cambs 09/90 Site 1

Agricultural Land Classification

Block Fen, Mepal, Cambs

Site 1

STATEMENT OF SITE/SOIL PHYSICAL CHARACTERISTICS

BLOCK FEN, MEPAL

1.0 SITE PHYSICAL FACTORS

1.1 Details of climate, relief and drainage and geology are included in the full ALC report supplied for this site.

2.0 SOIL PHYSICAL FACTORS

2.1 Field survey observations indicate that a fairly high degree of variability exists in the terrace soils identified on site both laterally over short distances and vertically down the soil profile. For this reason only one soil type has been identified on site and this is described in detail below.

2.2 Towards the extreme east of the site, a narrow ribbon of lowlying land flanking the brook and graded 2 is comprised of peaty textures which are acid at and below 40cm. Some consideration should be given to handling this small area of contrasting soils separately.

3.0 SOIL TYPE 1

Topsoil Texture	:	sandy loam, sandy silt loam or medium clay loam
Colour	:	variable, typically 10YR 3/2 & 10YR 3/1
Stone	:	total stone is typically less than 5% topsoil volume, comprising predominantly of flints and pebbles in the size range 2mm-2cm Stonier patches (up to 25% topsoil volume) were recorded locally with a similar size distribution.

Depth	:	although a-typical topsoil depths of between 20 and 50cm were recorded in isolated locations, most topsoils were in the range 30-40cm, with 35cm emerging as the modal depth.
Structure/Porosity:		cultivation zone - not applicable.
Boundary	:	smooth, clear or abrupt lower boundary.
Roots	:	common fine and very fine roots.
Subsoil Texture	:	comprise finely bedded coarse and fine loamy soils. Typical textures include sandy loam, sandy clay loam, clay loam, although these may be interbedded with lenses of sand/loamy sand or clay/sandy clay horizons at variable depth.
Colour	:	In the range 7.5YR 4/6 to 2.5Y 3/6
Stone	:	In the range 0-70% (for ALC purposes 70% plus stones is assessed as gravel). Size distribution as topsoil.
Depth	:	variable over short distances. In the range 45-120cm, typically 70-80cm.
Structure	:	weakly developed coarse subangular blocky or massive. Friable to firm consistence.
Porosity	:	generally more than .5% biopores (>.5mm).
Boundary	:	clear, smooth to irregular lower boundary.

Roots : common to 70/80 cm; fewer 70/80cm plus, except in area of acid peaty soils, where rooting is likely to be restricted at shallow depth.

Gravel Deposit : Typically comprises of grit and fine gravel stones which appear in varying quantities in a matrix ranging from sand to clay. Less frequently deposits of stoneless sand are encountered.

Additional Information:

Wetness class

Predominantly wetness class I, smaller areas of wetness class II occur locally in more slowly permeable (clayey) subsoil variants.

Calcium carbonate

Typically non calcareous in upper horizons may become more calcareous as the gravel deposit is approached. Individual profiles may contain a thin highly calcareous marly horizon at depth.

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AGRICULTURAL LAND CLASSIFICATION

LAND AT BLOCK FEN, MEPAL

SITE 1

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 135) (MAFF, 1971) the site is graded 2. 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 show smaller areas (ie less than 80 hectares) of individual ALC grades.

2.2 A detailed agricultural land classification (ALC) survey of this 41 hectare site was made on the 14th and 15th March 1989.

2.3 The site comprises two enclosures. At the time of survey the western enclosure was under cereals, whilst the eastern enclosure, was cultivated, and due to be drilled with sugar beet.

2.4 A total of 42 soil inspections were made over the site on a 100 metre 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 Area 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 540mm (21.6 inches) which is low by national standards. Soils are likely to be at field capacity for a relatively short period of approximately 88 days between mid March and mid December. During this time the workability of the land is not likely to be greatly impaired due to the relatively free-draining nature of the gravel substrate.

3.3 The accumulated temperature for this area is approximately 1457 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 114mm and 118mm respectively. These figures are slightly higher than average for lowland England.

3.4 The site is neither particularly exposed, or frost prone.

3.5 There is no overall climatic limitation to the agricultural use of this land, although some of the soils are susceptible to drought.

Relief and Drainage

3.6 The site lies between altitudes of 1 and 2m above O.D. in a fen skirt locality. Gradients are very gentle and do not constitute a limitation to agricultural land quality. Soils on site are naturally relatively free draining and groundwater levels are controlled by a network of deep ditches and dykes which feed into a pumped drainage system, which relays water into the Hundred Foot Drain.

Geology and Soils

3.7 The published 1:50,000 scale geology map for this area (Geol Surv; 1980) indicates that the site comprises first and second terrace river gravels overlying Jurassic Ampthill Clay. Field observations support this general description and indicate that a fairly high degree of variability exists within the soils identified on site, both laterally over short distances and vertically down the soil profile. In very general terms however, profiles comprise organic sandy loam, or medium clay loam topsoils (see para 3.8) over thinly bedded coarse and fine loamy subsoils. Typically subsoils include sandy loam, sandy clay loam and loamy sand textures, although these may be interbedded with heavier clay-enriched horizons of clay and sandy clay textures between 45cm and 80cm depth. The underlying gravel deposit is usually encountered between depths of 80-100cm, although deeper and shallower soil profiles were noted intermittently.

* 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.

3.8 The Nordelph peat, which once formed a mantle over this area has now largely wasted. Successive cultivations have progressively incorporated the peat remnant into the underlying mineral soil to form an organic mineral topsoil* in most parts of the site. Laboratory analyses on a range of typical topsoil textures indicate organic matter levels are in the range 5.2% to 11.6%, with the majority of topsoils having in excess of 8.6%. These enhanced levels of organic matter effectively contribute to the water storage capacity of the soil and help offset any susceptibility to drought stress.

3.9 Profile stone is variable, ranging from slightly or very slightly stony** in many parts of the site to moderately or very stony in parts of the central and southeastern areas. Generally profiles become increasingly stony as the underlying gravel deposit is approached. The topsoil stone volumes recorded on site are not sufficient to constitute a limitation to agricultural use, although they will influence the water storage capacity of the soil, and therefore affect its susceptibility to drought.

3.10 Over the majority of the site, pH readings of 6.5 or 7.0 were recorded throughout the soil profile. In two slightly lower lying central locations however, organic loam lenses were noted beneath the topsoil one of which recorded a pH value of 4.8. This is believed to be sufficiently low to restrict plant rooting and cause a limitation to crop growth.

3.11 Soils are typically non calcareous although towards the north of the site random profiles exhibit a thin strongly calcareous marl horizon at variable depth. The underlying gravel deposit is mainly strongly calcareous.

3.12 Soil profile pit observations indicate that soils are porous and free draining (predominantly wetness class I) and are not subject to any significant wetness or workability constraints. Field observations support this assessment and indicate that moderately heavy falls of rain do not significantly delay cultivation or drilling operations.

* Defined as containing between 6% and 25% organic matter, on a sliding scale, determined by clay content

** Comprising small and very small subangular flints and rounded pebbles.

4.0 AGRICULTURAL LAND CLASSIFICATION

4.1 Land on this site is graded 1, 2 and 3a. A breakdown of ALC grades in hectares and % terms is provided below.

ALC	Hectares	Percentage
1	10.8	26.5
2	22.6	55.4
3a	7.4	18.1
Total	40.8	100.0

Note : The ALC grading in this report and on the accompanying maps relates to the long term potential of the land without irrigation.

4.2 The majority of this land is limited by droughtiness. The relative severity of this limitation was assessed using the Revised guidelines and criteria for grading agricultural land (MAFF 1989). Crop adjusted available water capacity (AP)* values were calculated for each sample profile, using maincrop potatoes and winter wheat as reference crops, characteristic of a broad range of arable and horticultural crops. These AP values were then offset against the crop adjusted soil moisture deficit values described in para 3.3 to obtain moisture balance figures for wheat and potatoes. These moisture balance figures indicate the relative degree of the droughtiness limitation and relate directly to ALC grade. A description of the type of land occurring in each grade is provided below :

4.3 **Grade 1**

Grade 1 is mapped in the centre of the site. Profiles in this area are generally only slightly or very slightly stony in the upper horizons, and comprise organic sandy loam or medium clay loam topsoils over sandy clay loam, clay loam or sandy loam subsoils which in turn overlie the gravel deposit below 80-85 cm depth. The water storage capacity of land in this grade is high. This derives in part from the enhanced organic matter content of the topsoils, and also from the relatively stonefree, well bodied and water retentive subsoils. Drought risk is consequently minimised and the land is capable of producing consistently high yields of wide range of crops.

* 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.

4.4 **Grade 2**

This surrounds grade 1, to the east and west of the site. Profiles typically have organic surface horizons but are generally slightly stonier than those in grade 1 and often contain greater depths of less water retentive sand and loamy sand texture within the subsoil. At one sample location a strongly acid organic loam horizon was noted in the subsoil. This is likely to impede root penetration, and therefore reduce the quantity of water available for crop growth. Land in this grade is limited by minor droughtiness imperfections, which are most likely to be apparent in crop establishment and during the early growth period. Although this will not affect the range of crops grown, it will be likely to depress yields slightly in all but the wettest seasons.

4.5 **Grade 3a**

This is mapped in the south east corner of the site. Soils in this area are stonier than those occurring to the north and west and do not have organic surface horizons. Taken together these factors effectively reduce the water storage capacity of the soil and cause the land to be subject to moderate droughtiness imperfections. Flexibility of cropping remains high, but yields are generally lower, and also likely to be more variable than in land graded 2.

4.6 Although individual profiles of better and/or poorer grades were noted within each mapping unit, they occurred too randomly or inextensively to permit separate delineation at the scale shown.

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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 (1971) 1:63,360 scale ALC Map Sheet No 135 (Provisional).

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

GEOL.SURV. (1980) 1:50,000 scale solid & drift edition geology map, sheet number 173. (Ely)

MAFF (1989) Agricultural Land Classification in England and Wales. Revised guidelines and criteria for grading the quality of agricultural land.