the state and the administration) or individual barriers (shrinking back from personal conflicts). There are also considerable gaps as regards comprehensible definitions of areas which could actually be the subject of measures.

Conclusion: On the basis of standard definitions and statistical divisions for reverted land, criteria should be drawn up which could serve as guidelines for legislators in the individual Member States. Particular attention should be paid to practical application and feasibility, with special reference to the institutional possibilities.

6. Use and allocation of reverted land

Individual measures relating to the use and allocation of reverted areas fall down mainly on the fact that they take account only of individual interests (e.g. forestry, town planning); although individual measures are developed and introduced only regionally, they are not brought into line with overall regional development plans.

Conclusion: A general framework should be developed for regional allocation of reverted areas to fit in with general and specific landscape planning. Such an overall concept is essential, given the maginitude of reverted land and the need for coordinated regional planning.

7. Use of information gathered

As the present study shows, considerable knowledge has been gained on the question of reverted land; existing gaps in research, legislation and planning can be filled by means of the action referred to in points 1 to 6. The information available today is too rarely put into practice; in future knowledge gained should be put to direct use.

Conclusion: Using the information obtained regarding reverted land as a basis, regionally selected promotional measures should be developed and funded. The range of measures could include, for example:

(a) Afforestation subsidies for regions where there is a small proportion of forested land accompanied by a high proportion of reverted land;

(b) Transport cost subsidies aimed at retaining pasture management in regions suitable for this;

(c) Financial backing for the remaining agricultural units to preserve the landscape in regions threatened by reverted land;

(d) Simplification and funding for change of land use and voluntary exchange of land in regions with awkwardly distributed reverted plots.

Further measures, which have to be adapted to prevailing local conditions, arise naturally from the objectives in view.

A N N E X E S

ANNEX 1

Definitions of some less common terms

"Ödland" (Waste land) in the sense used in official statistics denotes areas which produce no agricultural, forestry or other form of yield or can be brought into use only with the aid of costly cultivation measures. It also includes areas formerly used for agricultural purposes which have already become devastated.
(from: Statistische Berichte des Hessischen Statistischen Landesamtes, 10 February 1972, p. 4)

In fact it is extremely difficult to draw a line between social and marginal reverted land and waste land, particularly if no previous agricultural use is known of. Nevertheless, in all cases where it is clearly a question of former agricultural land which is no longer managed, it is advisable to call it "agricultural land which is no longer used". The term "Dauerbrache" (permanent reversion) has also come into use for these areas in cases where they constitute arable land and permanent grassland which has not been used for one year or more and also other agricultural areas which are no longer used, such as former vineyards or orchards, for example.

In the statistics, waste land is frequently lumped together with "Unland und Geringstland" (barren land and minimal land). Barren land and minimal land constitute areas which are not used, such as rocky spurs, stony spurs, fairly large escarpments, dunes and abandoned mine workings.

In the literature and the numerous land statistics, the definitions for waste land and barren land vary widely and it is often impossible to make a precise distinction between them. Nevertheless, it is useful to differentiate between land which can be cultivated and land which cannot. The following distinction is therefore regarded as possible:

a. waste land denotes areas which produce no agricultural, forestry or other form of yield and can be brought into use only with the aid of costly cultivation measures; = derelict land?

b. barren land denotes areas without any plant growth to speak of, which cannot be cultivated; = unvegetated?

c. permanent reversion (social reversion) denotes agricultural land which has not been used for one year or more, which can be recultivated at reasonable cost. degenerate? infested?

A number of terms used in the literature are less important, and are mentioned here only for the sake of completeness:

a. "Strukturödland" (Structural waste land): since "social reversion" is by definition a transitional phenomenon and limited in time, Büring (1970) suggests that reversion which occurs as a result of social differentiation processes should be called "structural waste land", which means that there is no likelihood over a fairly long period of time of its being converted back into agricultural land under conditions that are foreseeable at the present time.

b. "Naturbrache" (Natural reversion): owing to its prevailing unfavourable natural growth conditions, Grebe (1968) also calls "marginal reversion" by the name "natural reversion".

c. "Ödbrache" (Waste reversion): instead of the term "social reversion", Voppel (1958) uses the name "waste reversion", since in his opinion in the Saar the phenomenon of reversion is due chiefly to economic causes, and the proviso of "social separation" constitutes too narrow a view. Niggemann (1970) has already rejected this name as being too imprecise.

d. "Konjunkturbrache" (Conjunctural reversion) can denote both marginal reversion and social reversion and is also condemned as being too imprecise (Niggemann 1970), since the term contributes nothing in the way of clarification.

e. "Spekulationsbrache" (Speculation reversion): this relates exclusively to land formerly used for agricultural purposes which is to be put to a different use, usually building development. Speculation reversion areas are situated for the most part on the fringes of large towns, and more rarely in rural districts.

ANNEX 2

Explanations of terms in English, French and Italian

E n g l i s h

Abandoned land =

Completely abandoned agricultural areas for which there is no prospect of recultivation.

Reverted land =

Agricultural areas which have been abandoned and provide a picture of fallow vegetation in various stages, but for which rural amenity or recultivation measures are still possible.

Unmanaged land =

Land which is not managed or tended. Comprises the first stages of reversion; can be used again as agricultural land at any time by means of management or tending.

Neglected land =

Land which has been abandoned recently and displays at most the initial reversionary stages in the natural succession. Can easily be recultivated.

Under-used land =

Not reverted land in the strict sense; may be grazing land used on a very non-intensive basis (e.g. one sheep per 10 ha). Could be used more intensively under suitable overall socio-economic conditions, since the natural management capacity is greater than that used at present. The beginnings of natural vegetation occur periodically but are eliminated repeatedly by grazing or other measures.

Overgrown land =

Land which is covered with natural vegetation resulting from reversion. Gives no grade of intensity; can comprise all stages of reversion; indicates, however, that there was former agricultural use.

Despoliated land =
Land which gives the impression of having been "plundered"; a term which carries little information value.

Unkempt land =
Untended, "dishevelled" land; also of little information value; is completely charged with emotion (biased towards rural amenity) and makes little contribution to specialist concepts.

Deteriorating land =
Land which is gradually deteriorating from the point of view of both natural production conditions (depletion, infertility, erosion) and all socio-economic conditions (migration away from the land, urbanization) and also from the visual aspect (negative judgement of spreading vegetation).

Marginal/Submarginal land =
Sites with economically marginal yields.

Reverted land/Idle land.

F r e n c h

Terre en friche =
Reverted land, land left idle (general).

Terre abandonnée =
Completely abandoned agricultural land, with no prospect of recultivation.

Terre vacante =
Unworked and unmanaged land, usually in urban regions; also land excluded from building use; sometimes also reverted land in semi-urban regions (speculation reversion).

Terrre dégradée =
Land whose capacity and productivity are severaly reduced. The reasons lie either in depletion resulting from over-intensive management or in natural phenomena (erosion, etc.).

Terre inculte =
General: unmanaged agricultural land, land withdrawn from cultivation.

Terre sous-exploitée/terre sous-utilisée =
Land used below its full capacity; land under non-intensive use. Not reverted to land in the strict sense.

Terre sous-pâturée =
Pasture land under non-intensive use. The natural capacity is greater than that used at present.

Zone défavorisée =
Handicapped region; zone with particular structural weaknesses, chiefly in the agricultural sector. The danger of agricultural land reverting is especially high in these zones.

Zone sauvage =
This term conveys the visual impression of agricultural areas that have reverted. The name encompasses uncontrolled development of vegetation and "wild growth".

Zone boisée =
Reverted land at the stage of shrub colonization; growth with low or fairly high scrub and clumps of bushes.

Word combinations which differentiate the term "friche"

friche sociale	social reversion; reverted land created by predominantly social reasons
friche technique	reverted land created by reasons associated with technological development
friche industrielle	industrial fallow
friche urbaine/friche péri-urbaine	reverted land in urban areas or the fringes of towns
friche de spéculation	speculation reversion
friche agricole	reversion which concerns agricultural land
friche forestière/friche sylvestre	areas formerly used for forestry purposes now felled and not replanted.

I t a l i a n

Terre abandonnate =
Completely abandoned agricultural land; reverted land in the strict sense of the definition given in section 3.11.

Terre incolte =

Land excluded from agricultural use; agricultural land which is no longer managed.

Terreni non coltivati =

Agricultural land which is unmanaged.

Terreni insufficientemente coltivati =

"Under-used" land; land under non-intensive use, but which is not reverting. Beginnings of the development of a reverted vegetation are repeatedly suppressed by periodic management.

Terreni cespugliati =

Reverted land overgrown with scrub and/or clumps of bushes.

Maggese =

Bare fallow, a term commonly used in agricultural science, is almost unknown in northern Italy since it does not really occur there. It is sometimes used in the poorer cereal-producing areas of southern Italy.

Terre marginali =

Marginal land, a much used term which relates to the economic situation (Lechi 1977).

ANNEX 3

Wachhorst (1972) gives the following figures for the area of "agricultural land which is no longer used" in the Federal Länder in 1971:

Table 10: Extent of reverted land in the Federal Republic of Germany

Bremen	1 608 ha	10.0% of the UAA (agricultural land)
Lower Saxony	21 036 ha	0.7% of the UAA
Schleswig-Holstein	3 717 ha	0.3% of the UAA
Hesse	35 307 ha	3.8% of the UAA
Rhineland-Palatinate	49 213 ha	5.4% of the UAA
Baden-Württemberg	47 724 ha	2.7% of the UAA
Saar	11 930 ha	10.0% of the UAA
Bavaria	45 406 ha	1.2% of the UAA
North Rhine-Westphalia	28 552 ha	1.5% of the UAA
Federal Republic of Germany	244 928 ha	1.8% of the UAA

Table 11: Figures given by various authors on the area of reverted land (in 1000 ha) in the Federal Republic of Germany

Author/Year	1958	1965	1968	1969	1970	1971	1972	1973	1975	1980	1985
Ruppert 1958b	4.0										
Buchwald 1968			250.0								
Wagner 1970		150.0			200.0						
Buchwald 1971						320.0					
Agrarbericht 1971		150.0	171.3			212.0					
Meisel/Hübschmann 1971					220.0	244.9	255.0*				
Schwaar 1972							320.0				
Stählin et al 1973								245.0 320.0			
Gutschick 1973						245.0					
V. Papp 1974								272.0			
Meisel 1975								275.0			
Keimer 1975				157.4	220.6	244.9	255.0				700.0 1000.0
Gekle 1976									272.0	500.0*	
Agrarbericht 1976									300.0		

* = forecast

ANNEX 4

Information on the significance of reverted areas in the individual Länder of the Federal Republic of Germany

According to Schwaar (1975) and Nohl (1976), reverted areas are occurring to an increasing extent on the lowland sites of north-western Germany and the Lower Saxony geest. Schlephorst (1975) draws attention to the increase in reverted land in North Rhine-Westphalia in the regions of Olpe, Lüdenscheid and Wittgenstein and the Oberbergischer Kreis. He names the following as focal points of reversion:

a. upland regions (Dill and Sieg regions, Westerwald);
b. Moselle valley, Middle Rhine;
c. large towns on the Rhine, Main and Ruhr;
d. northern Black Forest.

Schmid (1974) draws particular attention to the following as regions affected by fallow:

a. Rhön Mountains
b. Spessart
c. Bavarian Forest
d. Fichtel Mountains
e. Franconian Forest
f. Alps.

The development trend of reversion in the Saarland demonstrates clearly its dependence on the general economic situation and conditions relating to the structure of agriculture:

Table 12: Development of reverted land in the Saarland

Year	ha of reverted land	% of UAA (agricultural land)
1950	1 168	0.9
1953	9 111	-
1955	12 512	9.0
1956	14 625	-
1957	16 429	12.0
1960	24 479	18.3
1970	10 780	8.3
1973	13 366	10.3

Source: Rathjens (1958); Bungert (1961); Saarland (1974)

The annexation of the Saarland to French territory after the war caused agriculture in the Saarland to be exposed to keen competition with French agriculture. As a result of the industrial boom and the wide disparity between incomes in agriculture and outside agriculture, as early as the 1950s the occupants of small and part time farms in particular abandoned agriculture and left to follow a different occupation. The areas which this left idle remained lying unused because the full-time farms were not in a position to take over the land either from the structural point of view or as regards their technical resources. After the reincorporation of Saarland in the Federal Republic, some 25 000 ha, i.e. almost one fifth of the agricultural land, were reverted land.

The measures which were introduced immediately to improve the structure of agriculture, especially measures to rearrange holdings, roadbuilding, resettlement of the population, and restoration and capitalization of old farms, put the full-time farms that were capable of expansion in a position where they were able to resume management of the land that had reverted. By 1970 the proportion of the total agricultural land represented by reverted land had been reduced to 10 780 ha. Since then, reverted land in Saarland has increased slightly, as it has in the other Länder. However, the present reverted land chiefly constitutes marginal reversion, and only partly concerns land in the immediate catchment area of the industrial zone along the Saar, whose owners are counting on a more economically favourable form of disposal in the foreseeable future (Saarland 1974).

In Rhineland-Palatinate, as part of the "Agricultural Development Programmes", areas have been mapped "on which profitable agricultural use will probably no longer be possible in future" (Rhineland-Palatinate 1975). As against the very extensive marginal sites in the planning region of western South Palatinate (ca. 50 000 to 60 000 ha of agricultural land), from 1973 onwards there have been some 19 132 ha of agricultural land which are no longer used. "In the region of the Hardt Mountains in particular

and also the Idar-Oberstein area, agricultural land which is no longer used represents more than 40% of the total area of agricultural land. The abandonment of land management in these localities is a result of increased expectations of income, and in the first instance is occurring mainly wherever there are opportunities for alternative employment outside agriculture (or wine-growing) within a reasonable distance. In the Hardt Mountains, things are made more difficult by the fact that the existing agricultural land consists mainly of meadow valleys, which can be claimed to be absolutely marginal sites for agriculture. These areas have already come to be managed to an increasing extent by part-time agricultural units". (Rhineland-Palatinate 1975).

The "Western South Palatinate" development programme also states: "Since, in addition, social reverted areas occur only to a certain extent, at the present time up to about 60% of the agricultural marginal sites are still used for agricultural purposes. The extent and rate at which agricultural marginal sites are withdrawn from land management will vary greatly over the next few years from one region to another in accordance with the development of the structure of agriculture and will also be influenced decisively by general economic trends".

In the planning region of the "Eifel-Hunsrück" agricultural development programme (Rhineland-Palatinate 1973), as against some 66 000 ha of agricultural marginal sites there are no more than approximately 8100 ha of agricultural land which is no longer used. The focal points of social reverted land in this region are the wine-growing districts located in Eifel and Hunsrück. The abandonment of land management here is mainly the result of the recent trend towards specialization in the wine-growing sector.

In Baden-Württemberg, as part of the "Black Forest Programme" the Statistical Office and the Ministry of Food drew up a map on "structural conditions in agriculture" in 1969. This map shows clearly that in the region covered by the programme, particularly in the southern Black Forest (south of the Feldberg) and in the North Black Forest (north of Wolfach/ Hausach), the structural conditions of agriculture are far more unfavourable than average conditions over the Land as a whole. A fall in

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agricultural income as a result of a deterioration in the price/cost situation would have a particularly negative effect in those regions with unfavourable structural conditions. In the opinion of the Ministry of Food, this trend would lead to an enormous increase in marginal or reverted areas and seriously endanger the popular cultural and recreational landscape in the Upper and North Black Forest. The measures of the Black Forest Programme are intended to counter this trend (Baden-Württemberg 1973).

In the "Western Alb Foothills", mainly involving the strata of the Brown and Black Jurassic and the Upper and Middle Keuper which extend in front of the steep slope of the Swabian Alb (a region of divided estates with difficult soil conditions), in many districts there are no longer any real full-time farms at all. In this region an especially large number of areas have been withdrawn from agricultural use and left completely idle. Social reversion has multiplied in recent times. The Alb Programme drawn up in 1971 provides for a whole range of measures aimed at avoiding further reversion and putting the areas concerned to properly organized use (Baden-Württemberg 1971).

In Hesse, reverted land increased between 1971 and 1975 in almost all regions (Kolt 1976). Despite the countermeasures which were introduced, the proportion of reverted land in the focal regions has even increased farther. In all, there are 41 000 ha of former arable land and meadows which are lying idle in Hesse (1975). The Hessian Minister for Agriculture and the Environment also anticipates a further increase in reverted areas.

Table 13: Reverted land as a percentage of the utilizable agricultural area in selected Landkreise of Hesse, 1971 and 1975

Kreis	1971	1975
Dill	35.8	45.5
Offenbach	20.7	22.7
Main-Taunus	12.5	12.6
Rheingau	9.4	11.8
High Taunus	8.7	11.1
Wetzler	8.6	10.3
Lower Taunus	5.2	6.7
Gross-Gerau	5.2	5.1
Dieburg	4.8	5.5
Main-Kinzig	4.3	6.3
Limburg-Weilburg	4.3	5.3

Source: Kolt (1976)

ANNEX 5

Information on the geographical distribution of reverted regions in Italy

Even without going into detailed analyses, which with the data available at present are not possible, a certain number of indications can be given on the location of the reverted regions. The statements made relate both to letting land go idle and under-management and also to the conversion of agricultural land into forest land.

In Piemont, increasing areas of mowable meadow are being left idle in the upland regions; in the province of Turin the percentage is approaching 50%. These areas quickly become invaded by woodland. Pastures to which access is difficult because of the lack of roads are being left idle.

A similar situation is to be found near Cuneo, but aggravated still farther by the proximity of industrial centres in the Val d'Ossola. The pastures are mainly under communal ownership and rented out to middle-men, who as a rule pay little heed to their land. Farms in the valley are being lumped together and this is causing a reduction in grazing use; there is even a tendency for herds to be no longer brought down to the plain in winter, as was the case previously.

It may be emphasized that this trend for meadows and pasture land in the upland regions to be left idle is only partly attributable to physiological facts, and that a certain proportion of the areas which are now unmanaged could be recultivated if the structural conditions of agriculture became more favourable.

In the Valle d'Aosta, where the autonomous region had provided subsidies for this purpose, the trend is now running in the opposite direction: the area under pasture management is on the increase. The chestnut forests in the mountains are for the most part no longer used.

In the Piemont Mountains, chiefly in the Cuneo and Asto regions, areas which are located far away from population centres are reverting, and also

those with a fragmented management structure. In the south of Turin there are more than some 25 000 ha of flatland areas which have been left idle, although the soil is in any case difficult and dry. There is a similar but smaller zone to the north (Le Vande), but this tends more towards forest than agriculture.

Problems similar to those in Piemont exist in Lombardy. In the mountain zones of Como and Varese, up to 21 - 25% of pasture land has been left idle, owing to the migration of the population away from the land because of nearby industrialization (general socio-economic structural reasons). There is a parallel, although less concentrated, tendency for pasture land to revert in Valtellina, which is attributable partly to economic factors and partly to the migration of the population away from the land. In the mountain ranges farther to the east (Lecco, Bergamo, Brescia) the marginal yield of the land is the reason for the phenomenon. There is a fairly common tendency for meadows in upland regions to be left idle and subsequently invaded by woodland (25% in Sondrio, 3000 ha in Brescia).

Many areas in the lowland and mountain regions are no longer managed because they constitute land likely to be designated for building. To the north of Milan there is a concentration of reverted land in a triangle of intensive industrialization. Most of the very poor land here appears to be being invaded by woodland.

The trend in the alpine zones is repeated in the Appennine and Pavia regions and also applies to other zones of Emilia, where land is being left idle for structural reasons. The laws on the leasing of land have prevented almost any new form of management here in recent years.

In Venetia, the estimates available are more precise (Irsev 1976). In lowland and upland areas the phenomenon of leaving land idle is attributable almost entirely to reasons of urbanization. The bulk of the 150 - 160 000 ha of idle land lies in the mountain province of Belluno (more than about half of it external to farms). Of this, over half of the fringe regions concerned show signs of inadequate use. The remainder is attributable to structural shortcomings (emigrants who, because of current legislation, prefer to leave land lying idle rather than lease it; or other forms of employment, as in the region of Cortina and Cadore). The pasture land in these regions is used to a certain extent by livestock farmers from the Upper Adige. The pastures belong either to the parish or to the Community in general.

In the Upper Adige the situation is better, owing to the province's foresight and the Tyrolean custom of "maso chiuso", which has prevented the division of farms in the valleys that still happens continuously in other zones under the Roman law of entail. Conditions in Trento and Friuli to some extent resemble the situation in Venetia. The structural conditions of agriculture in this province are worst in the regions near Yugoslavia (valleys of Nahsone).

For the remainder of Italy, a number of general observations are made. In the mountain zones of the Apennines (Tuscany, Marche, Lazio, Abruzzi) and also in extensive hill regions in the Lower Apennines and in the province of Siena, letting land revert is a significant factor. In the lowlands, no land is left idle except land of an urban nature. In southern Italy and on the islands, the few fertile lowland zones are cultivated, and are put to other uses only in the event of urbanization (as also in the poor regions of the Apennines). (Lechi 1977).

ANNEX 6

Table of threshold values and conditions for land reverting

Table: "Threshold values and conditions"
(cf. Fig. 6, p. 52)

The table below gives, for individual causes and circumstances, threshold values or conditions which can result in land being left to revert.

1.	Natural site conditions	
1.1.	soil	
1.1.1	soil type: nutrient-deficient soils, flat soils and soils strewn thickly with rocky debris.	
1.2.	topography	
1.2.1	altitude:	in central mountain regions more than 400 to 600 m above sea level
		in the Alpine region more than 600 to 800 m above sea level
	gradient:	for arable land, more than 18% for grassland, more than 24 to 30%
	aspect:	for arable land, northern slopes for grassland, southern slopes
1.3.	climate	
1.3.1	microclimate:	depending upon aspect and relief
1.3.2	macroclimate:	
	temperature:	low average temperatures, danger of early and late frosts
	precipitations:	less than 500 mm/year
	growing season:	mean daily temperature above + 5°C for less than 180 to 200 days for arable land and less than 160 to 180 days for grassland
1.4	water	
1.4.1	ground water	drop in the water table
1.4.2	surface water	waterlogging, inadequate or non-existent run-off and drainage
2.	Economic conditions in agriculture	
2.1	structure of agriculture	
2.1.1	farm-size structure	
	own land:	insufficient area
	rented land:	no opportunities for renting

2.1.2	division into holdings:	management units of less than 0.5 to 1 ha
2.1.3	fragmentation of holdings:	widely scattered location, especially in regions where estates are divided
2.1.4	distance between farm and field:	depending upon unit organization, cultivation ratio, degree of mechanization and transport conditions
2.2	income situation in agriculture	
2.2.1	expenditure	
	costs:	rising cost of agricultural working materials, unfavourable location as regards transport to market
	organization:	an inadequate land area, shortage of capital and manpower and also lack of professional skill of the head of the unit make it difficult to adapt the organization of the unit to changing conditions
2.2.2	revenue	
	natural yield:	depending upon soil, climate and organization; less than 30 to 32 dt/ha of cereals or less than 2500 to 2800 KStE/ha of gross increment
	prices:	depending upon the quality of the farm's products and the market
3.	Social conditions in general	
3.1	attitude to agriculture	
3.1.1	on the part of farmers themselves	
	loss of interest: no value attached to agricultural work? pressure towards livestock rearing: found to be a pressing burden greater workload for wives: head of the unit pursues additional or part-time employment	
3.1.2	on the part of the rest of the population	
	difficulty of finding a marriage partner: with negative attitude to agricultural work	
3.2	structure of population and residential areas	
3.2.1	concentration of residential areas: in densely populated regions, considerable inconvenience caused to farmers by urban population, traffic and road routings	
3.2.2	decrease in population: shortage of manpower in regions where the population is becoming scattered; fewer than 20 to 25 inhabitants/km^2	
3.2.3	change in the professional structure: drift away from agricultural work into other occupations outside agriculture	

3.3 income situation in sectors outside agriculture

3.3.1 higher income outside agriculture:
regular working hours, regular leisure time and social security

3.3.2 more lucrative seasonal work: higher expectation of income from forestry work, tourism and other part-time activities outside agriculture

3.4 infrastructure availability

3.4.1 transport conditions: lack of public transport facilities, poor road conditions

3.4.2 leisure facilities: lack of infrastructure arrangements for leisure

3.4.3 educational facilities: lack of arrangements for the education and further education of the rural population

3.5 land speculation (land expected to be designated for building)

4. administrative conditions

4.1 measures taken as agricultural policy: lack of aid to submarginal farms under unfavourable natural, economic and social conditions

4.2 legislation

4.2.1 laws on rural land use
4.2.2 laws on forests and woodland } no obligation to consent or tend
4.2.3 laws on nature conservation

4.3 land-use planning: no systematic identification of areas to be managed or tended.

ANNEX 7

Synopsis: Criteria applied for the classification of reverted land

Criteria (Author)	Type designation
Frequency of occurrence of reverted areas Meisel (1975)	a) vicinity of large towns - speculation reversion b) vicinity of industry - social reversion c) regions where estates are divided - structural reversion d) central mountain ranges/Alps - marginal reversion
landscape based on reversion development Rey (1970)	a) circular reverted zones around villages b) linear reverted zones along valleys c) "drop-shaped" reverted zones in secondary valleys or "cluster-shaped" reverted zones as a conglomeration of several such valleys in valley systems affected by reversion
aesthetic differentiation Nohl (1976)	a) wet-moist / fresh-dry b) flat-undulating / hilly-mountainous c) linear / extending areas d) vegetation flat - medium - tall
vegetation von Borstel (1974)	I. grassland: a) unused semi-dry mountain b) unused heathland c) unused fresh meadows d) unused moist/wet meadows II. arable land: a) initial stage b) ruderal stage c) grassland-like stage d) stage resembling felling area
possibilities for leisure activities Riemann et al (1971)	a) reversion on dry/fresh sites b) reversion on moist/wet sites

initial situation and suitability Bauer et al (1975)	a) heathland b) dry turf c) arable land d) dry valley meadows e) orchard meadows f) moist meadows g) banks of streams, rivers and lakes h) forest margins
geographical location of handicapped regions Anonymous UK (1976)	a) upland and mountain areas b) lowland peat c) lowland areas with wet mineral soils
form of use Rey (1970)	a) agricultural zone b) forest zone c) grazing zone

ANNEX 8

Legislative measures in some Länder of the Federal Republic of Germany

Bavaria is the first country in Europe to have incorporated the "preservation of cultivated land" in its agricultural legislation (Eisenmann 1971). The state commits itself to "special aid" in cases where necessary land management cannot be maintained owing to the prevailing price/cost relationships. For example, up to 100% of the costs of procedures for the consolidation of holdings, which help to preserve the cultural landscape, can be paid out of public funds (Moser 1971).

Alternative use of reverted land through afforestation is strictly limited by the forest laws. In principle, all afforestation programmes must be authorized. Authorization is refused if such programmes run counter to the interests of nature conservation and the protection of the landscape. On the other hand, the forest authorities can propose afforestation programmes and even make them a legal obligation, if this is in "the public interest" (Hachenberg 1971).

In Rhineland-Palatinate, grants for the afforestation of reverted areas amounting to up to 70% of the costs were paid by the state (Preuss 1970). Baden-Württemberg, Bavaria and Hesse paid "grazing bonuses" of between DM 4.00 and DM 15.00 per ewe (Wilke 1975). (These grazing bonuses were sometimes also called "transport bonuses", since they were intended to cover the costs of transporting sheep to winter sites.)

In some Black Forest districts, "mowing fees" of between DM 50.00 and DM 100.00/ha were paid to the owners of reverted areas for keeping them open (Zundel 1968). It would be going too far to list here all the grants, subsidies and bonuses which, in localities of varying sizes and under numerous trial programmes, have been paid out of public funds to the owners or managers of land for the tending of reverted land in the common interest. All measures of this kind are based on the principle that the public must pay for these services from agriculture.

Positive results have been obtained from the obligation to consent. In tourist districts in particular, what are called "rural amenity squads" are an effective method of keeping extensive reverted areas clear. As shown in section 3.6 on "Possibilities and costs of caring for or recultivating reverted areas", mechanical tending methods have the advantage of carrying the least financial risk. However, the obligation to consent to use for grazing by neighbouring farmers or roaming sheep makes tending easier over extensive areas. Conditions are best in those districts where a system of land rearrangement (consolidation of holdings) was carried out for the purposes of countryside management. The revision of the law on the consolidation of holdings of 16 March 1976 makes even more detailed provision for this than the law on the consolidation of holdings of 14 July 1953.

At present, the demarcation of areas carrying the obligation to tend is still presenting very considerable difficulties. The formulation of rural amenity skeleton plans and rural amenity plans should help to establish legal definition of areas carrying the obligation to tend. However, since rural amenity skeleton plans and rural amenity plans on a fairly large scale cannot in themselves provide grounds for any legal liability on the part of land-owners, they must in the first instance be regarded only as preliminaries. An obligation to tend which is "plot-specific" could be established only at the level of the building development plan prescribed by § 9 of the Federal Law on Building.

The kind of legal difficulties which this procedure involves can be demonstrated by an extract from a joint decree of the Hessian Minister for Agriculture and the Environment and the Hessian Minister of the Interior dated 31 August 1976:

"The Hessian Rural Amenity Law (HLPfG), by virtue of § 3, paragraph 5, links rural amenity planning at local district level to regional planning and to architectural planning, and hence to the provisions of the Federal Law on Land Use and the Federal Law on Building (BBauG). In accordance with 1, paragraph 3 of the BBauG, the objectives of the rural land use programme and the stipulations of the rural development plan and of the regional land use plans, including the rural amenity skeleton plans, must be observed and incorporated into the rural amenity plan.

Rural amenity plans cannot be drawn up until the rural amenity skeleton plans, following the regional land use plans in accordance with 7 of the Hessian Rural Planning Law, have been completed and published ..."

"The function of rural amenity plans is, as a component of architectural plans:

a. to single out the possibilities and conditions of the natural environment as part of the social framework and as a sphere for experience and recreation;

b. to adapt, in conjunction with other subsidiary plans, the development of the planning area to these possibilities and conditions of the natural environment and thereby also to extend its potential uses; and

c. to incorporate, in conjunction with other subsidiary plans, green and open areas appropriately into the overall development of the region in relation to the needs of the population."

"Rural amenity plans must also indicate, in accordance with 5 of the BBauG, or define, in accordance with 9 of the BBauG, those areas of land on which management or tending is to be maintained (3, paragraph 2, clause 3, no. 1, and 5, paragraph 1 of the HLPfG). Rural amenity plans as decreed by 9 of the BBauG must also, in accordance with 3 of the regulations for the implementation of the HLPfG of 27 July 1973 (GVBL.I, p. 320), define the minimum requirements attaching to the obligation to tend."

To conclude this section on experience gained so far in the Federal Republic of Germany, we can also mention an example from the Dill region (Kolt 1976a). The tending measures in the rural amenity model for this region were financed by raising the tax assessments for land taxes A and B. The work itself was carried out by the local council. No problems were experienced in the operation of the consent to use. This example shows that the "social costs" incurred by a required tending of reverted land can be levied and paid successfully even within a local district.

ANNEX 9

List of laws and draft legislation on the treatment of reverted land in Italy

Repubblica Italiana	Decreto legislativo luogoteneziale 19 ottobre 1944, n. 279.
	Decreto legislativo del Capo provvisorio dello Stato 6 settembre 1946, n. 89
	Legge 18 aprile 1950, n. 199
	Legge 10 agosto 1962, n. 1368
	Proposta di legge, presentata il 2 aprile 1974
	Proposta di legge, presentata il 15 gennaio 1975
	Proposta di legge, presentata il 28 ottobre 1976
Puglia	Legge sulle terre abbandonate 22 gennaio 1974
Marche	Legge sulla concessione di terre incolte o insufficientemente coltivate anche all'ente di sviluppo nelle Marche 8 ottobre 1974
Abruzzo	Legge sulle norme per il recupero alle colture delle terre incolte o insufficentemente coltivate in Abruzzo 24 gennaio 1975, n. 13
Campania	Legge sulle norme in materia di assegnazione di terre incolte 28 aprile 1975
Piemonte	Legge sulle norme per il recupero alle colture delle terre incolte o insufficientemente coltivate 21 aprile 1976
Umbria	Legge sulle terre abbandonate, incolte o insufficientemente coltivate 2 dicembre 1976
Emilia Romagna	Progetto di legge regionale 12 marzo 1975 n. 218

ANNEX 10

Information on some detailed aspects of tending or recultivating reverted areas

The man-hour requirement is a function of machine width, power rating and working speed. These are influenced by:

a. state of cultivation of the area;
b. load-bearing capacity of the soil;
c. physical obstacles;
d. gradient.

For example, the larger the area, the lower the expenditure of labour per hectare. On the other hand, the costs increase with increasing gradient and increasing vegetation density. All figures on area outputs and costs must therefore be interpreted with this in mind.

Plot size	Gradient		
(ha)	0	25	50
0.1	122.00	142.00	171.00
1.0	69.00	85.00	109.00
10.0	58.00	73.00	97.00

Plot shape: rectangular, L : B = 2 : 1
Labour costs: DM 10.00/man-hour

Table: Costs for mowing in DM/ha for different gradients as a function of plot size

Gekle's figures of between DM 58.00/ha and DM 171.00/ha for the once-yearly mowing of reverted areas are confirmed by other authors. Nüsslein (1972) calculated costs for mowing:

a. on dry meadows at DM 136.05/ha;
b. on wet meadows at DM 435.60/ha.

The obviously extreme example for wet meadows demonstrates clearly how dangerous it is to generalize these figures.

Mowing attachments are suitable for use only when the areas are in relatively good condition. If the mowings can or have to be left on the area, instead of sensitive mower blades it is preferable to use more robust chaff cutters, or "mulching attachments" specially developed for tending reverted land.

The area outputs of mulching attachments are satisfactory even under favourable conditions. These robust devices seldom need to be repaired. What is more, since in any case the mowings are not to be removed, tending costs are lower in the case of mulching than in that of mowing.

Table 14: Costs for mulching in DM/ha for different gradients as a function of drive power, vegetation density and plot size

Antriebs-leistung PS	Grüngut-bestand dz/ha	Teil-stücks-größe ha	Hangneigung % o	1o	2o	3o	4o
		o,1	8o,-	81,-	84,-	9o,-	1oo,-
	5o	1,o	51,-	52,-	54,-	58,-	65,-
		1o,o	44,-	44,-	46,-	49,-	54,-
		o,1	99,-	1o3,-	1o7,-	112,-	119,-
8o	1oo	1,o	65,-	68,-	71,-	75,-	8o,-
		1o,o	58,-	6o,-	62,-	65,-	68,-
		o,1	124,-	128,-	132,-	137,-	145,-
	15o	1,o	84,-	86,-	9o,-	93,-	98,-
		1o,o	75,-	78,-	8o,-	83,-	86,-
		o,1	74,-	78,-	81,-	87,-	96,-
	5o	1,o	48,-	51,-	53,-	57,-	64,-
		1o,o	42,-	44,-	46,-	48,-	53,-
		o,1	1o2,-	1o5,-	1o9,-	114,-	121,-
65	1oo	1,o	68,-	71,-	74,-	78,-	82,-
		1o,o	61,-	64,-	66,-	69,-	71,-
		o,1	129,-	133,-	136,-	142,-	149,-
	15o	1,o	88,-	92,-	94,-	98,-	1o3,-
		1o,o	81,-	83,-	85,-	88,-	91,-
		o,1	79,-	83,-	87,-	92,-	98,-
	5o	1,o	52,-	55,-	58,-	62,-	66,-
		1o,o	46,-	48,-	51,-	53,-	56,-
		o,1	113,-	117,-	121,-	126,-	133,-
5o	1oo	1,o	77,-	8o,-	83,-	87,-	92,-
		1o,o	71,-	73,-	75,-	78,-	81,-
		o,1	147,-	151,-	155,-	161,-	167,-
	15o	1,o	1o2,-	1o5,-	1o8,-	112,-	117,-
		1o,o	95,-	97,-	1oo,-	1o3,-	1o6,-

Cutting width: 2.08 m
Plot shape: rectangular, L : B = 2 : 1
Specific throughput: 1.3 dz/horsepower-hour
Labour costs: DM 10.00/man-hour
[*dz = Doppelzentner = 100 kg]

Source: Gekle (1976)

In the case of the initial clearance of an area already overgrown with shrubs, the power requirement is very high even with a small cutting width (Arens 1974b). The area output is given as 0.25 ha/hour (Kolt 1972).

In the case of mulching as part of regular tending of reverted land, a lower power consumption is adequate even with a large cutting width. The area output in this case is given as 0.7 to 1.0 ha/hour.

ANNEX 11

Results of model calculations on livestock rearing

According to these model calculations, which are based on the prices and costs and also the "agreed income" of 1972, only keeping boarded livestock, with an operational period of 6.5 months (growing season!), shows a surplus. The labour costs, which at the time were taken as around DM 18 000.00/year per full-time worker, have in the meantime risen to around DM 24 000.00/year (1977), and mean that even keeping boarded livestock now shows a negative result. Furthermore, there are organizational and technical difficulties standing in the way of an extension of the practice of keeping boarded livestock. The demand for boarding pasture is therefore very limited.

As the synopsis of the model calculations given overleaf shows clearly, in the case of breeding lean livestock, keeping cows and keeping penned sheep, the investment requirement for fixed assets (stall buildings including fodder storage, equipment with tractive power and machines, fencing of pastures) and livestock and floating capital is extremely high, amounting to DM 4000.00 to 5000.00/ha in all. Owing to the high capital requirements combined with the annual subsidy requirement, under central European conditions the creation of what are called "centralized farms" cannot be claimed to be economic. After initial trials and set-backs, this fact has now gained widespread acceptance.

Table 15: Possible scale, capital requirement and results of some forms of grassland use (one full-time worker)

Item	Units	Form of use				
		Fattening store cattle	Keeping cows	Keeping penned sheep	Keeping boarded livestock	Hay or greenstuff production for sale
Grassland area used	ha	70	130	90	70	70
Livestock numbers	Animals	97[1]	72[2]	453[3]	280	-
Workforce:						
Full-time workers	Number	1	1	1	1[4]	1[5]
Part-time helpers	Hours	213	467	433	-	479
Investment requirement:						
Fixed assets[6]	DM	305 830	351 360	243 240	37 470	86 070
ditto per ha	DM/ha	4 370	2 700	2 700	535	1 230
Livestock capital value	DM	24 150	116 100	65 630	-	-
Floating capital	DM	42 750	31 210	44 340	16 380	14 570
Livestock plus floating capital	DM	66 900	147 310	109 970	16 380	14 570
ditto per ha	DM/ha	955	1 135	1 220	235	210
Factor income/factor costs:						
Operational income	DM	4 830	-17 800	-5 830	20 650	5 750
Labour costs	DM	17 070	18 340	18 160	8 800	8 400
Capital costs	DM	21 620	27 110	19 900	1 930	4 200
Surplus or deficit	DM	-33 860	-63 250	-43 890	9 920	-6 850
ditto per ha	DM/ha	- 480	- 490	- 490	140	- 100

1) Animals sold per year
2) Cows without subsequent breeding
3) Ewes without subsequent breeding
4) 6.5 months operation
5) 4.5 months operation
6) Stall buildings including fodder storage, equipment with tractive power and machines, pasture fencing

ANNEX 12

Details on trials with chemical methods

Gierer and Gregor (1975) were certainly able to report extremely successful use of chemical preparations, but make no recommendations because:

a. there were disadvantages caused by vegetation killed off;

b. the costs were too high (DM 250.00 to DM 410.00/ha).

Hailer (1973a) carried out trials with MPT over several years, mainly in nature conservation areas, and quotes costs of around DM 160.00/ha.

On the basis of his results, Hailer comes to the conclusion that the area application of herbicides makes it impossible to create an aesthetically pleasing landscape. On the other hand, he confirms the success of localized application.

However, to begin with Hailer (1973b) had to contend with set-backs even with the localized application of chemical preparations. In particular, the elimination of coppice shoots after felling hawthorn (Crataegus sp.) caused difficulties and incurred high costs. The coppice shoots had to be dabbed individually several times before they eventually died. Treatment with Tormona in a 50:50 mixture of fuel oil and tempering oil ensured that there was no damage to the other flora. However, to ensure that the preparation did not touch the soil or other plants it had to be dabbed on by hand, which was costly.

Other results from trials with combinations of chemicals are available from Hesse (Kolt 1972):

a) 5 kg Dowpon + 4 litres MPT
b) 5 kg Dowpon + 8 litres MPT
c) 31 litres CCC + 4 litres MPT
Time: end of April to the beginning of June
Results: a. visually unsatisfactory;
b. serious misgivings as to the harmlessness of the chemicals;
c. costs too high (DM 200.00/ha).

ANNEX 13

Rural land use studies on reverted areas

Institution responsible	Study site	Subject/purpose of the study	Methods
Biologisches Institut, Freiburg (D)	Kaiserstuhl	Influence of fire on species' vitality and litter development	Burning
Bayerisches Landesamt für Umweltschutz, Munich (D)	9 sites in the Bavarian Landkreise of Hersbruck, Weissenburg, Starnberg, Erding, Aichach and Fürstenfeldbruck	Prevention of colonization by shrubs, maintenance of groundwater conditions, correction of damage caused by intensive sheep-farming	Removal of stunted trees, Mowing, Burning, Non-intensive grazing
Amt für Landwirtschaft, Laufen (D)	Southern part of the Berchtesgarden Land Landkreis	Avoidance of reversion, keeping the landscape open	No data
Government of Lower Bavaria, Landshut (D)	Zwiesel and Finsterau, Bavarian Forest	Preservation of the cultivated landscape	Mowing, Grazing, Use of growth inhibitors
Schafhaltervereinigung Bayerischer Wald, Mitterfels (D)	Bavarian Forest	Preservation of the cultivated landscape	Grazing
Amt für Landwirtschaft und Bodenkultur, Würzburg (D)	Rothenburg, Lkrs. Aschaffenburg, Weibersbrunn, Lkrs. Aschaffenburg	Various possible ways of tending abandoned arable	Grazing, Mowing, Mulching Burning, Chemicals

Hess. Lehr- und Forschungsanstalt für Grünlandwirtschaft und Futterbau, Bad Hersfeld (D)	Dietzhölztal/ Dillkreis	Management of vegetation development	Mulching Mowing Grazing Burning
Various university institutes, Giessen (D)	Wieseck-Aue, Giessen	Various methods of tending fallow	Mulching Mowing Fertilizing
Institut für Geobotanik, Götingen (D)	Neuer Botanischer Garten, Göttingen	Investigation of undisturbed and uncontrolled succession	Mowing Fertilizing
Lehrstuhl Landschaftsökologie, Münster (D)	15 sites in Baden-Württemberg and in the following Landkreise: Tauberkreis, Reutlingen, Zollernalbkreis, Ortenaukreis, Wäldshut, Esslingen, Karlsruhe, Baden-Baden, Lörrach	Investigation of undisturbed and uncontrolled succession and extensive farming measures in respect of their effects on the site and the balance of nature	Grazing Mulching Burning Application of herbicides
Fredningsstyrelsen, Copenhagen (DK)	Five different sites in nature parks (reserve) in Denmark	Vegetation development and beef production	Vegetation trial on plots 10 m x 10 m quadrats Grazing
Molslaboratorium, Ebeltoft (DK)	Ebeltoft (DK)	Influence of grazing on vegetation (meadows, dry meadows, heisland)	Comparison with mechanized methods
University Botanical Institute, Copenhagen (DK)	Mols-Berge/Ebeltoft Randers, Abendra	Influence of grazing on vegetation development	Grazing
Centre d'Etudes Phytosociologiques et Ecologiques, Montpellier (F)	In the Languedoc near Montpellier	Possible ways of intensifying productivity in the "Garrigue"	Mowing Burning Chemicals Grazing
Botanical Institute of Nijmegen University (NL)	Wylerberg Nature Reserve near Nijmegen	Transition of ruderal tall herbacious vegetation into an oat-grass meadow	Mowing (2xyear) Fertilizing (83 permanent quadrats)
Forestry Commission, Scotland (UK)	Shin Forest, Sutherland Scotland	Development of pinus contarta on marginal areas	Ploughing Fertilizing Fencing (Game reserve) Planting

ANNEX 14

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This report begins with an analysis of the evolution of abandoned land within the EEC countries. There then follows a systematic representation of the natural and socio-economic factors accounting for the abandonment of areas previously used for agriculture. The study attempts to pinpoint the environmental effects of abandoned and reverted land in the environment (soil, water balance, climate, flora and fauna) on the basis of existing studies. It is stated that these effects have not yet been adequately investigated. Reliable information on the consequences of the abandonment of agricultural land is rarely available. The findings of research workers on the basis of investigations and observations made in certain areas or under certain conditions do not always correspond with the findings of other research workers for different areas and different conditions.

Laws and regulations to prevent reverting of agricultural land as well as the scope for and costs of the maintenance or recultivation of relevant areas are also discussed. There are many ways in which abandoned land can be used or maintained. Mulching is the most economical method of maintaining fertility. The highest costs are to be expected if marginal areas are maintained by grazing. The use of chemicals and chemical processes is much criticized for ecological reasons.

The authors make general recommendations for measures dealing with abandoned land under the following headings:

Definition of types of abandoned land and related notions;

Standardization of the land-use statistics covering fallow and abandoned land;

Coordinated study of fundamental effects;

Elaboration of criteria as guides for legislation;

Development of an overall approach to the regional use of abandoned land and measures tailored to regional needs.

The study has been published in German and English.
A French edition is being prepared.

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