APPENDIX 4-19

Industrial Cutaway Bog Land-Use Studies (Clonsast) – Internal Bord na Móna Report 1978

INDUSTRIAL CUTAWAY BOG LAND-USE STUDIES

(A Bord na Mona Series)

Cutaway Study No. 1, 1978

CLONSAST

SUMMARY

CLONSAST CUTAWAY STUDY - 1978

Objective

This study is a first exercise in the planning of the long term use of the cutaway bog following fuel peat production by Bord na Mona.

Abstract

All the known data on 2,325 hectares of Bord na Mona cutaway bog at Clonsast, Co. Offaly are co-ordinated. The fuel production life of the area with the resulting emergence pattern of the cutaway bog is calculated.

Research work conducted on the potential of this land is summarised as is the development work done by Bord na Mona to date. Using these facts various land use options are suggested and the financial and social implications examined.

From these conclusions a policy for development in the immediate future by Bord na Mona is recommended.

Background

Total peat area of the country is estimated at 1.29 million hectares. Bord na Mona is producing peat from 68,826 ha. The area under study is thus 3% of the total Bord na Mona area and 0.05% of the total peat area of the country.

Definition of Area

According to the 1936 survey the average depth of peat in the undrained Clonsast bog was 8 metres. Production of sod peat commenced in 1936 and is now beginning to decline.

Survey of the sod peat cutaway in 1977 showed that there is an average of 1.4 metres of peat remaining, varying from 0.5m to 4m consisting of a layer of top strippings over forest, fen or reed swamp peat. Survey of the subsoil highlighted three main types, glacial drift at the higher contour levels, glacial sand at a lower level and shell marl in the depressions.

It is now planned to harvest milled peat from the deeper areas of the sod peat cutaway. This will prolong the fuel life of the bog by 12 years and yield an extra 3.6 million tonnes of peat. The average depth of peat remaining will be 0.5 metres ranging from 0 - 2 metres. We estimate that 10% of the area will have 2 metres of peat after milling in areas ranging from 20 to 80 ha. It is calculated that 76 m.m. of this peat (mainly fen) will yield an annual output of 187 tonnes per ha. The area of milled peat cutaway available for development can be calculated as follows:

1978	109	hectares (already developed)
1985	334	"
1990	578	"
1995	978	"
2000	1333	"

Research

Research on the potential of milled peat cutaway bog has been going on for 20 years and concludes that grass is the best crop. It also recommends that for vegetables deeper peat is required due to the annual wastage. It has also been shown that forestry will do well on cutaway bog with minimum peat.

Development

In the study area Bord na Mona has developed 109 ha. of grassland which is used for the production of beef both from summer grazing and winter feeding of silage.

Cutaway areas other than Clonsast developed are 80 ha. at Derrygreenagh used for a beef breeding herd, 130 ha. at Oweninny, Co. Mayo (blanket bog) for sheep production, 15 ha. at Lullymore for beef production, 52 ha. at Boora for cereal production. Problems encountered to date are:

(a) timber (old forest trees and stumps) emerging through the grassland, (mainly in the deeper peat areas).

(b) uneven subsidence and shrinkage.

(c) cracking on drying out.

(d) poor trafficability and poaching in deeper peat areas.

These problems will be overcome by:

(a) Milling the deeper areas and extracting the timber.

(b) Using cereals as a first crop (3/4 years) so that all settling will be complete before grassing.

(c) watertable control to prevent drying out.

(d) Deep ploughing and subsoil mixing to give better water movement.

All these solutions are being tested.

Nutritional problems are confined to copper deficiency in the herbage mainly affecting breeding animals. Preventative measures by feeding supplementary copper are in operation. Vegetables growing on deep (2 metre) fen peat is in progress since 1970 with disappointing yields and quality. This will continue and every

effort made to overcome the production problems. Recent measurements indicate that there is a loss of 58 m.m. of peat annually with vegetable growing which must be compared with a loss of 76 m.m. per year in milled peat production.

Recent surveys have also shown that there is at present approximately 12,000 ha. in the Bord na Mona production area with peat depths of 2 metre or more (classified as the most suitable for vegetable production). This area will increase over the next 15 years. If the vegetable production problems are overcome and if market conditions change a large area can be taken out of fuel production and used for this purpose.

Land Use Planning

Considering the physical data of the 2,325 ha. of cutaway bog (milled peat cutaway with 0.5 m. of peat remaining) and the research findings and the experience gained by Bord na Mona to-date, the following are the options for the use of this land.

Option 1

Grassland	- 91%	2116 ha.
Road structure	- 4%	93 ha.
Shelter and amenity planting	- 5%	116 ha.

The grassland could be used for beef production by Bord na Mona as at present. If suitable, it could also be subdivided for private farming by sale or leasing in the long term.

Option 2

Grassland, commercial forestry and amenity use.

Grassland	- 60%	1395 ha.
Commercial forestry and lakes	- 36%	837 ha.
Roads	- 4%	93 ha.

The better areas of peat and subsoil would be sown to grass and the deeper and more difficult peat sections sown with forestry. Some of the major depressions could be flooded for lake areas.

Option 3

Grassland, arable and vegetable production, shelter and amenity use.

Grassland	- 61%	1418 ha.
Arable Cropping - 10% of total area plus the North Bog	- 20%	465 ha.
Roads	- 4%	93 ha.
Lakes, shelter and amenity planting	- 15%	349 ha.

This is a combination of all uses retaining the deeper peat areas for vegetable production.

Option 4

Commercial forestry only.

The main factor militating against this option is its low labour requirement and subsequent fall off in employment.

Option 5

Biomass production.

This option is the use of the area for short rotation forestry as a source of energy. This concept is being researched in 1978 in co-operation with An Foras Taluntais.

Peripheral Area

This area between the Bord na Mona bog and the main road boundaries is 1,854 hectares. It is divided up as follows:-

Mineral soil	-	770 ha.
Developed cutaway bog	-	500 "
Undeveloped	-	236 "
High bog	-	208 "
Forestry on peat	-	140 "

The peat areas are typically poorly drained and fragmented and should be developed in association with Bord na Mona cutaway in Clonsast.

Financial Implications

Cost of developing grassland is estimated at £887 per hectare.

Total capital costs up to the year 2000 for a system of cereals for four years, followed by grassland and beef production (employing one man per 40 hectares) would be:-

Development	£1.1	million
Buildings, Machinery	1.0	"
Total:	£2.2	"

Production cost	£4.8	million	(or £345/ha. per annum)
Livestock purchases	2.3	"	
Total Sales	8.4	"	

This plan has an operating surplus each year but the difficulty would be to carry out the plan from our own resources or commercial borrowing due to high interest charges, mounting overdraft and the compounding of interest.

The Forestry option, while much less capital intensive, gives no return for 15 years and employs only 1 man per 400 hectares.

Social Implications

The Economic & Social Research Institute was retained by Bord na Mona to conduct a survey of employees at Clonsast and E.S.B. employees at Portarlington Power Station to determine the following:

(a) the characteristics of the workers

(b) the implications for the workforce of the run-down of fuel peat production

(c) the implications for the total employment in the catchment area of a run-down of operations

(d) to obtain the opinions of all workers as to how the cutaway bog should be utilised.

A total of 292 out of 375 Bord na Mona employees and 59 out of 119 E.S.B. employees were interviewed.

The report concludes that

(a) the surrounding area is very dependent on Bord na Mona and the E.S.B. for employment and income. Wages and salaries in 1977 were £1.5 million

(b) fewer workers than in peat production will be employed in farming the cutaway regardless of how it is worked or owned

(c) alternative employment must be provided, particularly for the younger generation in the area, by Bord na Mona in association with the E.S.B. and the I.D.A.

Particularly surprising was the small number of employees (9%) who are part-time farmers.

Conclusions

In the present situation production of energy from native resources is important and it is thus desirable to produce the maximum amount of fuel from our bogs. In the undrained state the bogs were of no use and fragmented. There is now an opportunity of producing good agricultural land from the cutaway bogs using optimum planning and management methods.

From research and development work to date, the options for its use are: grassland, vegetable production, forestry and amenity use.

Social and economic aspects need frequent review.

Programme

All emerging cutaway bog (which will have an average of 0.5 metres of peat) will be developed for grassland after an initial period in cereal production. The methods of developing and

utilising this grassland will be perfected in association with all interested parties. Further research will be carried out by An Foras Taluntais with a proper inter-organisational structure. The long term use of this land cannot yet be determined. No specific areas of deep peat will be retained for vegetable production in the foreseeable future but growing trials will continue.

INDUSTRIAL CUTAWAY BOG LAND-USE STUDIES

(A Bord na Mona Series)

Cutaway Study No. 1, 1978

CLONSAST

OBJECTIVE

This study is a first exercise in planning the long term use of the land left following fuel peat production by Bord na Mona.

ABSTRACT

In this report all the known information such as peat types and depth, sub peat mineral soil types, drainage pattern etc. on 2,325 hectares of Bord na Mona cutaway bog at Clonsast Works, Cushina, Co. Offaly is presented. The studies made to determine the fuel production life of the area with the resulting cutaway emergence pattern are described.

A summary is made of Research and Development work to date in developing Bord na Mona cutaway bog for agricultural purposes.

Using all this data various land use options are put forward and suggestions made as to how this land might be used in the future.

The financial and social implications of the change from fuel production to other uses are examined.

From the conclusions a policy for Bord na Mona development of this land in the immediate future is recommended.

INTRODUCTION

Background

In a survey conducted between 1810-14 it is recorded that there was then over 1.29 million hectares of peat covered land in Ireland or 15% of total area.

This was sub-divided as follows:-

0.65 million ha. mountain bog (50%)
0.34 million ha. blanket bog (26%)
0.30 million ha. raised bog (24%)

Harvesting of peat by hand has been practised in Ireland for generations but it is difficult to measure what quantity has or is being produced. It can be clearly seen that in the intervening years large areas have been harvested and some of the cutaways developed for various agricultural purposes.

The first State involvement in peat production began in 1936 with the setting up of the Turf Development Board. This Board was replaced by Bord na Mona in 1946 to facilitate the more extensive development of the country's peat resources. During the intervening thirty years the Board has purchased 68,826 ha. of virgin bog which it has drained, developed and worked for peat production in units ranging from 8,100 - 240 hectares. Up to 1977 Bord na Mona has produced a total of 75 million tonnes of peat. Output in 1976 was 5 million tonnes plus over 1 million cubic metres of moss peat, realising a sales revenue of £27 million and employing 5,385 people. Some 56% of this fuel output went into the generation of 25% of the nation's electricity and the remainder to the domestic fuel market as sod peat or briquettes. This output of peat fuel represents a saving on imported energy in the form of oil of £50 million in 1976.

While this contribution by Bord na Mona to national progress is substantial there is another and even greater contribution to be made in the development of the cutaway bogs when fuel production ceases.

Some trial development work is in progress at a number of locations. The first large area of worked-out bog will be at the Clonsast Works near Portarlington.

Clonsast Works

Clonsast bog is located five miles north of Portarlington and lies on 7° 9' West latitude and 53° 15' North longitude. Height above sea level varies between 64-76 metres. The average annual rainfall is 855 mm. and the average annual temperature is 48.4°F. The Clonsast group consists of Garryhinch, Derryounce, Derrylea, Clonsast main bog, North bog and the Bulge. The gross area involved is 4,343 hectares. This study is confined to the latter three bogs, namely, Clonsast main bog, North bog and the Bulge,

comprising an area of 2,325 hectares, which is approximately 3% of the total area that will become available from Bord na Mona operations over the next forty years and 0.05% of the total peatland area in the country.

Bog development commenced at Clonsast in 1936 with the acquisition by the Turf Development Board of about 1,619 hectares of virgin bog. Production was begun in 1939 with one cutting machine. Over the years the operation has been mechanised and employment which was running at 600 per annum in the 1950s is now down to 330.

Since 1939 Clonsast works has produced six million tonnes of sod peat. Over the past five years production and sales have been as follows - tonnes:-

	Production	E.S.B. Sales	Total Sales
1973/74	224,590	155,009	202,586
1974/75	219,281	162,276	226,333
1975/76	221,186	192,443	254,020
1976/77	177,089	170,000	226,300
1977/78	210,000	120,000	200,000

A 25 M.W. generating station was built at Portarlington by the E.S.B. in 1948 and during the early 1960s a further 12.5 M.W. was added. This power station employs almost 100 people and takes 60% of the Clonsast peat output. At present this generating station forms part of the E.S.B's. base load capacity and will continue to do so up to the early 1990s when it will be phased out.

Definition of Area

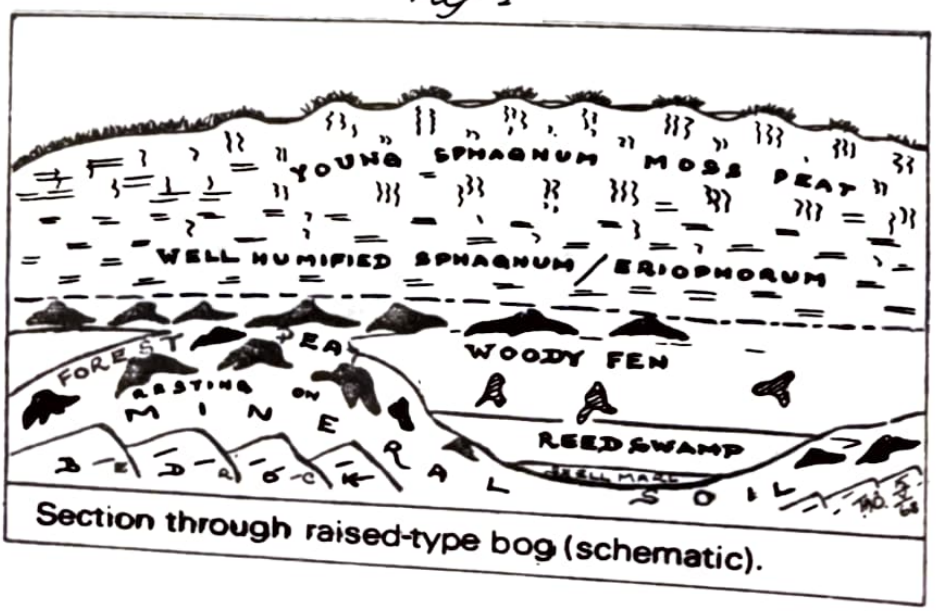
This is Hochmoor or raised-type bog typical of the Central Plain of Ireland. According to the 1936 survey the average depth was 8 metres undrained (10 metres maximum and 3.6 metres minimum). The average moisture content in Ireland of this type of bog is 96% before drainage.

Peat in general is an accumulation of organic residues originating under more or less water-saturated conditions through the incomplete decomposition of plant remains. The peat type varies with the plant species that formed it.

Raised bogs overlie layers of fen peat or forest peat of variable thickness. These developed from about 8000 B.C. in areas subject to prolonged waterlogging such as lake margins and river flood plains. Fen peat is mainly derived from plants such as reeds and sedges, which during their period of growth were more dependent on nutrient-rich groundwater than on rain water for their moisture supply. It frequently includes the fragmented remains of birch and alder. Fen peat comprised mainly of non-Sphagnum mosses and containing a significant proportion of wood fragments is frequently termed "woody fen". Due to their relatively high base content, fen peats are only marginally acid.

As fen peat gradually increased in thickness over about six thousand years the living vegetation on their surface became further removed from the influence of groundwater and more dependent on rain for its moisture supply. This resulted in a complete change in their flora to plants such as heather, bog cotton and Sphagnum mosses, which are more suited to the acid conditions prevailing. The partially decomposed remains of these and other plant species eventually resulted in the development of what are today termed "raised bogs".

Fig 1



Section through raised-type bog (schematic).

Fig 2

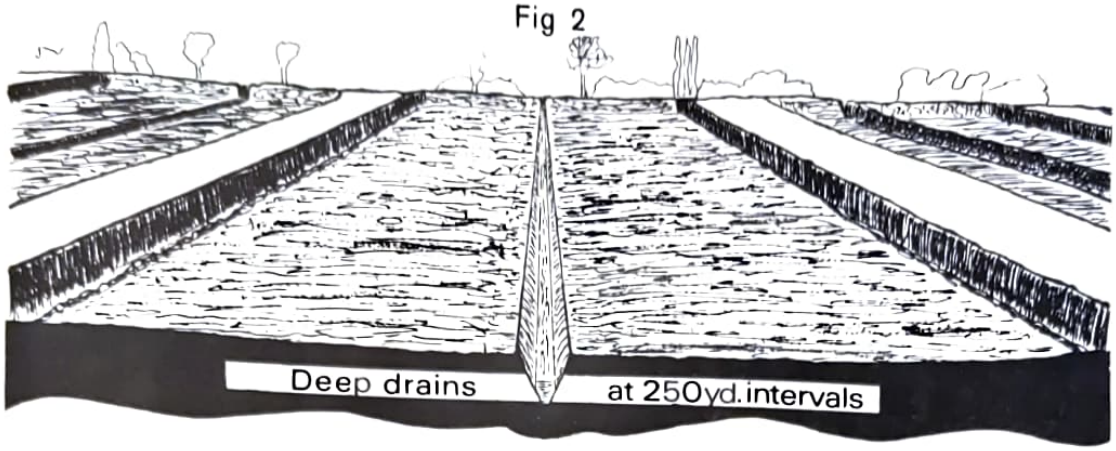
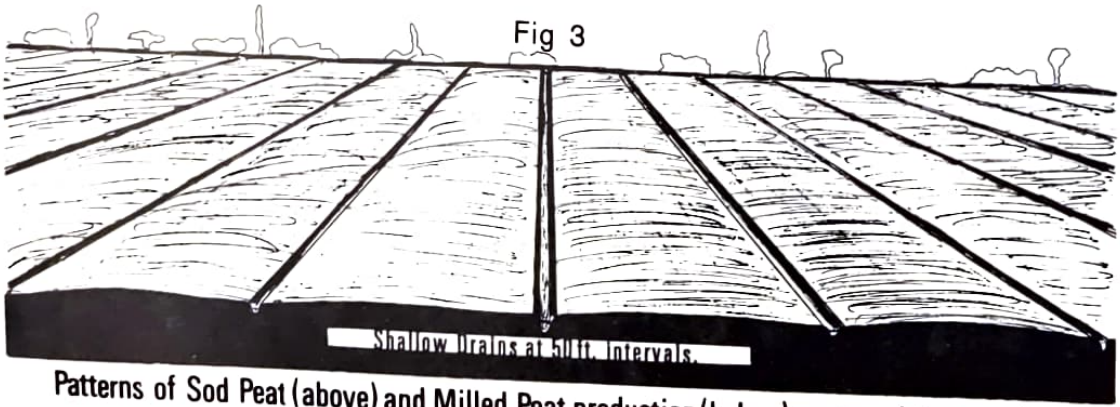


Fig 3



Patterns of Sod Peat (above) and Milled Peat production (below) compared. Schematic.

Throughout the study area bog peat proper consisting of younger and older Sphagnum and Eriophorum, spp. overlies forest peat consisting of forest debris found only on the higher levels of the floor. On slopes it overlies woody fen or forest peat. Over convexities in the floor it overlies reed swamp, with or without a woody fen layer at the transition level.

Sod Peat Production

Sod peat is produced by excavating two metre wide strips of bog along a drainage trench vertically to a maximum of four metres of the bog profile. The top half metre (Sphagnum moss) is first stripped and left on the cutaway. Initially the surface of the bog is used as a spreading and drying ground. As cutting proceeds the area of uncut bog decreases and the area of cutaway increases and is used for spreading and drying. Sod peat cutaway is thus required as a spreadground until the total bog is cut out. (Fig.2)

Sod Peat Cutaway

The sod peat cutaway, surveyed in 1964, was found to consist of a layer of top stripping, mainly young Sphagnum peat 25-50 mm. thick, lying on one or more of the other peat types which were undisturbed except where levelling operations, in preparation of the cutaway as spreadground for sod peat, had mixed the materials in the top 50 mm. or more (1).

The deeper stripping layers lay over the deep reed swamp; the least depth of stripping over the shallow forest peat on convexities and on high ground generally.

Correlations between peat types and depths were found as follows (undisturbed peat in cutaway):

(a) 0.3 - 0.5 m. of forest debris on all major convexities.

(b) 0.5 - 1.5 m. of woody fen peat, most often found on slopes (depths more variable than at the other levels).

(c) 1.5 - 3.0 m. of reed swamp in the major hollows.

(d) 3.0 m. plus as for (c) but with shell marl under the reed swamp.

These correlations were found to hold good over a total of 8100 hectares of machine sod peat cutaway subsequently surveyed in the Clonsast, Ballydermot, Timahoe and Mountdillon groups. They were, therefore, used as a basis for a 'natural regions' sub-division of all the surveyed bogs. This classification received further support later when it was found that there was a reasonably good correlation with subsoil variations also. The regions were lettered A, B, C and D (Map I).

Subsoils

The sub-peat mineral soils of Clonsast were investigated for Bord na Mona in 1961/64 (2). They were found to be as follows:-

S.1 - well developed relict soil, sandy loam to loam.

S.2 - moderately developed soil, loam.

S.3 - undeveloped soil, highly calcareous shallow silt loam over calcareous glacial drift, etc.

S.4 - undeveloped soil. Glacial clay, sand, gravel. Find sands and silty clays (calcareous).

S.5 - shell marl.

Cutaway Soil Maps

Recent discussions have produced agreement on the following simplification of the above nomenclature and classification of sub-peat mineral soils of Clonsast, - solely for the purpose of producing a more simple soils map to assist in our present study.

S.1 and S.2 soil types, being more or less weathered and matured soils, with some degree of decalcification towards their former surfaces, are coupled and termed WEATHERED SOILS.

S.3 and S.4, unweathered and immature soils materials, are together termed UNWEATHERED SOILS.

S.5 stands as before - SHELL MARL.

Map 2 carries the simplified notation of the mineral soils referred to above.

Data from the cutaway peat survey and from the mineral soils survey (simplified version) were then combined in Map 4 in order to show whatever correlations exist and to assist in sub-dividing the general area into possible planning regions.

It must be emphasised, however, that the boundaries between these regions are by no means firm. They may alter with the particular form of land use envisaged and with changing circumstances, e.g. eventual depths of peat remaining after fuel peat removal.

Peat Depth

During 1976/77 the area was surveyed for peat depth - excluding the portions of high bog which have still to be utilised for sod peat production. Map 6 shows these depths in detail and there is a much greater depth of peat on the cutaways of the North bog and Bulge than on the Clonsast main bog area. This is

because the former two areas had greater peat depths and came into production later. Analyses of the peat depths from the soundings taken are as follows:-

Peat Depth Range (metres)	Percentage of Area within depth range	Approx. Hectares within depth range (Peat Production Area)
Main Bog:		
0 - 0.5	12.06	173
0.5 - 1.5	32.73	470
1.5 - 3.0	31.53	452
3.0 and over	23.68	340
North Bog:		
0 - 0.5	Nil	Nil
0.5 - 1.5	5.3	10
1.5 - 3.0	16.7	33
3.0 and over	78.0	155
Bulge:		
0 - 0.5	4.8	16
0.5 - 1.5	4.8	16
1.5 - 3.0	16.7	61
3.0 and over	73.7	308

Average depth of peat on the cutaway within the study area is 1.4 metres.

As already explained this cutaway peat consists of a layer of Sphagnum strippings overlying either forest debris, woody fen or reed swamp peat. It was assumed that this would be the composition of cutaway bog available for development and on which development has been in progress since 1972.

Milled Peat Production

The term 'milled peat' is used to describe peat in crumb or powder form. It is produced over the entire working area by milling and drying a shallow layer of peat each harvest. In an average season twelve crops are harvested giving 187 tonnes per hectare. The boç is serviced by drains at 15.2 metre centres. With this system all the peat is harvested and there is no top stripping left on the cutaway as in sod peat production. (Fig.3)

Milling continues until the subsoil appears in the field drains. This occurs haphazardly due to the undulating nature of the subsoil. When a subsoil outcrop occurs in a production area milling must stop to avoid mixing stones, etc. with the peat which makes it unsuitable for burning. It is thus not possible to leave a uniform depth of residual peat. In practice an average of 0.5 metres is left with approximately 10% of the cutaway having depths of 2 metres or more over areas of 20-80 hectares. Milled peat cutaway bog is peculiar to Bord na Mona area and will not be found in any other peat areas of the country.

Trial milled peat harvesting of the deeper areas of sod peat cutaway were successfully conducted over the past three years at Clonsast. All sod peat cutaway with more than 0.5 metres of peat will now be used for milled peat production. The advantages of this for fuel production are obvious because harvesting can be undertaken immediately on a drained and developed area. The amount of harvestable peat will be discussed in the next chapter. Milling also aids cutaway development because:-

(a) it removes the old sod peat stripping which is not a good medium for agriculture

(b) it reduces the area of very deep peat (2-3 metres) which is also problematic for agriculture

(c) it disposes of timber (old forest trees and stumps) which occur in the lower layers of peat (described in Chapter II).

This cutaway bog available for development over the next twenty-three years is in the Main bog only and accounts for all fuel production area there. No cutaway will be available on either the North bog or the Bulge in that time span due to greater peat depth and it is estimated that milling will continue on those two areas for a further six years, i.e. until the year 2006.

While the areas becoming available for development over the next twenty years are substantial it must be remembered the emergence of these areas is haphazard and it will be many years before any large block of developed land will be available.

Drainage Pattern

Map 5 shows the flow pattern and final drainage plan now operating in the study area. No further drainage is necessary for fuel production and it must be assumed that this will be the drainage pattern for cutaway development. The eight pumping stations pinpointed are necessary to facilitate peat production at the lower contour levels. The area requiring pumping at present is estimated at a total of 405 ha. and for future development, unless this area is flooded for amenity purposes, these pumping stations must be maintained to keep a low water table level and allow agricultural operations.

It can be seen that there are three catchments in the area flowing into the three Barrow tributaries, namely, the Philipstown river to the north, the North river flowing through the Main bog and the Cushina river to the south. These three tributaries meet at Monasterevan and flow into the river Barrow. Levels to ordnance datumshow the break points on each trench together with levels at key points on all outfalls and pumps (entry and exit).

The permanent railway system is also shown on this map but it is visualised that this railway will have no part to play in the cutaway utilisation for which a system of roads will be constructed.

The red lines on Map 5 indicate the subsoil contours.

Peripheral Area

In the course of the study the peripheral area between the Bord na Mona bog and the main road boundaries was surveyed (Map 6). This area is 1,854 hectares consisting of:-

Mineral land	-	770 hectares
Developed cutaway	-	500
Undeveloped cutaway	-	236
Undeveloped high bog	-	208
Forestry (on peat)	-	140

As most of this area is serviced by the outfalls developed by Bord na Mona since 1939 it could be very easily drained and developed. The active 'facebanks' (for hand harvesting turf) numbered 131 from which an estimated 3,000 tonnes of turf was produced in 1977. There is also a private machine turf cutting

enterprise producing an estimated 2,500 tonnes per annum. On the peat area depth varies from 0.15 m. to 3.9 m. - averaging 1.4 m. (Map 6).

This peat area in private ownership should be developed and restructured in conjunction with the Bord na Mona cutaway bog and a land use plan be drawn up for the total area of 3,269 hectares of bogland excluding forestry.

Summary

From the foregoing it is now possible to define the nature of the cutaway bog in this study area.

It will consist of an average of 0.5 metres of peat of either forest debris, woody fen or reed swamp type, overlying one of the three types of sub peat soil - weathered relict soils, unweathered silty loams etc. or shell marl. Using these combinations it is possible, for planning purposes, to divide the Bord na Mona cutaway bog area into three regions, as in Map 4.

CHAPTER 3

RESEARCH AND DEVELOPMENT

Research

The first growing trials on cutaway bog were started in 1955 at Clonsast by the Department of Agriculture. Here for a period of six years investigations were carried out into the growing of grass, kale and potatoes.

Phosphate, potash and nitrogen were found to be essential for growth, but yields were generally low in the second and subsequent cropping years. Grass and potatoes were the most suitable. (3)

Research work also commenced at Lullymore in 1955 on milled peat cutaway and was continued by An Foras Taluntais from 1958. Preliminary results showed that grass was the only crop which grew satisfactorily on shallow peat and basal soil. It was also shown that arable cropping should be located on deeper peats and that Sphagnum peat in situ or as a waste product of sod peat harvesting and basal soil are unsatisfactory media for arable crops. (4)

From 1962 research on cutaway bog was confined to grassland for which Bord na Mona developed and allotted to An Foras Taluntais 32 ha. of milled peat cutaway and 10 ha. of sod peat cutaway at Lullymore and Timahoe respectively.

Until 1972 work was confined to beef production from grass (summer grazing). Results from 1968 showed that satisfactory liveweight gains could be obtained. This was verified over the following years when gains of 0.8 kg. per day were achieved. Mineral levels in both animal and herbage were monitored and no advantage was observed from feeding supplementary copper. (5)

In 1972 an agreed programme of research for four years was undertaken at Lullymore to observe the performance of breeding animals on cutaway bog and identify problems associated with minor element deficiencies and their effect on fertility. Parasitic behaviour on this land was also investigated. It was concluded that animal fertility was normal but severe copper deficiency was observed and a system of supplementary copper feeding was necessary. Parasitic (Strongolides) build-up was also associated with copper deficiency and required special treatment. (6)

Research on Vegetable Growing

1967/68 growing trials of vegetable crops on deep (2 m.) fen peat at Derrybrennan gave considerably higher yields than the national average. While the addition of high levels of major nutrients and of some minor ones, such as boron and copper, was necessary and while weed control was a problem it was concluded that deep fen peat had many advantages for horticultural production. (7)

Forestry

Results from trial plantings made on Trench 14 (within the study area) by the Forest and Wild Life Service of the Department of Lands in 1955 suggest that cutaway bog has a high potential for timber production. Yields of 25 cu. metres per hectare per annum have been recorded. (8) Recent examination has shown yields above national average for nine out of eleven species compared. Root development is satisfactory. On shallow peat roots of one species (Abies grandis) have penetrated into the calcarous subsoil. (9)

Development and Utilisation to date

Bord na Mona commenced the development of cutaway bog in 1972. The first development of 48 hectares took place on the study area. This consisted of two sod peat spreadgrounds 120 metres wide and 2.4 kilometres long, serviced by one of the 14 main drains which runs through the bog. Over the length of the developed area the depth of this drain varied between 1 and 4 metres and for most of its length it was cut into the mineral subsoil. The average depth of residual peat was 1.5 metres and this was typical of sod peat cutaway, consisting of a layer of Sphagnum stripping overlying forest peat to the north and fen peat in the remainder of the area. The mineral subsoil contained all three types already described, i.e. weathered glacial drift to the north, unweathered silty clay for about two-thirds of the area and a small portion in the centre overlying shell marl. The peat on the east side of the drain contained a large quantity of drain excavated subsoil.

All surface timber was extracted. The total area was levelled and graded to an approximate gradient of 1% towards the main drain. No intermediate tile drains were used.

The pH of the cutaway varied from 3.5 - 7.5, the higher figure being obtained where subsoil was more prevalent. Quantities of lime varying from 0 - 15 tonnes per hectare were applied to neutralise the acidity and raise the pH to an average level of 5.5. The other nutrients applied and the seed mixture used are given in Tables 1 and 2.

Grass establishment was excellent even on areas where sub peat mineral soil was exposed.

During 1973 the pasture was used both for summer grazing and for silage making. A satisfactory liveweight gain of .60 kg. per animal per day was obtained during the grazing season from June-October. The silage yield of 15 tonnes per acre was also satisfactory and there was no problem with mechanised operations.(10)

Accommodation for over-wintering 400 bullocks was built adjacent to the grass area. In the first winter silage mixed with barley and minerals was fed to 300 animals and a liveweight gain of .66 kilos per day was obtained.

The animal slurry was collected during the winter, stored in steel tanks and applied to the grass area in 1974.

Soil analyses (Table 3) demonstrate that while a very high initial application of nutrients is required to obtain the desirable fertility level subsequent applications are somewhat similar to those for mineral soil to maintain that level of fertility. The average annual application of nutrients is given in Table 4.

While the response to nitrogen application is very evident the deficiency of this element is quickly observed by the orange and green discoloration of the grass tips accompanied by a marked drop in yield.

The analyses of both herbage and silage (Tables 5, 6 and 7) indicate that good quality material can be grown on and ensiled from cutaway bog.

A point worth noting is the consistently low level of copper in both herbage and silage. This low level of copper is further complicated by an abnormally high level of molybdenum which can aggravate copper deficiency by making the copper that is present unavailable. However, animal performance in this unit does not seem to be affected by this imbalance of minor elements. This is borne out by the satisfactory levels of nutrients found in the samples of animal blood and liver analysed (Table 8).

To date a total of 120 ha. of grassland has been developed at Clonsast Works and is used for the production of beef by summer grazing and over-wintering. While most of this grassland is on cutaway bog some marginal areas on the periphery of the bog have been taken in and developed also.

Other Developments

Over the past five years the Board has developed other areas of cutaway bog as follows:

Derrygreenagh:

80 ha. of grassland established on milled peat cutaway bog. The peat depth on this area was approximately 0.7 metres of reed swamp overlying very porous glacial outwash gravels. This combination of peat and subsoil will not be encountered in the study area at Clonsast. The 80 ha. of grassland has been used for the maintenance of a single-suckling herd of 150 cows and the production of beef animals for finishing at Clonsast.

Oweninny:

130 ha. of grassland developed from milled peat cutaway. This is blanket type peat peculiar to the west of Ireland and will not be encountered in the study or any midland area. This grassland has been used for the maintenance of a flock of 1,000 ewes and the production of mid-summer lamb for three years.

There is some summer grazing with lightweight cattle which are later brought to Clonsast for finishing as beef. It was always envisaged that the development of cutaway bog in Mayo would be difficult due to the prevalent peat type and adverse climatic conditions. This has been borne out in practice and the performance of livestock in this area is still unsatisfactory.

Lullymore:

At this works an area of 15 ha. of milled peat cutaway bog has been developed as grassland and used in conjunction with 64 ha. of mineral soil for the production of beef and for cereal growing.

Boora:

52 ha. of milled peat cutaway has been developed at Boora and used for the production of wheat and barley over the past two years.

Blackwater:

12 ha. of marginal mineral soil has been used for growing wheat in the 1977 season.

In total the Board will be working in 1978:- 346 ha. grassland, 220 ha. cereals, 4 ha. vegetables. Some 52 ha. will also be planted for shelter and amenity.

Problems Encountered

Nutrition:

With the grazing and over-wintering of beef animals no major nutritional problems have been encountered. While we have recorded some erratic performances from time to time we are convinced that these are due to factors other than nutrition. Among the breeding animals at Derrygreenagh numerous cases of copper deficiency have been encountered and a system of copper supplementation is constantly practised. The copper level in animal tissue is continuously monitored in co-operation with An Foras Taluntais with a view to perfecting this supplementation programme. All analytical data from the sheep flock indicate that its nutrient and minor element status is satisfactory to date.

Parasites:

No parasite problems have arisen with beef animals, but as was found by other research (4), parasite infestation in combination with copper deficiency in the breeding herd has been difficult to control. A system of preventative treatment has been undertaken in association with research scientists of An Foras Taluntais and the Veterinary Research Laboratory of the Department of Agriculture. In the sheep flock, with the climatic conditions prevailing at Oweninny, parasite control is one of the major factors affecting production levels and an elaborate system of preventative treatment is in operation there. To date a build-up of infection has been prevented but further experience is required before an extension of this project will be undertaken.

Physical Problems

The physical problems encountered in utilising grass from established grassland on cutaway bog have been substantial over the past five years and can be summarised under the following headings:-

1. Timber Emergence

The degree of tree cover prior to bog formation varied throughout the country. The area under study was covered by a very dense forest and as a result the cutaway bog contains a high proportion of tree trunks and stumps of pine, oak and yew.

The area developed for grassland contains an average of 0.75 m. of peat varying from 12 mm - 3 metres. During development all visible timber was extracted, but due to subsidence in the intervening years the timber below the surface has emerged through the grassland and caused serious problems in utilising this grass. It has been a major hindrance to machine operation both in the application of fertilisers and in harvesting of grass and has necessitated timber extraction every year for the past three years. This extraction and pasture renewal has reduced output and made proper management difficult.

2. Uneven Subsidence

When cutaway bog is levelled, graded, drained and sown down to grass uneven subsidence immediately occurs due to the variations in peat depth and types particularly in the case of sod peat cutaway. This again makes mechanical operations difficult and reduces output.

3. Cracking

This phenomenon too is associated with the drying out process in developed cutaway bog and varies with the degree of drainage and also with the peat type. While cracking is not a major problem at Clonsast it has been very widespread at Derrygreenagh where reed swamp peat overlies a porous subsoil. Proper management has been difficult and we estimate that production has been reduced by over 50% on most of the area. It will be necessary to renew the grass on all this area in the coming years.

Again at Oweninny cracking is a problem but does not affect the management of sheep to the same extent.

It must be remembered that the past three summers have been exceptionally dry and have aggravated the three problems mentioned. It is not possible to say at this stage whether they will recur to the same extent in the future.

Solutions

(a) Milled Peat Production on the Sod Peat Cutaway

The taking of milled peat from sod peat cutaway at Clonsast will alleviate to some extent the timber emergence problem as most of this timber will be extracted in the milling process.

(b) Cereal Growing

To avoid uneven subsidence, and to some extent eventual cracking, cereals have been used as a first crop on the cutaway bog at Boora Works for two years. Our purpose in doing this was to ensure that all levelling and subsidence would be completed before permanent pasture is established. While the yield of these cereals and the quality of grain has been below average, the operation is having the desired effect and will be continued. It is now envisaged that in future cereals will be grown on all cutaway bog for a number of years before grass is sown.

(c) Watertable Control

It was always expected that the drainage of cutaway bog would be a problem but, from our experience over the last three years in particular, we are now of the opinion that certain areas may be over-drained and that watertable control may be necessary for future development. An area of 80 hectares of cutaway being developed at Boora will be used to test the feasibility of controlling the watertable level by pumping.

(d) Deep Ploughing and Subsoil Mixing

Deep ploughing and mixing the residual peat on the cutaway bog with the subsoil was tested in 1977. Twenty hectares was treated at Clonsast and a further 14 hectares at Derrygreenagh. Preliminary observations indicate it to be of benefit but further tests will be conducted in the coming year in association with the Soil Physics Dept. of An Foras Taluntais so that a full appraisal can be made. We expect this pulverisation of peat layers and subsoil will give deeper root penetration and better water conductivity and thus a reduction in drying out and cracking. It should also have the effect of reducing peat wastage and subsidence and allow more even settling.

4. Trafficability

Bog drainage is designed to cater for fuel harvesting over the major portion of the area. Due to the varying contour levels it is not possible to drain every portion fully and some areas of deep peat at lower contour levels will always have a high water-table. These pockets of peat (generally overlying shell marl) will always cause problems in cutaway development and must receive special attention. One such area has been developed at Clonsast and has been very difficult to manage due to poaching by livestock and difficulty in machine operations

Shelter

In our experience the provision of shelter is important for satisfactory animal performance and is deficient in our operations to date. We realise that shelter must be provided many years before actual cutaway development takes place and is of prime importance in any land use plan. Tree planting is also of prime importance from an amenity aspect in reducing the monotony of the landscape and providing a habitat for wild life.

Horticulture

Bord na Mona is investigating the potential of deep fen peat for horticultural production at Derrygreenagh since 1971. An area of 28 ha. was taken out of milled peat production and redeveloped for arable cropping. It had an average depth of 1.5 to 2.0 metres of woody fen and phragmite peat overlying a free draining gravel subsoil - a combination which is not found in the study area.

After grading, levelling and draining, nutrients were added to raise the fertility to the desired level.

In the intervening years a complete range of crops have been grown but yields have not been spectacular as can be seen from the following table.

Crop	Years Grown	Yield (Tonnes/Ha.)	Experimental Yields A.F.T.1967, 1968
Potatoes	6	26.65	47.5
Onions	4	41.40	72.5
Carrots	4	28.00	72.5
Carrots - early	3	11.75	43.7
Cauliflower	6	2.50	-
Calabrese	2	2.75	8.5
Celery	4	18.10	165.0
Barley	4	3.30	-

Not only are the yields disappointing but poor quality produce has been obtained with many crops.

The reasons given for this poor performance are many and varied, but the trial growings will continue in an effort to obtain better yields and quality so that the deeper areas of suitable peat left after fuel production may be utilised for this purpose. From figures available at present 10% of the cutaway bog will have 2 metres or more of peat remaining. This deep peat area could form a very substantial vegetable enterprise if production problems are solved and market conditions are favourable.

Overall Picture

From our surveys conducted on Bord na Mona sod peat cutaways in the late '60s and from calculations made on the milling process over the last 25 years we estimate that approximately 12,000 hectares of its production area at present has a depth of 2 m. of peat or more. As production increases (only 1/3rd of the peat deposits of the Bord na Mona bogs have as yet been exploited) this area with 2 m. of peat will increase for approximately another 15 years before it will begin to decrease, (Graph 1). It is obvious that at any time over the next 25 years a very large area of deep fen peat can be taken out of fuel production and retained for this purpose if required. Also assuming that Bord na Mona will develop 80,000 hectares of bog for fuel production it will have 80,000 hectares of cutaway peat and 10% of this will have a depth of 2 m. or more of peat. Therefore, 8,000 hectares of Bord na Mona cutaway peat will have peat depths suitable for vegetable production.

Peat Subsidence

It should be noted that the loss in depth under vegetable production since commencing in 1970 is 58 m.m. per year and for cost/benefit purposes must be compared with a loss in depth of 76 m.m. to produce 187 tonnes of milled peat per hectare per year. A worldwide comparison of peat loss under various croppings and over varying periods can be seen in Appendix 1.

Summary

Development work to date has been generally confined to shallower peat areas overlying the better subsoil types. Some experience has also been gained from small areas of deep peat overlying the more difficult subsoils both in the study area and elsewhere. However, at this stage it is our opinion that we have not yet created the perfect pasture or arable cropping programme from cutaway bog. The problems encountered have been highlighted and will be tackled and solved by further development.

Research to date does not allow us to be dogmatic as to the suitability of any particular area for any one specific land use. The broad recommendation is that grass is the most suitable crop for shallow peat and that for arable cropping and vegetable production greater peat depths are required. Our experience to date is in line with this conclusion.

CHAPTER 4

LAND USE PLANNING

From the preceding chapters on peat and subsoil type it is evident that the area under study is of a complex nature and is therefore unlikely to be suitable for any single form of land use.

For this reason we have to approach land use planning using a number of hypotheses, the validity of which remain to be proved.

Assuming that an average depth of 0.5 metres of peat will remain on the study area the following are the options in land use as we see them now:-

1. Total area sown to grassland, less 5% for shelter and amenity planning and 4% for roads.

2. Sowing down the more suitable peat and subsoil areas to grass and commercial forestry on other areas plus amenity planting to include the creation of lakes by flooding.

3. The shallow peat area sown down to grass, the deeper peat areas for arable and vegetable production, 10% for shelter and amenity planting and a further 10% of low-lying areas flooded for amenity.

4. Afforestation of the entire area.

5. Use of the total area for Biomass production that is short rotation forestry for fuel.

OPTION 1

(Grassland Only)

Here it is assumed that all areas will be equally suitable for development as grassland after an initial period of cereal production. Map 7 shows this plan with 5% tree planted and a further 4% allocated to roads and buildings. This gives a total pasture area of 2,000 hectares.

This area of grassland will be developed gradually over a period of 25-30 years as the cutaway emergence plan shows in Chapter 2. This would entail the retention of the eight existing pumping stations to maintain the low water level necessary for agricultural operations in the lower contour areas (Map 4, Region 3 and Region 2 North).

If, as at present, the grass were used by Bord na Mona for beef production by grazing and winter feeding, three centralised serving units would be sufficient. These units would include cattle housing, slurry storage, grain storage and processing, fertiliser and machinery storage.

The-long term aim would be to maximise silage use for over-wintering and reduce summer grazing to a minimum. This would create an outlet locally for young cattle in the autumn and be complementary to local farming. It might also be possible to arrange contract winter feeding for part of the livestock of neighbouring farmers.

Possible alternatives within this system would be grass meal production - using peat-fired dryers, grass juice extraction (for protein production) prior to grass drying, or silage, slurry treatment with the addition of peat for the production of an organic fertiliser to be marketed in conjunction with moss peat, etc. These alternatives (subject to economic appraisal) would raise the employment level above that of a straightforward grass/beef production system estimated at 50 for this area, that is one man per 40 hectares.

A further alternative use for such grassland is private farming. This could be done on a short or long-term lease basis, without buildings, or by sub-division into economic holdings, with provision of farm buildings to selected qualified individuals. Such a suggested sub-division is indicated by the red numbers on Map 7, giving 36 farms of approximately 50 ha. each, plus an area to service the existing cattle unit (No. 24). This suggested sub-division is dependent on the assumption that we will create the land and conditions suitable for private farming.

OPTION 2

(Grassland, Commercial Forestry and Amenity Uses)

This option is shown in Map 8. All the better subsoil areas (Map 2) are used for grass production as are the poorer subsoil areas covered by the better type peat, i.e. forest debris and woody fen. Regions 1 and part of 2, (Map 4) are under grass. Commercial forestry would be established on the remaining deeper areas of reed swamp peat. Amenity and shelter planting would be established on the lower contour areas (Region 3) eliminating the need for pumps.

Under option 2 the area would be divided as follows:-

Commercial forestry, lakes and shelter belts	-	36% - 837 ha.
Roads and buildings	-	4% - 93 ha.
Net usable grassland	-	60% - 1395 ha.

The alternatives for the use of this grassland are as in Option 1. Similarly the long-term alternatives would be farming by Bord na Mona, or leasing or sale. The red numbers on Map 8 indicate how this grassland could be sub-divided into 21 individual farms of approximately 50 ha. each plus an area to service the existing cattle unit.

OPTION 3

(Grassland, Arable and Vegetable Production, Shelter and Amenity)

This option as shown in Map 9 entails the sowing of all shallow areas to grass and the retention of the deeper areas for arable cropping and vegetable production. As stated in Chapter 2 it will not be possible to mill all the area down to a depth of 0.5 m. and we visualise 10% of the area having 2 m. or more of residual peat. Most of this deep peat will be in the lower contour areas some or all of it requiring pumping to control the watertable level. At this stage we think this may be an advantage in avoiding moisture deficiency and fast subsidence. Some of these areas could be flooded for amenity use and also to facilitate irrigation, which we believe is necessary for successful vegetable growing on deep peat.

If present vegetable production and marketing problems are overcome consideration could be given to the preservation of all the deep peat in the North bog area (196 ha.) in conjunction with the other similar areas designated for this purpose. From the cutaway emergence pattern it is evident that the North bog will not be available for milling for another 20 years leaving ample time for this decision.

With this option the following could be the land use plan:-

Grassland	61%	-	1418 hectares
Roads and buildings	4%	-	93 hectares
Arable cropping (10% of total area plus the North bog)	20%	-	465 hectares
Lakes, shelter and amenity planting	15%	-	349 hectares

Peripheral Area

The breakdown of the peripheral area (1,854 hectares) between the Bord na Mona bog and main road boundaries is given in the last chapter and can be seen on Map 6. We would like to think that the peat sections (944 hectares) of this area could be drained, developed and restructured in conjunction with the development of the cutaway bog in the study area. The options for the use of this area would be similar to those listed under 1, 2 and 3. If the total area is suitable for grassland it would allow the creation of say 19 x 50 ha. farmlets well developed and conveniently laid out. Again some of the deeper peat would be suitable for arable and vegetable cropping when drained and some of the high bog would be suitable for milled peat production and forestry.

OPTION 4

(Commercial Forestry Only)

This is a straightforward land use plan for planting the total area as it becomes available with commercial forestry. Research has shown (Chapter 3) that yields higher than the national average could be obtained from forestry on cutaway bog.

By augmenting the commercial plantations with those ornamental species which grow best on the different peat types and depths and combining the planting with the flooding of the main depressions, the total area could become an important tourist attraction, for wild life, shooting, boating, fishing etc. The main factor militating against this option is its low labour requirement and subsequent fall of employment in the area.

OPTION 5

(Biomass - short rotation forestry)

There is much concern at present at the rate world energy reserves (coal, oil and peat) are being exhausted. For example the oil reserves which took 100 million years to form are to be used up in a single century. It is obvious that provision must be made for the future.

Peat is our main source of natural energy and this will be exhausted within another 40-50 years. It is thus more important than ever for us to provide for our future energy needs.

Formation of carbohydrates by photosynthesis in plants is one way of converting solar energy (which is largely under-utilised) into a combustible fuel. This process is now referred to as "Biomass" conversion. The theory is that by planting specially selected fast growing trees, cutting them every 3-5 years, allowing them to coppice (regrow) and cutting again 3-5 years later, a continuous fuel supply will be available. There are many unknown factors in the efficiency of this process but it may have possibilities for our future energy supply.

Plantings are in progress, in association with An Foras Taluntais, to test Biomass growth rate, output and harvesting techniques and the results of these will determine whether large scale plantings will be made on cutaway in the years ahead.

CHAPTER 5

FINANCIAL IMPLICATIONS

OPTION 1

This option assumes the development as grassland of the cutaway areas becoming available up to the year 2000.

The plan and cost projections are based on development work carried out to date.

CAPITAL COSTS

While development is geared to areas available from cutaway emergence, it is planned to proceed at a rate which makes the most efficient use of manpower and machines. For example, we have allowed for the purchase and employment of one bulldozer wholetime for the first nine years (until 1987) at which stage the workload justifies a second machine throughout the remaining years of this development cycle.

The plan provides for the establishment of a suitable road structure comprising eight miles of tarmac roads and nine miles of spur roads.

It also includes 48 hectares of shelter belts and 16 hectares of amenity planting which in conjunction with the 3 hectares already planted amount to 5% of the total area.

We have allowed for the necessary supply of power and water and for the initial costs of fencing, liming, fertilising and grassing.

The project requires the wholetime use of bulldozers, and hence, we have included in the development charge the repair and overhaul costs of these machines based on their working age and on historical maintenance costs of similar machines in Clonsast.

Direct overheads are related to projected labour on development; the charges for administration and technical services provided by the local Works are in line with the similar charge per hectare for farm production.

While our estimates as a whole seem higher than the development costs hitherto associated with grassland establishment they account for the range of capital outlay which a project of this type and scale entails. In a series of possible land use options the opportunity cost of capital employed must be highlighted and each option assessed on the total commitment of resources involved.

Total projected expenditure on developing this area is £1,146,540 analysed as follows:

	Total Cost	Cost per Ha.
	£	£
Materials	648,073	491.34
Wages	437,677	331.82
Overheads	60,790	46.09
Total	1,146,540	869.25

In addition to the foregoing outlay on development the following capital expenditure is required for beef and grain production.

	£
Plant and machinery	548,000
Buildings	491,500
	1,039,500

Total capital expenditure is £2,186,040.

PRODUCTION PLANS

The plan for developed areas is four years initially on cereal crops - first year under wheat followed by three years under barley, and then sown to grass.

Grass utilisation is based on a calf to beef system over a two-year cycle. In addition, where available grassland is not sufficient to justify a further cattle house at that stage we have provided for summer grazing of heavy store cattle in order to maximise the return from the grasslands.

PERFORMANCE STANDARDS

Expected standards are higher than what we have achieved so far but they are attainable targets which are necessary for the viability of this kind of enterprise.

Outputs on this scale are being achieved generally in the country and we are projecting them as realisable standards in our plan.

(1) Liveweight gains

	Average daily gain per head	Liveweight total per head
	Kg.	Kg.
Purchase (calf)		50
Summer 1	0.7	
Winter 1	0.5	
One year old		275
Summer 2	0.8	
Winter 2	0.85	
Sale (bullock)		575
Heavy stores - summer grazing	1.0	

The overall gains over the duration of the plan (1978-2000) average 853 Kg. per hectare.

(2) Livestocking rates

1 livestock unit per 0.6 hectare
Heavy stores - 1850 kg. per hectare on summer grazing.

(3) Mortality rates - calf to bullock

	Rate %
Up to 3 months	5.0
+ 3 months - 12 months	2.5
+ 1 year - 2 years	0.5

(4) Cereal Crops - grain yields

Wheat	4.45	tonnes per ha.
Barley	3.95	" " "

The plan provides for the use of our own grain in the barley soya compound produced in the grain complex.

PRODUCTION COSTS

Labour and material charges are based on current rates and likewise the revenue from sale of livestock and grain.

The costs from year to year are determined by the nature and range of the planned operations and are linked primarily with livestock numbers and crops.

The following is a summary of production costs (excluding cattle purchases) over the period:

	Total Cost	Cost per Ha.
	£	£
Materials	2,827,130	202.65
Wages	1,300,200	93.20
Overheads	633,150	45.38
Total	4,760,480	341.23

Note: There is no provision for rates in this projection but our present rateable valuations would likely be increased if we engage in large scale agriculture.

CATTLE TRADING

The plan provides for purchase of calves in the spring at £80 per head and sale after two years at £75 per 100 kg. live-weight.

	Total - £
Sales	7,425,070
Purchases	2,288,790
Net trading revenue	5,136,280

Allowing for the value of unsold stock the gain on trading over the period is £5,428,210 which is equivalent to £562 per hectare of grassland.

SALE OF CROPS

Gross return on cereal crops, allowing for retention of feeding barley required for compound mix, is £1,014,740.

Summary Cash Flow

	£'000	
Cattle sales	7,425	
Crop Sales	1,015	8,440
Capital expenses	2,186	
Production expenses	4,760	
Cattle purchases	2,289	9,235
Cash flow		(795)

The following schedule (No. 1) shows for each year and in total the projected revenue, expenditure, cash flow, finance required and interest charges.

These figures illustrate the impracticality of funding this plan from our own resources or from borrowing on commercial terms. The main militating factor is the high cost of servicing the investment because of the mounting overdraft and the compounding of the interest. Total interest charges at 9% p.a. amount to £3,515,240.

Projecting the position at year 2000 when development of this area is completed and working on beef production only the enterprise at present rates would yield a return of £90,800 per annum which allows for the average cost of plant replacement.

OPTIONS 2 AND 3

We have not costed these specifically for the following reasons:

1. We have strong reservations regarding the use of standards supplied by the Forestry and Wildlife Section to the more difficult cutaway areas. We have not got performance data for commercial forestry on reed swamp peat.

2. To date our performances in arable and vegetable production have not given commercially successful yields.

This area of peat agriculture needs further research and trial before we can plan production based on attainable outputs and quality necessary for its commercial viability and the constraints of the market.

In addition to these factors we would also have the problem of funding capital expenditure as outlined in Option 1 for utilisation and expansion of the grassland areas (about 60% of total area).

The funding difficulty would be accentuated by the absence of any return from forestry for the initial fifteen years.

OPTION 4

This plan refers to commercial forestry only. Schedule 2 attached shows the results of a pilot study of this area completed by Forestry Officials.

As no back-up figures were supplied we are unable to verify the authenticity of these figures on a basis which would provide comparability with our grassland study.

We have however doubts about some of the criteria used in arriving at the forestry results, particularly the high yield class (22) and a ½% p.a. wood price increase. We understand from Forestry that they too have reservations about this yield from one-half metre of peat.

OPTION 5

There are no available details on Biomass production on which we can make a commercial assessment.

As stated in Chapter 4 this is still in the experimental stage of development.

CHAPTER 6

SOCIAL IMPLICATIONS

The Economic and Social Research Institute was retained by Bord na Mona to conduct a comprehensive survey of Bord na Mona employees at Clonsast and the E.S.B. employees at Portarlington Power Station to determine the following:-

(a) the characteristics of the workers

(b) the implications for the work force of the run-down of fuel peat production operation

(c) the implications for the total employment in the catchment area of a run-down of operations

(d) to obtain the opinions of all workers as to how the cutaway bog should be utilised.

The remainder of this chapter is a brief summary of the E.S.R.I. report:

Since its establishment in 1946 the Clonsast Works have proved to be a major source of non-agricultural employment in the Portarlington area. However, over this period the average number of workers employed annually at the works has declined as is seen from the following table.

Employees at Clonsast Works classified by occupation in selected years since 1959/60 ≠

Year	Occupation				
	Administrative	Supervisory	Skilled	Semi and unskilled	Total
			No.		
1959/60	15	36	39	496	586
1965/66	11	31	56	366	464
1970/71	11	23	79	217	330
1976/77	17	18	68	216	319
Change in number 1959 - 1977 (%)	+2	-18	+29	-283	-267
	+(13.3)	-(50.0)	+(74.3)	-(57.1)	-(45.6)

≠ The figures for 1976/77 were supplied by Bord na Mona and the remainder were taken from Fell (1971). They do not include seasonal workers (mainly unskilled) whose numbers have declined substantially.

There are at present 319 full-time workers employed by Bord na Mona at Clonsast of whom about 70 are skilled workers, mainly fitters and electricians. A further 60/70 seasonal workers are employed in turf saving activities during the summer. In addition the E.S.B. employs 120 workers. Wages and salaries and local spending for other goods and services for 1976/77 was £1.5 million. Hence, when turf production ceases, economic activity in the area will be seriously affected unless alternative industries can be introduced either by the I.D.A. or through diversification policy by Bord na Mona.

The catchment area for Bord na Mona and E.S.B. workers extends over an area of about 58,400 hectares (230 sq. miles) but because it is covered by extensive deposits of bogland it is not a particularly good farming area and lacks features capable of attracting tourists.

The total population of all the region concerned in 1971 was about 17,000 people, of which the rural population was 8,000 and that of the towns about 9,000. Between 1966 and 1971 there was a 3% increase in the population of the region. The phasing out of Bord na Mona and E.S.B. operations would certainly have a serious effect on our future growth in population. Portarlington in particular would suffer very much.

The total number of Bord na Mona workers interviewed was 292 out of a total of 375 (including both seasonal and permanent employees) and in the Power Station interviews were conducted with 59 out of 119 employees. The remainder either refused to co-operate or were unavailable for interview throughout the survey period.

The overall response rate was 71%. In view of this high percentage we believe that the samples given give an accurate representation of the circumstances and views of the workers involved.

Occupation of Workers

The occupation of workers classified by age are given in Table 9. The first part of the Table shows that of the total interviewed 14.2% had administrative, clerical or supervisory posts; 23.1% were skilled manual; 33.9% were semi-skilled manual and 28% were unskilled workers. The second part of Table 9 shows that 7% of the workers interviewed were under 20 years of age; 31% were 50 years of age and over while 18% were over 55 years of age.

The E.S.B. workers are mainly in the middle age groups. None were under 20 years of age and only 10% were over 55 years of age.

The third section of Table 9 shows that 80% of the workers in the sample were full-time, about 2% were part-time and 18% were seasonal workers.

Marital Status, Relationship to Head of Household and the Size of Household

Table 10 shows the marital status of employees classified by occupation and relationship to head of household. As can be seen from the first section of this Table about 64% of all employees are married and 35% are single.

Education and Training of Employees

The percentage of employees classified by occupation, by age on completion of full-time education, and by type who are attending is shown in Table 11. The first section of this Table shows that 41% of the workers finished full-time education at 14 years of age or later, 16% finished at 15 years of age, another 16% at 16 years of age, 14% at 17 years and 11% at 18 years and over. In all about 87% of sample left full-time schooling between 14 and 17 years of age. The second section of Table 11 shows that over half the sample did not go beyond primary school.

Salaries and Wages

The total gross wage and salary for Bord na Mona and E.S.B. for workers residing in the Clonsast area for year ending 31st March 1977 was £1.5 million and when deductions such as P.A.Y.E., Social Welfare, Superannuation remain nett receipts of workers were £1.25 million. These are very substantial receipts for a rural area of this size.

Job Satisfaction

Over 90% of the employees were satisfied with their job arrangements to and from work and a similar number said that Bord na Mona and the E.S.B. were good firms to work for and that the hours worked were convenient. Almost equally high proportions stated that their present jobs were the only ones they could get if they wished to stay in the area and that they were very happy in their present jobs. A high proportion also stated that their work was interesting, that the pay was good and that they were given a chance to do the things they want.

Employees' plans for the Future

On this question 37% of the employees thought that Bord na Mona or the E.S.B. would provide other jobs in the Clonsast areas when present jobs ceased. A further 16% said that they would get jobs from Bord na Mona or E.S.B. elsewhere. The people who were most confident of obtaining other jobs with Bord na Mona or the E.S.B. in Clonsast were the semi-skilled and unskilled workers. Very few workers (3.7%) hoped to become full-time farmers when the present work ceased in the Clonsast area.

Experience of Farming

Some questions on farming experience were included in the questionnaire and the answers are given in Table 12. The first part of this Table shows that about 9% of the sample owned and operated farms, a further 1.4% operated rented land while 6% helped on family farm. Almost 84% of the sample did not work on farms at the time of the survey. The second part of this Table which gives the size of the farms operated, shows that 35% of operators worked on farms of less than 15 acres, 26% operated on 15-30 acre farms, 21% on 30-50 acre farms and 17.5% on farms of 50 acres and over. The third section of this Table shows that about 70% of all employees had some experience of farming.

Options as to best use of Cutaway Bog

About half the sample thought that root and vegetable crops would be most suited to cutaway bog, 11% favoured dairying and 17% thought that dry cattle rearing would be more suitable while only 6% spoke in favour of forestry.

Options varied widely as to the number of acres of cutaway bog with which to make an economic holding. Most thought that 50-100 acres would suffice but 4% felt that 200 acres would be needed while another 4% thought that less than 30 acres would do.

When questioned as to who should farm the cutaway bog about half the respondents said that Bord na Mona should farm it themselves. About 1/5 suggested that it should be farmed on a co-operative basis by Bord na Mona or E.S.B. employees, 1/6 thought that it should be divided into farmland and sold or let on a long-term basis to Bord na Mona or E.S.B. employees while 6% only were in favour of dividing it among local farmers.

When asked about selling or renting the cutaway bog to local farmers over 60% said that it would be a very bad idea. Giving reasons of this view about 1/3 said that the locals were not using their own holdings well and therefore, would not be expected to do otherwise with cutaway bog. About 1/5 said that local farmers lacked training and almost half thought they lacked the capital equipment required for such an operation.

About 60% of all the respondents said they would be prepared to become full-time farmers on cutaway bog and that their wives and family would be prepared to go along with the idea.

Those who said that they would be prepared to become full-time farmers on cutaway bog were asked to state the amount per acre they would be prepared to pay either to purchase or rent the land. Purchase prices ranged from £20 - £1,000 per acre, the average respondent being £205 per acre. Rental prices ranged mainly from £5 - £100 per acre, the average being £33 per acre.

Other Industries

When employees were asked to suggest other industries which might be set up in the Clonsast area if Bord na Mona and E.S.B. had wound down their operations about 1/5 of the workers thought that a grassmeal factory would be suitable. Another 1/5 thought that vegetable processing would be best while about 1/8 suggested engineering. The amount of employment which workers thought the different industries would give varied considerably among the different groups. About 7% thought that there would be jobs for less than 100 people, about 39% thought that over 300 could be employed.

Industrial Development Authority

The recent job creation performance of the cluster of towns incorporating the Clonsast region is of some interest. The ideal regional planning for the period 1973-1977 set a target of 750 nett new jobs. During 1973 and 1976 only 300 new jobs were actually created. A further 200 new jobs are expected in 1977 leaving a shortfall of 250 nett new jobs for the period as a whole.

The I.D.A. have taken this disappointing performance of 1973/77 period into account in setting up a job creating target of 750 new jobs for this cluster of towns in 1978/81 period. Special efforts are being devoted in job creating in this region in view of the fact that Bord na Mona and E.S.B. (the largest employers in the area) would be scaling down on their operations. Furthermore, it is hoped to persuade a large industry which will eventually employ over 1,000 workers to establish at Portarlington.

As part of the effort to create employment in the area the I.D.A. has stated that it is willing to co-operate with Bord na Mona in:

(a) supporting the development of new products suitable to the resources and skills available in the area through its Research and Development Programme.

(b) through its project identification programme the I.D.A. co-operating with the Board will help identify products which can be produced using the skills available in the area. It will provide financial support where appropriate towards the establishment of industry to produce such products.

(c) making services available in arranging joint ventures between the Board and another party and providing financial support to such ventures as appropriate.

(d) supporting the establishment of small industries in the area. This programme is particularly suitable for skilled employees to set up an industry of their own.

Conclusions by the E.S.R.I.

The Clonsast area is heavily dependent both directly and indirectly on the operations of Bord na Mona and the E.S.B. for the provision of employment and income. The survey results showed that even with phased closure of operations over a number of years large numbers of jobs would be lost. Furthermore, the survey showed that very few of the workers had income other than from their present jobs. Particularly surprising was the small number of workers who were engaged in part-time farming.

It seems clear that if the Clonsast area is not to suffer great economic and social costs following the cessation of operations by Bord na Mona and E.S.B. alternative employment would have to be found. Unfortunately the prospects for such alternative employment do not appear especially bright at present. Indeed, if alternative employment were available, it is likely that some workers (notably those in the older age groups possessing little or no skills) would find it difficult to obtain such employment. This situation is further exacerbated by the fact that large numbers of young, relatively well educated people are entering the local labour force for the first time. In addition to the direct effect on the Bord na Mona and E.S.B. workers and their family, the indirect effect of a closure on other persons in the area must be considered. The income earned by those working on the bog and those working in the Power Station is spent mainly in the Clonsast area, thereby generating further income and employment. Recipients of this secondary income would also suffer when the Bord na Mona and E.S.B. operations in the area cease. Given the heavy dependence in the area on Bord na Mona and E.S.B. it is not surprising that our survey showed that workers looked on these bodies to alleviate the difficulties that would arise when the bog finally is exhausted.

It is obvious that alternative employment must be provided in the Clonsast area. However, the economic feasibility of any venture needs to be thoroughly investigated as well as its technical feasibility. It is not enough to know that an enterprise can produce a particular item, one must also know that production is profitable and that the product will be a marketable one. It is also true that the method of organisation of any venture may influence its economical feasibility. Hence it is necessary to distinguish clearly between the potential value of a venture under the perfect conditions and the value likely to be realised under actual real world conditions.

We believe that considerabl fewer workers could be employed in farming the cutaway bog than are at present in Bord na Mona and the E.S.B. irrespective of the ownership or type of farming adopted. It might be possible to employ considerable numbers in ancillary processing industries but economic viability of such industries would have to be carefully assessed before any recommendation could be made.

CHAPTER 7

CONCLUSIONS

Fuel peat production is very important to the Irish economy in reducing energy imports, creating exports and gainfully employing people in rural areas. There is now a greater need than ever to produce as much energy as possible from native resources and it is thus desirable to produce as much peat as possible from our bogs.

Agriculture is vital to the Irish economy and every effort should be made for its expansion. The development of good agricultural land from Bord na Mona cutaway bog is thus a very important consideration, and the long-term use of this land will not be sacrificed for short-term fuel gain.

Research work which has been going on for over 20 years recommends that grass is the most suitable crop for cutaway bog and that for vegetable and arable cropping a greater depth of peat is required.

The development work by Bord na Mona since 1972 verifies this general finding but also highlights the necessity for further work for different combinations of peat and subsoil types before one can say what each area is best suited for.

Planning the long-term use of this land now, the options available to us are:-

Grassland

Arable and Vegetable production

Forestry

Biomass production

and the combination of all those with amenity areas for tourist attraction. The capital requirement for the development is substantial and must be planned in advance.

The social considerations in changing from labour intensive fuel production to other operations must get serious consideration. Alternative employment must be found within this area regardless of the long-term use or ownership of the lands.

Recommendations

The first decision to be made is what depth of peat should be left after fuel production. The development of the cutaway as grassland or for forestry allows maximum fuel to be extracted. If arable cropping and vegetable production are to be practised greater depths of peat are required. It has been shown that both fuel production and vegetable production use up the peat deposits at approximately the same rate. It is thus a question

of cost benefit between the two operations. It has been demonstrated that if our vegetable production problems are solved and if market conditions change in the future a decision can then be made to retain suitable areas of deep peat for this use. In the meantime fuel production should continue, leaving an average of 0.5 metres of peat and the resulting cutaway should be developed for agricultural purposes, mainly grassland. Amenity and shelter belt planting which has already begun should be accelerated.

More time and experience is required to solve our present problems. Further research will also be required into many aspects such as watertable control, deep ploughing etc. and An Foras Taluntais with a proper inter-organisational structure has a special position for this purpose. The place of cereals in the initial development of cutaway bog will have an important place and further work is necessary to maximise their yield and reduce disease. The economics of the development will need annual review.

Plans must now be implemented to safeguard the future of all existing employees of Bord na Mona and the E.S.B. in this area by the creation of alternative employment. New opportunities must be created for the younger generation.

Although the study area is no more than 3.0% of that accruing from Bord na Mona operations over the next forty to fifty years it is the first time in the history of the State that such an acreage of potentially good land can be properly planned and managed in the national interest from the start.

Development of this and all emerging cutaway bog should continue by Bord na Mona alongside further research and in co-operation with all interested parties so that the best long-term plan can be devised and implemented in good time.

TABLE 1

Initial Nutrients applied to cutaway bog

76.3 Kg. N per hectare
76.3 Kg. P per hectare
152.7 Kg. K per hectare
31.0 Kg. Cu SO_4 per hectare
3.25 Kg. Co per hectare

TABLE 2

Grass Seed Mixture Used

18.25 Kg./ha.		New Zealand Perennial Ryegrass
13.63	"	Sceempter Perennial Ryegrass
4.3	"	R.V.P. Ryegrass (Italian)
1.7	"	New Zealand White Clover

TABLE 3

	pH	%		p.p.m.				
		P	K	Cu.	Mo.	Mn.	Fe.	Zn.
Pre-development 1972	4.5	1	24	.75	2.5	280	270	1.3
September 1973	7.3	9	86	3.0	2.6	300	270	1.5
September 1977	6.5	7	74	2.6	2.6	310	240	1.6

TABLE 4

Average Annual application of nutrients (Kg/ha)

N	P	K
450	75	300

TABLE 9

Employees in the sample classified by occupation, employing organisation, age and whether full time, part-time or seasonal

	Occupation (BnM and ESB combined)						Sub-group totals	
	Non-Manual	Skld. Manual	Semi-Skld.	Un-Skld.	Total		BnM	ESB
	%	%	%	%	%	No.	%	%
Employing Organisation								
Bord na Mona	13.7	21.2	38.7	26.4	100.-	292	-	-
E.S.B.	16.9	32.3	10.2	40.7	100.-	59	-	-
All workers	14.2	23.1	33.9	28.8	100.-	351	83.2	16.8
Age groups								
15 - 19	2.0	16.0	0.0	10.9	7.1	25	8.6	0.0
20 - 29	16.0	43.2	14.3	16.8	21.9	77	22.9	16.9
30 - 39	14.0	17.3	19.3	19.8	18.2	64	14.7	35.6
40 - 49	22.0	11.1	27.7	21.8	21.4	75	20.9	23.7
50 - 54	20.0	1.2	19.3	12.9	13.4	47	13.4	13.6
55 and over	26.0	11.1	19.3	17.8	17.9	63	19.5	10.2
Total	100.0	100.-	100.-	100.-	100.-	351	100.-	100.-
Full-time, part-time or seasonal								
Full time	100.-	97.5	81.5	65.3	83.2	292	80.1	98.3
Part time	0.0	1.2	3.4	3.0	2.3	8	2.4	0.0
Seasonal	0.0	1.2	15.1	31.7	14.5	51	17.5	1.7
Total(Percentage)	100.-	100.-	100.-	100.-	100.-	-	100.-	100.-
Total (Number)	50	81	119	101	-	351	292	59
Bord na Mona	40	62	113	77	-	292	-	-
E.S.B.	10	19	6	24	-	59	-	-

APPENDIX 1

DEPTH LOSS IN MILLED PEAT PRODUCTION

Representative samples from the study area were analysed to determine the average depth of peat required to produce 187 tonnes of milled peat per hectare (Bord na Mona's average annual production from 12 harvests).

The following chart is a summary of the results.

Depth Metre	Moisture Content	Density	Peat Solids per litre (grams)	Yield at 55% m.c. Tonnes/hectare/ 25 mm.
0 - 0.15	79.18	.939	145.25	110.2
0.15 - 0.30	82.28	.936	165.53	93.4
0.30 - 0.45	84.53	.949	147.08	82.7
0.45 - 0.60	86.95	.953	125.24	70.0
0.60 - 0.75	89.08	.965	105.38	59.4
0.75 - 0.91	89.13	.987	107.60	60.7
0.91 - 1.06	90.30	.992	96.20	54.3
1.06 - 1.21	89.95	.992	99.70	56.2
1.21 - 1.37	90.10	.979	97.20	54.8
1.37 - 1.52	88.95	.994	109.70	61.9
1.52 - 1.67	88.o0	1.008	114.90	64.8
1.67 - 1.82	88.80	1.013	113.50	64.0
Average	87.32	0.975	123.02	69.4

This shows that each 25 mm. of peat depth will yield 69.4 tonnes of milled peat per hectare. Thus to obtain the average output of 187 tonnes per hectare would require 68 mm. of depth in the study area. However, this is a nett figure and it is found in practice when losses etc. are taken into consideration that a depth of 76 mm. is required.

It is obvious that the lowest moisture contents and the highest yields per hectare are found in the shallow peat areas. The moisture content increases and the yield decreases as the peat becomes deeper, until the lower depths are reached which are influenced by subsoil drainage. When the results for bog moisture contents are plotted against calculated milled peat yields at 55% moisture content, the relevant regression line is shown on the graph. This enables yield from a bog area to be predicted when its mean moisture content level is known. It must be remembered that this average yield of 69.4 tonnes per hectare refers only to the area under study and is not an average for the total Board working area.

A comparison can be made here of the loss in peat depth under agriculture and horticulture in various parts of the world from the following chart.

RATE OF PEAT SUBSIDENCE UNDER CROPPING

Location	Original Depth Metre	Years in use	Subsidence mm/year
Holme Fen England	6.6	84	38
	6.6	22	110
	6.6	103	33
Everglades (grassland)	2.7	41	31
Everglades	3.3	20	71
	3.3	50	45
Michigan	-	5	42
Holland Marsh (Canada)	-	1	28
Ireland A.F.T. Lullymore (Grass)	0.50	7	21
B.N.M. Lullymore (Grass)	0.75	2	137
B.N.M. Derrygreenagh (Vegetables)	2.00	7	58
Russia	.46	46	4
	1.10	46	11
	2.10	46	25

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