LAND-EVALUATION STUDIES IN IRELAND

M. J. Gardiner
Head, National Soil Survey of Ireland

INTRODUCTION

A widespread land-evaluation programme was carried out in Ireland back in the early part of the 19th century under the direction of Sir Richard John Griffith. This evaluation which was based on the capacity of the land to produce certain crops was used mainly for taxation purposes, and has not been superseded up to the present time. Because of changed technology, however, certain anomalies in this evaluation are now apparent (1). Subsequent to Griffiths evaluation an attempt was made to prepare "agrologic maps" (2) which were based on a comparison of the soil as determined by chemical analysis with Griffiths evaluation. These agrologic maps were subsequently lost.

Soil Survey

Systematic soil survey work based on modern principles commenced in Ireland in 1959 when the Agricultural Institute was established. It was decided to prepare soil maps for each of the twenty-six counties. For this purpose field mapping was carried out at a scale of 6 inches to 1 mile (1 : 10,560) but these maps were reduced to $\frac{1}{2}$ inch to 1 mile (1 : 126,720) for publication purposes

Qualitative Land Evaluation

In addition to the systematic soil survey itself the suitability of

the soils for agricultural, horticultural, forestry and amenity uses is determined. Based on their suitability for production the soils are grouped into suitability classes and a suitability map produced to accompany each soil map.

The suitability classes range from those with soils suitable for a wide range of farm enterprises and which have few limitations other than possibly their low pH and nutrient status to those with very severe limitations and which have an extremely limited potential in agriculture. Such soils may be more suitable for recreational or amenity purposes.

Six suitability classes ranging from A to F are usually established.

Class A

The soils placed in Class A are well adapted to modern techniques. Their main limiting factors of low pH and nutrient status are easily overcome by liming and fertilization. They can withstand the impact of heavy machinery, cultivate easily, allow early growth in spring and are capable of carrying large stocks of grazing animals over a prolonged period of the year without suffering physical damage.

Class B

Class B soils have a more limited potential use-range than those in Class A and are generally only of moderate suitability for cultivated crops, pasture and forestry. Limitations include coarse texture, somewhat weak structure or the necessity for constant attention to drainage maintainance.

Class C

The soils included in Class C have a more limited potential use-range

than those in Classes A or B and they are generally only of moderate suitability for cultivated cropping. Compared to Class A soils the effort required to develop a suitable tilth by cultural operations is greater and they are slow to warm up in spring due to their high moisture status. Growth is slow early in the season and harvesting by modern mechanical means is often difficult due to soft ground conditions. Economically, therefore, arable crop production is at a disadvantage compared to production from Class A soils

They are well suited to pasture production and output can be very high. However, to attain this, they require constant attention with particular reference to grazing management. Allowance must be made for resting the pastures during wetter periods to avoid pouching by grazing stock. For this reason the high mid-season production must be exploited to the full by conserving surplus summer growth as silage or hay for winter feed.

Class D

Class D soils have a limited potential use-range due mainly to poor natural drainage conditions and in some also to weak structure and heavy texture resulting in slow permeability. They are poorly suited to cropping and provide poor growth conditions in spring.

They are more suited to pasture production but the restrictions to output and utilization and the procedures required to attain maximum returns, are similar or even more pronounced than those necessary on Class C soils.

Class E

Class E soils have a very limited potential use range. Main

limitations are shallow depth and rock outcrop. Steep slopes prevail in some and pan formations in the profile can be a serious problem, restricting water movement and root penetration.

Class F

The potential use-range of these soils is extremely limited. They may be very poorly drained, very shallow or have very frequent steep slopes. Only limited improvement for extensive grazing or for forestry may be possible and for these reasons, therefore, they are often more suited to wild life or amenity development.

Resources Inventory

After each soil map is completed, the extent of occurrence of each soil is measured. When this information is combined with the soil suitability or soil drainage classification as outlined above, the results constitute an inventory of the soil resources and potential within each county.

Some of the survey results indicate great differences in the agricultural potential between different counties and regions. A comparison of counties Wexford, Limerick, Carlow and West Donegal shows this clearly (Table 1).

Table 1 - Soil suitability classes as a percentage of the total area for counties Wexford, Limerick, Carlow and West Donegal.

	Area Statute Acres	Soil Suitability Class (%)			
		I	II	III	IV
County Wexford	584,521	60	13	22	5
County Limerick	661,738	38	8	43	13
County Carlow	221,540	67	4	23	6
West Donegal Region	263,050	1	6	90	3

N.B. 1 acre = 0.405 ha

One of the most striking features of these findings is that West Donegal with only 1% of Class I land has more holdings per square mile than County Carlow which has 67% of Class I land. The question of whether areas like West Donegal can maintain as many holdings as exist at present is immediately raised. The extent of occurrence of 38% Class I soils in County Limerick by comparison with 60% in County Wexford and 67% in County Carlow is also noteworthy especially in view of the popular reputation which County Limerick enjoys for good quality land. Provisional figures for percentages of different soil suitability classes in a number of other counties indicate the considerable differences between them in soil resources (Table 2).

Table 2 - A Soil suitability classification for some Irish counties

County	Soil Suitability Class (%)			
	I	II	III	IV
Roscommon	35	38	18	11
Monaghan	28	41	18	9
Mayo	23	20	12	45
Cavan	23	53	13	11
Sligo	21	41	16	22
Clare	14	14	46	26
Donegal	13	25	2	60
Kerry	10	14	23	53
Leitrim	1	2	64	53

Quantitative Land Evaluation

Measurements of crop yields have shown considerable performance variation between the different soil series already mapped even where management and fertilizer use are of a uniformly high order. Such yield measurements for sugar beet (3) and for wheat (Table 3) show a range of yields from 35.0 to 48.0 tons/ha and from 55 to 71 cwts/ha respectively (2,800 to 3,600 kg/ha) on different soil series.

Table 3 - Sugar beet and wheat yields on different soil series

Sugar Beet		Wheat	
Soil Series	Tonne/ha	Soil Series	cwts/ha
Broadway	47.7	Clonroche	71.0
Clonroche	43.9	Screen	65.5
Screen	38.4	Rathangan	55.8
Rathangan	35.1	Macamore	57.5

N.B. 1 cwt = 50.8 kg

As a result of these and other measured performance variations of different soils a large-scale productivity experiment has been laid down on a number of representative soils throughout the country. It is hoped, through this experiment, to establish not only the absolute performance variations between the different soils but also any seasonal differences existing. In this way, farm management practices can be matched to the most suitable crops and to total and seasonal grass production patterns which are characteristic of different soils. It will help to make possible also the application of the particular fertilizer treatment most suited to individual soil types.

National Figures

From the new soil map of Ireland (4) the extent of occurrence of each great soil group association was calculated and the results, together with the land-use interpretation findings were compiled to accompany the soil map (5). These results showed that the different soils have permanent limiting factors ranging from very strong limitations in some to only slight limitations in others. The extent of occurrence of soils in these different categories as well as the kind and degree of limitation involved is shown (Table 4).

Table 4 - Soils with varying degrees of limitations to agricultural use as a percentage of the whole country

Degree of Limitation	Type of Limitation	% of Country
A Slight	No serious limitations	35.8
B Moderate	Somewhat shallow depth Coarse texture	10.4
C Moderate to strong	Somewhat shallow depth Somewhat high altitude Poor permeability, poor structure Somewhat heavy texture	13.4
D Strong	Very poor permeability Poor structure Heavy texture	11.2
E Very strong	Rock outcrop, shallow depth Steep slopes, high altitude	20.6

Range of uses to which the different soils are suited

The soils were then grouped on the basis of the range of uses to which they are suited under normal management and fertilizer practices. The

results (Table 5) showed that approximately 32% of the total land area has a wide use-range with limitations that are overcome by normal manuring and management practices. Another 9% has a somewhat limited use-range.

Table 5 - Range of potential uses of Irish soils

Use-range category	% of total area
1 Wide	32.2
2 Somewhat limited	9.0
3 Limited	29.6
4 Very limited	9.5
5 Extremely limited	18.1

This constitutes a total area of 41% of soils with a wide or only somewhat limited range of potential uses.

Soils in the limited use-range category are those mainly unsuited to tillage but suited to a permanent grassland system (and mostly suited to forestry also); these occupy 29.6% of the country. The remaining 27.6% have an extremely limited use-range; the potential for agricultural development in areas occupied by such soils is greatly restricted. The usefulness of such figures is based not only on the fact that the amount of land in various use-suitability and limitation categories is calculated but also that the map itself shows the regional distribution of these categories.

Poorly Drained land

It was possible also from the survey findings to make an assessment

of the total amount of wet land in the country. It was found that (exclusive of the major peat areas) 29% of the country is occupied by poorly-drained mineral soils. When the soil characteristics of the wet land were taken into account, it was found that the 29% total could be broken down into 18% of soils which are wet because of heavy texture or poor structure, or both, and 11% which are wet mainly because they are situated in low-lying positions. These latter soils would be classified as ground-water gleys whereas the former would be classified as pseudogleys. The techniques necessary for the successful artificial drainage of these two soil types may be quite different and since there is a considerable annual investment in land drainage in Ireland, the breakdown of the drainage problem on the basis of causative effect is regarded as most important.

Grazing capacity map

Land-use in Ireland is dominated by pasture production and with some 85% of the land devoted to pasture, the livestock industry plays a most important role in the national economy.

The present livestock population has been estimated at 5.2 million livestock units (L.U.). The extrapolation of animal production experimental findings from the various research stations to the country at large was made possible by the publication of the Soil Map of Ireland (1969). This extrapolation (6) showed that approximately 10 million livestock units could be carried on the lowland mineral soils by the application of existing knowledge and techniques. Since the present livestock population is estimated to be 5.2 million livestock units, it can be seen that almost 100% increase in livestock density is possible on the basis of our known soil resources.

Considerable differences were found to exist between the different soils in the country in this regard. In a comparison of four counties, it was found (6) that present stock densities in County Roscommon and in County Leitrim are approximately 75% and 50% respectively of those in counties Limerick and Wexford. This is a reflection of the type of soils occurring in each county as is shown by comparing the actual number of livestock carried with what is possible according to the extrapolation of research findings (6). It was found that possible improvements in livestock units per 100 acres were 103%, 81%, 70% and 65% for counties Roscommon, Wexford, Limerick and Leitrim respectively.

Future Programme

The future programme is based mainly on the preparation of county soil maps at a scale of 1 : 126,720. A number of these have already been published e.g. (7), (8), (9), (10), (11). However, continuing emphasis will be placed on both the qualitative and quantitative interpretive work so that the basic soil survey programme will be as useful as possible in the planning of optimum land use. Where possible the basic soil and land-evaluation information will be correlated with the other physical, economic and sociological factors which are also highly important if we are to have a comprehensive understanding of the problems involved. Two such resource surveys have already been completed (12), (13). The ultimate aim of the programme would be to recommend the zoning of crop and livestock production on the basis of the most suitable soils and climate and the establishment of farm management systems based fundamentally on the seasonal pattern of production particularly in relation to pastures.

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