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Agricultural Land Classification

Charterhouse Farm,
Woodwalton Fen, Cambs

AGRICULTURAL LAND CLASSIFICATION

LAND AT CHARTERHOUSE FARM, WOODWALTON FEN, CAMBRIDGESHIRE

1.0 INTRODUCTION

1.1 The Agricultural Land Classification provides a framework for classifying land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. The limitations can operate in one or more of four principal ways: they may affect the range of crops which can be grown, the level of yield, the consistency of yield and the cost of obtaining it. The classification system gives considerable weight to flexibility of cropping, whether actual or potential, but the ability of some land to produce consistently high yields of a somewhat narrower range of crops is also taken into account.

1.2 The principal physical factors influencing agricultural production are climate, site and soil. The main climatic factors which are taken into account are temperature and rainfall, although account is also taken of exposure, aspect and frost risk. The site factors used in the classification system are gradient, micro relief and flood risk. Soil characteristics of particular importance are texture, structure, depth and stoniness. In some situations chemical properties may also influence the long term potential of land and are taken into account.

1.3 These factors result in varying degrees of constraint on agricultural production. They can act either separately or in combination, the most important interactive limitations being soil wetness and droughtiness. The grade or subgrade of land is determined by the most limiting factor present. Five grades of land are recognised ranging from Grade 1 land of excellent quality to Grade 5 land of very poor quality. Grade 3, which constitutes about half of the agricultural land in England and Wales is divided into two subgrades designated 3a and 3b.

1.4 Details of the Agricultural Land Classification (ALC) System are contained in MAFF's Revised guidelines and criteria for grading the quality of agricultural land. Descriptions of the ALC grades and subgrades are provided in Appendix I.

2.0 BACKGROUND TO THE SITE

2.1 On the Ministry's 1:63,360 scale provisional ALC map (sheet number 134) (MAFF, 1969) the site is graded 1. For detailed site - specific appraisals however, these maps are inappropriate as they were initially surveyed at a reconnaissance level, for strategic planning purposes, and do not always show smaller areas (i.e. less than 80 hectares) of individual ALC grades.

2.2 A detailed agricultural land classification survey of this 4.3 hectare site was made during April 1989.

2.3 The site comprises one enclosure, which at the time of survey had been drilled with peas.

2.4 A total of 9 soil inspections were made on the site on a structured grid basis, superimposed on the national grid. These inspections were made using a hand held 120 centimetre Dutch soil auger and were supplemented by observations from a soil profile pit.

3. PHYSICAL FACTORS AFFECTING LAND QUALITY

Climate

3.1 Site specific climate data has been obtained by interpolating information contained in the 5km grid data set produced by the Meteorological office, (Met Office, 1989).

3.2 The annual average rainfall is approximately 583mm (23.3 inches) which is low by national standards. Soils are likely to be at field capacity for a relatively short period of approximately 104 days between early December and late March. During this time the workability of the land is not likely to be greatly impaired due to the relatively free-draining nature of the soils.

3.3 The accumulated temperature for this area is approximately 1460 degrees celsius. This parameter indicates the cumulative build up of warmth available for crop growth, and has an influence on the development of soil moisture deficits (SMD)* and susceptibility to drought; the soil moisture deficits for potatoes and wheat are 116mm and 120mm respectively. These figures are slightly higher than average for lowland England.

3.4 The site is not particularly exposed, or frost prone.

3.5 There is no single overriding climatic limitation to the agricultural use of this land. However the light textured peaty topsoils are susceptible to blowing and erosion, particularly between the months of March to June, and this may necessitate re-drilling or re-spraying in some years. Risk of erosion may be reduced by strip cropping, or by using inter-row "nurse crops" of barley or mustard.

Relief and Drainage

3.6 The site occupies fairly level land between two and three metres below ordnance datum. Although very minor surface undulations were noted, which have resulted from the removal of bog oaks, these do not constitute a limitation to use. Soils are permeable and free draining (predominantly wetness class I), and groundwater levels are controlled by a pumping station located at TL 228370, approximately half a kilometre from the site. No irrigation facilities are available on site.

* SMD represents the balance between rainfall and potential evapotranspiration occurring during the growing season. For ALC purposes the soil moisture deficits developing under a winter wheat and maincrop potato cover are considered. These 'reference' crops have been selected because they are widely grown, and in terms of their susceptibility to drought, are representative of a wide range of crops.

Geology and Soils

3.7 No detailed published geological information is available for the vicinity of the site. However, the published 1:253,440 scale geology map indicates that the site comprises of peat and alluvium overlying Jurassic Oxford Clay, (Geol. Surv. 1931)

3.8 The Soil Survey and Land Research Centre have mapped Woodwalton Fen and the surrounding area at a scale of 1:25,000, (Soil Survey 1981). This map indicates the occurrence of Adventurers and Ridley soils in the vicinity of the site. Detailed field survey observations support these general descriptions and indicate the occurrence of the Ridley (now renamed Altcar 2) soil series on site. Brief descriptions of these soil series are provided at the foot of the page.

3.9 Soils identified during fieldwork are very uniform in nature and comprise black peaty loam, or humified peat topsoils to 35cm over partly humified semi-fibrous peat subsoils which extend to 120cm. Subsoils are usually reddish black in colour and typically contain recognisable remains of sedges and woody vegetation.

3.10 At the majority of sampling locations profiles were moist below 70cm, and were occasionally wet below one metre depth. At two sampling locations the presence of Bog Oaks impeded auger penetration below 70-80cm depth. As the peat gradually wastes* these buried Bog Oaks will eventually appear in the plough layer, necessitating their removal before cultivation can proceed. Although inconvenient and sometimes costly to remove, these features do not constitute an overriding limitation to land quality.

3.11 During field survey pH readings were taken throughout the subsoil at approximately 15cm intervals. These readings indicated that subsoil pH is typically 4.5 or less from immediately below plough depth. These strongly acid conditions are formed by the oxidation of pyrite (Ferrous disulphide), which is a stable constituent of some anaerobic marine sediment (MAFF, 1983), and which is also believed to occur locally within the underlying Oxford Clay. Following drainage, air is allowed to penetrate the soil mass and the pyrite oxidises to form sulphuric acid. Low pH levels are maintained in the long term by progressive wasting of the peat, which continually taps unoxidised reserves of pyrites held at depth in the soil. (Soil Survey, 1987).

Adventurers Soil Series : Deep peat soils. Flat land. Groundwater levels often controlled by ditches and pumps, some undrained areas. Risk of wind erosion.

Altcar 2 : Deep peat soils, in part very acid. Flat land. Groundwater levels often controlled by ditches and pumps, some undrained areas. Risk of wind erosion.

* **Peat wastage** : a general term to account for loss of peat through shrinkage, wind erosion and biochemical oxidation processes.

4.0 AGRICULTURAL LAND CLASSIFICATION

4.1 Land on this site is graded 2. It is excluded from grade 1 by susceptibility to drought. This imperfection derives from the presence of strongly acid conditions within the subsoil below plough depth. Soil profile pit observations on site indicate that rooting within these acid horizons is impaired and crops are consequently unable to utilize the considerable reserves of water held at depth within the peat.

4.2 In order to fully assess the effect of the droughtiness limitation, moisture balance figures were calculated using procedures outlined in the Revised guidelines and criteria for assessing the quality of agricultural land. (MAFF, 1988).

4.3 Using this system crop adjusted available water capacity (AP)* values were calculated for the soils occurring on site, using maincrop potatoes and winter wheat as reference crops characteristic of a broad range of arable and horticultural crops. Normal crop rooting was assumed to occur to 40cm, since this is the depth to which pH levels can normally be managed by liming operations. No allowance was made for rooting in the strongly acid horizons below this depth. The resultant AP values were then offset against the crop adjusted soil moisture deficit values described in paragraph 3.3. The moisture balance figures obtained from this process were +20mm for wheat and +24mm potatoes, which is with the limits prescribed for grade 2.

4.5 Since acid conditions below depths of 40cm are not easily corrected by normal management operations, this effectively constitutes a long term and overriding limitation to land quality. Although flexibility of cropping remains fairly wide, yields are likely to be slightly depressed, particularly in the more deeply rooting crop variants.

* AP is a measure of the quantity of water held in the soil profile which can be taken up by a specified crop. The water storage capacity of soil is influenced by texture, structure, organic matter content and stone content. Where rooting is impeded for chemical or physical reasons, this is also taken into account.

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APPENDIX I

DESCRIPTION OF THE GRADES AND SUBGRADES

The ALC grades and subgrades are described below in terms of the types of limitation which can occur, typical cropping range, and the expected level and consistency of yield. In practice, the grades are defined by reference to physical characteristics and the grading guidance and cut-offs for limitation factors in Section 3 enable land to be ranked in accordance with these general descriptions. The most productive and flexible land falls into Grades 1 and 2, and Subgrade 3a land collectively comprises about one-third of the agricultural land in England and Wales. About half the land is of moderate quality in Subgrade 3b or poor quality in Grade 4. Although less significant on a national scale such land can be locally valuable to agriculture and the rural economy where poorer farmland predominates. The remainder is very poor quality land in Grade 5, which mostly occurs in the uplands.

Descriptions are also given of other land categories which may be used on ALC maps.

Grade 1 - excellent quality agricultural land

Land with no or very minor limitations to agricultural use. A very wide range of agricultural and horticultural crops can be grown and commonly includes top fruit, soft fruit, salad crops and winter harvested vegetables. Yields are high and less variable than on land of lower quality.

Grade 2 - very good quality agricultural land

Land with minor limitations which affect crop yield, cultivations or harvesting. A wide range of agricultural and horticultural crops can usually be grown but on some land in the grade there may be reduced flexibility due to difficulties with the production of the more demanding crops such as winter harvested vegetables and arable root crops. The level of yield is generally high but may be lower or more variable than Grade 1.

Grade 3 - good to moderate quality agricultural land

Land with moderate limitations which affect the choice of crops, timing and type of cultivation, harvesting or the level of yield. Where more demanding crops are grown, yields are generally lower or more variable than on land in Grades 1 and 2.

Subgrade 3a - good quality agricultural land

Land capable of consistently producing moderate to high yields of a narrow range of arable crops, especially cereals, or moderate yields of a wide range of crops including cereals, grass, oilseed rape, potatoes, sugar beet and the less demanding horticultural crops.

Subgrade 3b - moderate quality agricultural land

Land capable of producing moderate yields of a narrow range of crops, principally cereals and grass, or lower yields of a wider range of crops, or high yields of grass which can be grazed or harvested over most of the year.

Grade 4 – poor quality agricultural land

Land with severe limitations which significantly restrict the range of crops and/or level of yields. It is mainly suited to grass with occasional arable crops (eg cereals and forage crops) the yields of which are variable. In moist climates, yields of grass may be moderate to high but there may be difficulties in utilisation. The grade also includes very droughty arable land.

Grade 5 – very poor quality agricultural land

Land with very severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

Sources of Reference

MAFF (1969) 1:63,360 scale ALC Map Sheet No 134 (Provisional).

MET.OFFICE (1989) Climatological data for Agricultural Land Classification.

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MAFF (1983) The Management of Acid Fen and Marsh soils in East Anglia. Unpublished Report by Soil and Water Management Panel. Eastern Region.

MAFF (1988) Agricultural Land Classification in England and Wales. Revised guidelines and criteria for grading the quality of agricultural land.

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SOIL SURVEY (1987) Lowland Peat in England and Wales. Special Survey No. 15.