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HEATH FARM, DESFORD

Agricultural Land Classification and Soil Physical Characteristics Report
January 1997

Resource Planning Team
Eastern Statutory Group
ADAS Cambridge

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AGRICULTURAL LAND CLASSIFICATION AND SOIL PHYSICAL CHARACTERISTICS REPORT

HEATH FARM, DESFORD, LEICESTERSHIRE

Introduction

1. This report presents the findings of a detailed Agricultural Land Classification (ALC) and soil physical characteristic survey of 32.7 ha of land at Heath Farm, Desford. The survey was carried out during January 1997.

2. The survey was commissioned by the Ministry of Agriculture, Fisheries and Food (MAFF) Land Use Planning Unit, Cambridge in connection with an application for a proposed extension to an adjacent brickwork's. This survey supersedes previous ALC surveys on this land.

3. The work was conducted by members of the Resource Planning Team in the Eastern Statutory Group in ADAS. The land has been graded in accordance with the published MAFF ALC guidelines and criteria (MAFF, 1988). A description of the ALC grades and subgrades is given in Appendix I.

4. At the time of survey the land use on the site was largely under oil seed rape, with a small field of permanent grassland to the north of Heath Farm. Heath Farm and associated buildings have been mapped as other land together with a small area along the southern boundary which is used for storing manure.

Summary

5. The findings of the survey are shown on the enclosed ALC map. The map has been drawn at a scale of 1:10 000 it is accurate at this scale but any enlargement would be misleading.

6. The area and proportions of the ALC grades and subgrades on the surveyed land are summarised in Table 1.

Table 1: Areas of grades and other land

Grade/Other land	Area (hectares)	% surveyed
3a	15.5	47.4
3b	16.2	49.5
Other land	1.0	3.1
Total agricultural land	31.7	96.9
Total survey area	32.7	100

7. The fieldwork was conducted at an average density of one boring per hectare. A total of 35 borings and 4 soil pits were described to assess subsoil conditions.

8. The land has been graded in almost equal proportions, a mix of subgrades 3a and 3b. Subgrade 3a, good quality agricultural land, is mapped on the highest land along Heath Road and on the lower land in the east of the site. Subgrade 3b, moderate quality agricultural land, is mapped in the north of the site and typically occurs on the upper slopes. The main limitation on the site is one of wetness and workability, the severity of which is dependant on the depth to the underlying slowly permeable clay. A small area along Heath Road contains coarse and fine loamy soils which suffer from a moderate droughtiness limitation which restricts the land to subgrade 3a. Occasionally topsoil stone content also restricts this land to this grade. Another small area on the south eastern side of the valley in the centre of the site is limited to subgrade 3b due to gradients in excess of 7°.

Factors Influencing ALC Grade

Climate

9. Climate affects the grading of land through the assessment of an overall climatic limitation and also through interactions with soil characteristics.

10. The key climatic variables used for grading this site are given in Table 2 and were obtained from the published 5 km grid datasets using the standard interpolation procedures (Met. Office, 1989).

Table 2: Climatic and altitude data

Parameter	Value	Value
Grid reference	SK465 062	SK463 059
Altitude (m, AOD)	122	137
Accumulated Temperature (day °C, Jan.–June)	1332	1315
Average Annual Rainfall (mm)	697	700
Field Capacity Days	161	162
Moisture Deficit, Wheat (mm)	96	94
Moisture Deficit, Potatoes (mm)	84	82
Overall Climatic Grade	1	2

11. The climatic criteria are considered first when classifying land, as climate can be overriding in the sense that severe limitations will restrict land to low grades irrespective of favourable site or soil conditions.

12. The main parameters used in the assessment of an overall climatic limitation are average annual rainfall (AAR), as a measure of overall wetness, and accumulated temperature (AT0, January to June), as a measure of the relative warmth of a locality.

13. The combination of rainfall and temperature at this site mean that the site straddles the Grade 1 and 2 climatic limitation boundary, with the higher land in the south west having a slight climatic limitation restricting the land in this area to Grade 2.

Site

14. The site occupies a north east facing valley side, with the highest land of 138m AOD occurring along the south western edge of the site. The minimum altitude of 112m AOD occurs along the north eastern edge of the site. Slopes are typically not a limiting factor, but there is a small area along the southern flank of the dry valley where slopes of 7½° were measured using a hand held clinometer. This limits this small area of land to subgrade 3b.

Geology and soils

15. The published 1:50 000 scale solid and drift edition geology map shows the whole site to be underlain by Triassic Mercia Mudstone and this is exposed in the northern part of the site. Elsewhere this is covered by glacial sand and gravel on the highest land in the north west and south west. On the midslopes and in particular in the south of the site glacial boulder clay has been mapped covering the underlying Mercia Mudstone.

16. There is no detailed soil map of this area but the 1:250 000 reconnaissance scale soils map (SSEW, 1983) shows the whole area to be mapped as Whimple 3 association soils. These are briefly described as reddish fine loamy or fine silty over clayey soils with slowly permeable subsoils and slight seasonal waterlogging. Some similar clayey soils are found on brows. Slowly permeable seasonally waterlogged fine loamy and fine silty over clayey soils are found on some lower slopes. During the detailed survey three different soil types have been identified.

Soil type I

17. Soil type I is mapped largely on the lower slopes of the site and covers approximately one third of the area. Soil profiles typically comprise a non calcareous, very slightly stony medium clay loam (occasionally medium sandy silt loam) topsoil. This overlies an upper subsoil which comprises typically heavy clay loam, occasionally medium or sandy clay loam which is non calcareous and very slightly stony. This horizon typically extends to 45/55 cm below the surface but is occasionally deeper. This in turn typically overlies a dense red clay which is slowly permeable. These profiles have been assessed as Wetness Class III (see Appendix III for definitions).

Soil type II

18. This soil type covers approximately half the site and is mapped over most of the higher land in the south western half of the area. Profiles typically comprise medium clay loam, (occasionally heavy clay loam or clay) topsoils which are non calcareous and very slightly stony. Upper subsoils typically comprise dense slowly permeable red clay and these are encountered directly below the topsoil. In some instances there is a narrow upper subsoil horizon of sandy clay loam or heavy clay loam, with the slowly permeable clay still encountered within 40 cm of the surface. In the extreme west of the site the upper subsoil horizon of clay is less dense and contains some weathered material, with the slowly permeable

red clay being encountered at 55/60 cm. In general, profiles have been assessed as Wetness Class IV with the latter profiles assessed as Wetness Class III.

Soil type III

19. This soil type occupies a small area along the south western edge of the site and contains soils of a lighter texture. Topsoils typically comprise non calcareous slightly stony (>11% hard stones >2 cm) medium sandy loam over similar or slightly lighter textured upper subsoils. Lower subsoils are mixed and comprise clay with lenses of sandier material. The depth to the lower subsoil horizon ranges from 50/90 cm. These profiles have been assessed as Wetness Class I.

Agricultural Land Classification

20. The details of the classification of the site are shown on the attached ALC map and the area statistics of each grade are given in Table 1, page 1.

21. The location of the auger borings and pits is shown on the attached sample location map and the details of the soils data are presented in Appendix III.

Subgrade 3a

22. Subgrade 3a land is mapped in conjunction with soil types I and III described above in paragraphs 17 and 19 respectively. Soil type I has been assessed as Wetness Class III as the depth to the dense red clay which is slowly permeable typically occurs between 45/55 cm. In combination with the fine loamy topsoil textures this limits the land to this grade due to wetness and workability constraints.

23. The land associated with soil type III has also been graded 3a. Soils are limited by topsoil stone in some instances, with up to 11% hard stones >2 cm. The main effect of stones are to act as an impediment to cultivation, harvesting and crop growth and to cause a reduction in the available water capacity of the soil. This land is also limited by a moderate droughtiness where there are deep coarse loamy or medium sandy subsoils. The combination of textures, profile stone content and climate result in the land being excluded from any higher grade. Where heavier textured subsoils occur land is of a better agricultural quality but these areas are too small to delineate separately.

Subgrade 3b

24. The land associated with soil type II and a small area of land with gradients in excess of 7° have been graded 3b. Typically these soils have dense red clay within 40 cm of the surface resulting in a moderately severe drainage problem. These profiles have been assessed as Wetness Class IV and in combination with topsoil textures result in the land having a reduced flexibility for cropping due to fewer days when the soil is in a suitable condition for cultivation. Thus this land is excluded from any higher grade.

25. In a small area on the southern side of the dry valley in the centre of the site, slopes exceed 7° which affects the safe and efficient use of agricultural machinery which restricts the land to subgrade 3b.

Soil resources

26. Three soil types have been identified within the site and their distribution is shown on the accompanying soil resource map which is illustrative of the soil resources available for restoration purposes. This is not a soil stripping map for the site. The thickness and volumes given in Table 3 below should be treated with some caution due to the variability of the soils.

Table 3. Soil Resources

		Area (ha)	Thickness (cm)	Volume(m^3)
Soil Type I				
	Topsoil	12.7	30	38100
	Upper subsoil	12.7	20	25400
	Lower subsoil	12.7	70	88900
Soil Type II				
	Topsoil	17.3	30	51900
	Upper subsoil	17.3	90	155700
Soil type III	Topsoil	1.7	30	5100
	Upper subsoil	1.7	55	9350
	Lower subsoil	1.7	35	5950

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SOURCES OF REFERENCE

British Geological Survey (1992) *Sheet No. 140, Leicester and Coventry* BGS: London.

Ministry of Agriculture, Fisheries and Food (1988) *Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land.* MAFF: London.

Met. Office (1989) *Climatological Data for Agricultural Land Classification.* Met. Office: Bracknell.

Soil Survey of England and Wales (1983) *Sheet 3, Soils of England and Wales, Midland and Western England.* SSEW: Harpenden.

Soil Survey of England and Wales (1984) *Soils and their Use in Midland and Western England* SSEW: Harpenden

APPENDIX I

DESCRIPTIONS OF THE GRADES AND SUBGRADES

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 or horticultural crops can usually be grown but on some land of this 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 land.

Grade 3: Good to Moderate Quality Land

Land with moderate limitations which affect the choice of crops, the timing and type of cultivation, harvesting or the level of yield. When 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 the level of yields. It is mainly suited to grass with occasional arable crops (e.g. 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 severe limitations which restrict use to permanent pasture or rough grazing, except for occasional pioneer forage crops.

APPENDIX II

SOIL WETNESS CLASSIFICATION

Definitions of Soil Wetness Classes

Soil wetness is classified according to the depth and duration of waterlogging in the soil profile. Six soil wetness classes are identified and are defined in the table below.

Wetness Class	Duration of waterlogging[1]
I	The soil profile is not wet within 70 cm depth for more than 30 days in most years.[2]
II	The soil profile is wet within 70 cm depth for 31-90 days in most years **or**, if there is no slowly permeable layer within 80 cm depth, it is wet within 70 cm for more than 90 days, but only wet within 40 cm depth for 30 days in most years.
III	The soil profile is wet within 70 cm depth for 91-180 days in most years **or**, if there is no slowly permeable layer present within 80 cm depth, it is wet within 70 cm for more than 180 days, but only wet within 40 cm depth for between 31-90 days in most years.
IV	The soil profile is wet within 70 cm depth for more than 180 days but not wet within 40 cm depth for more than 210 days in most years **or**, if there is no slowly permeable layer present within 80 cm depth, it is wet within 40 cm depth for 91-210 days in most years.
V	The soil profile is wet within 40 cm depth for 211-335 days in most years.
VI	The soil profile is wet within 40 cm depth for more than 335 days in most years.

Assessment of Wetness Class

Soils have been allocated to wetness classes by the interpretation of soil profile characteristics and climatic factors using the methodology described in *Agricultural Land Classification of England and Wales: Revised guidelines and criteria for grading the quality of agricultural land* (MAFF, 1988).

[1] The number of days is not necessarily a continuous period.

[2] 'In most years' is defined as more than 10 out of 20 years.

APPENDIX III

STATEMENT OF SOIL PHYSICAL CHARACTERISTICS

SOIL TYPE I

Topsoil	Texture:	:	medium clay loam (occasionally medium sandy silt loam
	Colour:	:	7.5YR4/3, occasionally 7.5YR4/2
	Stone	:	typically 2-4% hard stones
	Roots	:	many fine and very fine
	$CaCO^3$	:	none
	Depth	:	30 cm
	Boundary	:	sharp, smooth
Upper subsoil	Texture	:	typically heavy clay loam, occasionally sandy clay loam or medium clay loam
	Colour	:	7.5YR4/4, 5/4, 5/6
	Mottles	:	none
	Concretions	:	few manganese
	Stone	:	2-3% hard stones
	Structure	:	moderately developed coarse and very coarse sub-angular blocky
	Consistence	:	friable/firm
	Structural condition	:	moderate
	Pores	:	<0.5%
	Roots	:	common fine and very fine
	$CaCO^3$	:	none
	Depth	:	typically 45/55 cm occasionally to 70 cm
	Boundary	:	clear, wavy
Lower subsoil	Texture	:	clay
	Colour	:	5YR5/4
	Mottles	:	difficult to see but 5YR5/6 noted in pit
	Concretions	:	common
	Stone	:	1-3% hard stones
	Structure	:	moderately developed coarse and very coarse angular blocky
	Consistence	:	firm
	Structural condition	:	poor
	Pores	:	<0.5%
	Roots	:	common becoming few
	$CaCO^3$	:	none
	Depth	:	120 cm
	Comments	:	clay very dense assessed as Wetness Class III 2.5YR 7/2 specs common in clay

SOIL TYPE II

Topsoil	Texture:	:	medium clay loam, occasionally sandy clay loam, heavy clay loam or clay
	Colour:	:	7.5YR4/2 and 4/3
	Stone	:	2-5% hard stones
	Roots	:	common fine and very fine
	$CaCO^3$	:	none
	Depth	:	30 cm
	Boundary	:	abrupt, smooth
Subsoil	Texture	:	clay
	Colour	:	5YR4/4, 2.5YR4/4 and 5/4, ped faces 2.5YR4/3, 5/3
	Mottles	:	not visible - strong matrix colour
	Concretions	:	common/many manganese concretions
	Stone	:	stoneless- 3% hard stone
	Structure	:	moderately developed coarse prismatic
	Consistence	:	firm
	Structural condition	:	poor
	Pores	:	<0.5%
	Roots	:	common fine and very fine
	$CaCO^3$	:	none
	Depth	:	120 cm
Comments		:	assessed as Wetness Class IV, occ III
			grey streaks in subsoil
			red clay dense
			very occasionally narrow upper subsoil horizon of heavy or sandy clay loam

SOIL TYPE III

Topsoil	Texture:	:	medium sandy loam
	Colour:	:	10YR4/2, 7.5YR4/3
	Stone	:	total>15%, >2 cm >11%
	Roots	:	many fine and very fine
	$CaCO^3$	:	none
	Depth	:	30 cm
	Boundary	:	abrupt, smooth

Upper subsoil	Texture	:	medium sandy loam or loamy medium sand
	Colour	:	7.5YR 5/4, 10YR5/4 and 6/4
	Mottles	:	none
	Concretions	:	none
	Stone	:	15% hard stones
	Structure	:	weakly developed coarse subangular blocky
	Consistence	:	very friable
	Structural condition	:	moderate
	Pores	:	<0.5%
	Roots	:	Many very fine roots
	$CaCO^3$	:	none
	Depth	:	50/90 cm, typically 50/60 cm
	Boundary	:	abrupt, irregular
Lower subsoil	Texture	:	variable, clay with sand lenses in varying proportions
	Colour	:	2.5YR3/4, 5YR 4/6, 5YR3/4 and 5/4
	Mottles	:	none seen
	Concretions	:	few
	Stone	:	15-20%small stones
	Structure	:	weakly developed coarse subangular blocky in clay and moderately developed coarse angular blocky in lighter textured patches
	Consistence	:	overall, firm
	Structural condition	:	moderate
	Pores	:	<0.5%
	Roots	:	few very fine
	$CaCO^3$	:	none
	Depth	:	120 cm
	Comments	:	lower subsoil very variable assessed as wetness class I