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Pinvin
Agricultural Land Classification
November 1998

Resource Planning Team
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PINVIN
AGRICULTURAL LAND CLASSIFICATION SURVEY

CONTENTS

	Page
INTRODUCTION	1
SUMMARY	1
CLIMATE	2
RELIEF	3
GEOLOGY AND SOILS	3
AGRICULTURAL LAND CLASSIFICATION AND MAP	3
REFERENCES	5
APPENDIX I Description of the Grades and Subgrades	6
APPENDIX II Definition of Soil Wetness Classes	8
APPENDIX III Survey Data	9
	Sample Point Location Map
	Pit Descriptions
	Boring Profile Data
	Boring Horizon Data
	Abbreviations and Terms used in Survey Data

PINVIN

AGRICULTURAL LAND CLASSIFICATION SURVEY

INTRODUCTION

- 1 This report presents the findings of a semi detailed Agricultural Land Classification (ALC) survey of 168.6 ha of land at Pinvin Pershore. Field survey was based on 64 auger borings and 4 soil profile pits and was completed in October 1998.
- 2 The survey was conducted by the Resource Planning Team of FRCA Western Region on behalf of MAFF in its statutory role in the preparation of the Worcestershire Structure Plan.
- 3 Information on climate, geology and soils and from previous ALC surveys was considered and is presented in the relevant section. Apart from the published regional ALC map (MAFF 1977) which shows the site at a reconnaissance scale as Grade 3 in the north and Grade 2 in the south, the site had not been surveyed previously. However, the current survey uses the Revised Guidelines and Criteria for grading the quality of agricultural land (MAFF 1988) and supersedes any previous ALC survey. Grade descriptions are summarised in Appendix I.
- 4 At the time of survey, land cover was under cereal, oil seed rape, permanent and ley pasture, horticulture and some recently ploughed fields. An area of 15.7 ha of agricultural land within the survey area was not surveyed because access could not be obtained. Other land which was not surveyed included residential and farm buildings, highways and tracks, school buildings and sports ground and a nursery.

SUMMARY

- 5 The distribution of ALC grades is shown on the accompanying 1:25000 scale ALC map. The detail of information shown at this scale is appropriate to the intensity of field survey but could be misleading if enlarged or applied to small areas. Areas are summarised in the Table 1.

Table 1 Distribution of ALC grades [Pinvin]

Grade	Area (ha)	% Surveyed Area (135.6 ha)
2	31.7	23.4
3a	11.1	2
3b	77.1	56.8
Agricultural land not surveyed	15.7	11.6
Other land	<u>33.0</u>	
Total site area	168.6	<u>100.0</u>

moderately well drained sandy clay loam soils that have both minor soil wetness and soil droughtiness limitations. To the east of Pinvin the Grade 2 soils are sandier and well drained but suffer from a minor soil drought limitation. The Subgrade 3a soils in the south east of the site are heavier and have a moderate wetness limitation. The remainder of the site is mapped as Subgrade 3b here the heavy soils developed in the Lias clays are limited by significant soil wetness.

CLIMATE

- 7 Estimates of climatic variables for this site were derived from the published agricultural climate dataset Climatological Data for Agricultural Land Classification (Meteorological Office 1989) using standard interpolation procedures. Data for key points around the site are given in Table 2 below.
- 8 Since the ALC grade of land is determined by the most limiting factor present overall climate is considered first because it can have an overriding influence by restricting land to a lower grade despite more favourable site and soil conditions. Parameters used for assessing overall climate are accumulated temperature a measure of relative warmth and average annual rainfall a measure of overall wetness. The results shown in Table 2 indicate that there is no overall climatic limitation.
- 9 Climatic variables also affect ALC grade through interactions with soil conditions. The most important interactive variables are Field Capacity Days (FCD) which are used in assessing soil wetness and potential Moisture Deficits calculated for wheat and potatoes which are compared with the moisture available in each profile in assessing soil droughtiness limitations. These are described in later sections.

Table 2 Climatic Interpolations Pinvin

Grid Reference	SO 950 486
Altitude (m)	30
Accumulated Temperature (day °C)	1473
Average Annual Rainfall (mm)	604
Overall Climatic Grade	1
Field Capacity Days	127
Moisture deficit (mm) Wheat	113
Potatoes	107

RELIEF

- 10 Altitude ranges from 20 metres along the eastern side of the site to 35 metres on the western boundary with generally level ground

GEOLOGY AND SOILS

- 11 The underlying geology of the site is shown on the published geology map (BGS 1974 and 1993) as Jurassic Lias Clay with River Terrace Gravels running across the centre of the site. In the recent survey parent materials were found to be largely clay in the north and south of the site and stonier and lighter in the centre of the site particularly around Home Farm
- 12 Soils were mapped by the Soil Survey of England and Wales at a reconnaissance scale of 1:250 000 (SSEW 1983) as the Evesham 2 soil Association across the north of the site and south of Capen View and the remainder of the site as the Bishampton 2 Soil Association. More detailed information is also available in the 1:50000 scale survey of Worcester and the Malverns District (SSEW 1986)
- 13 The Bishampton 2 Soil Association is described as having deep fine loamy soils with slowly permeable subsoils and slight seasonal waterlogging. The soils of the Evesham 2 Association are described as being slowly permeable calcareous clayey soils but also associated with non calcareous clayey and fine loamy or fine silty over clayey soils
- 14 In the recent survey the soils were found to be clayey and slowly permeable across the majority of the site and sandier with a higher stone content across the centre of the site closely following the published soils distribution. None of the soils were found to have calcareous topsoils

AGRICULTURAL LAND CLASSIFICATION

- 15 The distribution of ALC grades found by the current survey is shown on the accompanying 1:25000 scale map and areas are summarised in Table 1. The detail of

information shown at this scale is appropriate to the intensity of field survey but could be misleading if enlarged or applied to small areas

16 Grade 2

An area of Grade 2 very good quality soils has been mapped across the centre of the site. These soils fall into two distinct textural profiles limited by soil wetness and/or soil droughtiness. West of the Upton Snodsbury Road the soils have been described as having sandy clay loam topsoil textures which overlie mottled sandy clay loam subsoils and clay to depth. The soils include very little stone although they were found to be slightly droughty. A soil profile pit confirmed that the gleyed lower subsoil was slowly permeable placing the soils into Wetness Class II (see Appendix 2) and Grade 2. To the east of Upton Snodsbury Road the soils are much lighter in texture the medium sandy loam topsoils pass onto sandy loam subsoils to depth. A profile pit dug in this area identified moderately stony subsoil horizons which together with the lighter soil textures restricted the available water and imposed a minor droughtiness limitation.

17 Subgrade 3a

A small area of Subgrade 3a, good quality soils has been mapped in the south east of the site east of the sports ground allotments and Abbey View. Here soils were described as having sandy clay loam topsoils overlying gleyed sandy clay or clay subsoils to depth. The subsoils similar to those described for the Subgrade 3b mapping units were assessed as slowly permeable and Wetness Class III with a sandy clay loam topsoil this places the soils into Subgrade 3a.

Subgrade 3b

Three blocks of land have been mapped as Subgrade 3b moderate quality agricultural land. The soils typically have heavy clay loam and clay topsoil textures which overlie a grey gleyed clay to depth. Two soil profile pits identified these clay subsoils as slowly permeable and the soils were assessed as Wetness Class III. This together with the heavy topsoils which were not calcareous restricts this land to Subgrade 3b.

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FRCA Worcester
November 1998

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Malverns district 1 50000 SSEW Harpenden

APPENDIX I

DESCRIPTION OF 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 include 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 most 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

Source MAFF (1988) Agricultural Land Classification of England and Wales Revised Guidelines and Criteria for Grading the Quality of Agricultural Land MAFF Publications Alnwick

APPENDIX II

DEFINITION OF SOIL WETNESS CLASSES

Soil wetness is classified according to the depth and duration of waterlogging in the soil profile

Wetness Class I

The soil profile is not wet within 70 cm depth for more than 30 days in most years

Wetness Class 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 not wet within 40 cm depth for more than 30 days in most years

Wetness Class 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 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 and 90 days in most years

Wetness Class IV

The soil profile is wet within 70 cm depth for more than 180 days but not within 40 cm depth for more than 210 days in most years or if there is no slowly permeable layer within 80 cm depth, it is wet within 40 cm depth for 91-210 days in most years

Wetness Class V

The soil profile is wet within 40 cm depth for 211-335 days in most years

Wetness Class VI

The soil profile is wet within 40 cm depth for more than 335 days in most years

Notes The number of days specified is not necessarily a continuous period

In most years is defined as more than 10 out of 20 years

Source Hodgson J M (Ed) (1997) Soil Survey Field Handbook Soil Survey Technical Monograph No 5 Silsoe

APPENDIX III

ABBREVIATIONS AND TERMS USED IN SURVEY DATA

Soil pit and auger boring information collected during ALC survey is held on a computer database and is reproduced in this report. Terms used and abbreviations are set out below. These conform to definitions contained in the Soil Survey Field Handbook (Hodgson, 1997)

1 Terms used on computer database in order of occurrence

GRID REF National 100 km grid square and 8 figure grid reference

LAND USE At the time of survey

WHT	Wheat	SBT	Sugar Beet	HTH	Heathland
BAR	Barley	BRA	Brassicas	BOG	Bog or Marsh
OAT	Oats	FCD	Fodder Crops	DCW	Deciduous Wood
CER	Cereals	FRT	Soft and Top Fruit	CFW	Coniferous Woodland
MZE	Maize	HRT	Horticultural Crops	PLO	Ploughed
OSR	Oilseed Rape	LEY	Ley Grass	FLW	Fallow (inc Set aside)
POT	Potatoes	PGR	Permanent Pasture	SAS	Set Aside (where known)
LIN	Linseed	RGR	Rough Grazing	OTH	Other
BEN	Field Beans	SCR	Scrub		

GRDNT Gradient as estimated or measured by hand held optical clinometer

GLEYSPL Depth in centimetres to gleying or slowly permeable layer

AP (WHEAT/POTS) Crop adjusted available water capacity

MB (WHEAT/POTS) Moisture Balance (Crop adjusted AP - crop potential MD)

DRT Best grade according to soil droughtiness

If any of the following factors are considered significant Y will be entered in the relevant column

MREL	Microrelief limitation	FLOOD	Flood risk	EROSN	Soil erosion risk
EXP	Exposure limitation	FROST	Frost prone	DIST	Disturbed land
CHEM	Chemical limitation				

LIMIT The main limitation to land quality. The following abbreviations are used

OC	Overall Climate	AE	Aspect	EX	Exposure
FR	Frost Risk	GR	Gradient	MR	Microrelief
FL	Flood Risk	TX	Topsoil Texture	DP	Soil Depth

CH	Chemical	WE	Wetness	WK	Workability
DR	Drought	ER	Erosion Risk	WD	Soil Wetness/Droughtiness
ST	Topsoil Stoniness				

TEXTURE Soil texture classes are denoted by the following abbreviations

S	Sand	LS	Loamy Sand	SL	Sandy Loam
SZL	Sandy Silt Loam	CL	Clay Loam	ZCL	Silty Clay Loam
ZL	Silt Loam	SCL	Sandy Clay Loam	C	Clay
SC	Sandy clay	ZC	Silty clay	OL	Organic Loam
P	Peat	SP	Sandy Peat	LP	Loamy Peat
PL	Peaty Loam	PS	Peaty Sand	MZ	Marine Light Silts

For the sand loamy sand sandy loam and sandy silt loam classes the predominant size of sand fraction will be indicated by the use of the following prefixes

F	Fine (more than 66% of the sand less than 0.2mm)
M	Medium (less than 66% fine sand and less than 33% coarse sand)
C	Coarse (more than 33% of the sand larger than 0.6mm)

The clay loam and silty clay loam classes will be sub divided according to the clay content **M** Medium (< 27% clay) **H** heavy (27 - 35% clay)

MOTTLE COL Mottle colour using Munsell notation

MOTTLE ABUN Mottle abundance expressed as a percentage of the matrix or surface described

F few <2% **C** common 2 - 20% **M** many 20 - 40% **VM** very many 40%+

MOTTLE CONT Mottle contrast

F	faint indistinct mottles evident only on close inspection
D	distinct mottles are readily seen
P	Prominent mottling is conspicuous and one of the outstanding features of the horizon

PED COL Ped face colour using Munsell notation

GLEYS If the soil horizon is gleyed a **Y** will appear in this column If slightly gleyed an **S** will appear

STONE LITH Stone Lithology One of the following is used

HR	All hard rocks and stones	SLST	Soft oolitic or dolimitic limestone
CH	Chalk	FSST	Soft fine grained sandstone
ZR	Soft argillaceous or silty rocks	GH	Gravel with non porous (hard) stones
MSST	Soft medium grained sandstone	GS	Gravel with porous (soft) stones

SI Soft weathered igneous or metamorphic rock

Stone contents are given in % by volume for sizes >2cm, >6cm and total stone >2mm

STRUCT The degree of development size and shape of soil peds are described using the following notation

<u>Degree of development</u>	WA Weakly developed Adherent	WK Weakly developed
	MD Moderately developed	ST Strongly developed
<u>Ped size</u>	F Fine	M Medium
	C Coarse	VC Very coarse
<u>Ped Shape</u>	S Single grain	M Massive
	GR Granular	AB Angular blocky
	SAB Sub angular blocky	PR Prismatic
	PL Platy	

CONSIST Soil consistence is described using the following notation

L Loose	VF Very Friable	FR Friable	FM Firm
VM Very firm	EM Extremely firm	EH Extremely Hard	

SUBS STR Subsoil structural condition recorded for the purpose of calculating profile droughtiness **G** Good **M** Moderate **P** Poor

POR Soil porosity If a soil horizon has poor porosity with less than 0.5% biopores >0.5mm a **Y** will appear in this column

IMP If the profile is impenetrable to rooting a **Y** will appear in this column at the appropriate horizon

SPL Slowly permeable layer If the soil horizon is slowly permeable a **Y** will appear in this column

CALC If the soil horizon is calcareous with naturally occurring calcium carbonate exceeding 1% a **Y** will appear this column

2 Additional terms and abbreviations used mainly in soil pit descriptions

STONE ASSESSMENT

VIS Visual **S** Sieve **D** Displacement

MOTTLE SIZE

EF	Extremely fine <1mm	M	Medium 5-15mm
VF	Very fine 1-2mm	C	Coarse >15mm
F	Fine 2-5mm		

MOTTLE COLOUR May be described by Munsell notation or as ochreous (OM) or grey (GM)

ROOT CHANNELS In topsoil the presence of rusty root channels should also be noted

MANGANESE CONCRETIONS Assessed by volume

N	None	M	Many	20-40%
F	Few <2%	VM	Very Many	>40%
C	Common 2-20%			

POROSITY

P	Poor	less than 0.5% biopores at least 0.5mm in diameter
G	Good	more than 0.5% biopores at least 0.5mm in diameter

ROOT ABUNDANCE

The number of roots per 100cm ²		Very Fine and Fine	Medium and Coarse
F	Few	1-10	1 or 2
C	Common	10-25	2-5
M	Many	25-200	>5
A	Abundant	>200	

ROOT SIZE

VF	Very fine	<1mm	M	Medium	2-5mm
F	Fine	1-2mm	C	Coarse	>5mm

HORIZON BOUNDARY DISTINCTNESS

Sharp	<0.5cm	Gradual	6-13cm
Abrupt	0.5-2.5cm	Diffuse	>13cm
Clear	2.5-6cm		

HORIZON BOUNDARY FORM Smooth wavy irregular or broken *

* See Soil Survey Field Handbook (Hodgson 1997) for details

SITE NAME		PROFILE NO	SLOPE AND ASPECT	LAND USE	Av Rainfall	604mm	PARENT MATERIAL	
Pinvin		PIT1 (ASP26)	2 N	OSR	ATO	1473 day C	Lower Lias	
JOB NO		DATE	GRID REFERENCE	DESCRIBED BY	FC Days	127	PSD SAMPLES TAKEN	
80/98		6/10/98	SO 9510 4920	SYH/GN	Climatic Grade	1	None	
					Exposure Grade			

Horizon No	Lowest Av Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness Size Type and Field Method	Mottling Abundance Contrast Size and Colour	Mangan Concs	Structure Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots Abundance and Size	Calcium Carbonate Content	Horizon Boundary Distinctness and form
1	25	C	25Y4/2	1% HR	None	None					CF+VF	None	Smooth abrupt
2	60+ dug to 60cm	C	25Y5/2 5/3 (25Y4/3) with depth colour changes to 5Y5/1 5/2 (5Y6/2)	None	mfd 10YR5/6 mfd 10YR5/6	few becoming more with depth Many	MDCPR breaking to CAB MD CPR breaking to CAB	VM VM		Low Low	FVF FVF along ped faces		

Profile Gleyed From	25cm	Available Water	Wheat	mm	Final ALC Grade	3b
Slowly Permeable Horizon From	25		Potatoes	mm	Main Limiting Factor(s)	WE
Wetness Class	III	Moisture Deficit	Wheat	mm		
Wetness Grade	3b		Potatoes	mm		
		Moisture Balance	Wheat	mm	Remarks	H2 Structure is initially C prismatic but easily breaks to CAB
			Potatoes	mm		
		Droughtiness Grade		(Calculated to cm)		

SITE NAME		PROFILE NO	SLOPE AND ASPECT		LAND USE		Av Rainfall		604 mm		PARENT MATERIAL		
PINVIN		PIT2 (ASP59)	1 S		CER		ATO		1473day C		River Gravels / Lower Lias		
JOB NO		DATE	GRID REFERENCE		DESCRIBED BY		FC Days		127		PSD SAMPLES TAKEN		
80/98		8/10/98	SO 9493 4878		SYH/GN		Climatic Grade		1		None		
							Exposure Grade						

Horizon No	Lowest Av Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness Size Type and Field Method	Mottling Abundance Contrast Size and Colour	Mangan Concs	Structure Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots Abundance and Size	Calcium Carbonate Content	Horizon Boundary Distinctness and form
1	27	HCL	10YR32	2%	None	None					F F+VF		Wavy abrupt
2	62	SC	10YR53	Isolated channel filled stones	mfd 75YR56	Many	MD CP	VM		Poor	F VF		Smooth/ clear
3	80	C	05Y52	No e	mfd 75YR56	C	[MD CP at top of C] MD CAB	VM		Poor	F VF		

Profile Gleyed From	27	Available Water	Wheat	mm	Final ALC Grade	3b
Slowly Permeable Horizon From	27		Potatoes	mm	Main Limiting Factor(s)	WE
Wetness Class	III	Moisture Deficit	Wheat	mm		
Wetness Grade	3b		Potatoes	mm		
		Moisture Balance	Wheat	mm		
			Potatoes	mm		
		Droughtiness Grade		(Calculated to cm)	Remarks	

SITE NAME		PROFILE NO	SLOPE AND ASPECT	LAND USE	Av Rainfall	604 mm	PARENT MATERIAL					
Pinvn		PIT 3 (ASP50)	Level	Cabbages	ATO	1473day C	River Gravels					
JOB NO		DATE	GRID REFERENCE	DESCRIBED BY	FC Days	127	PSD SAMPLES TAKEN					
80/98		8/10/98	SO 9522 4892	SYH/GN	Climatic Grade	1	None					
					Exposure Grade							

Horizon No	Lowest Av Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness Size Type and Field Method	Mottling Abundance Contrast Size and Colour	Mangan Concs	Structure Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots Abundance and Size	Calcium Carbonate Content	Horizon Boundary Distinctness and form
1	32	SCL	10YR3/1	1% HR	None	None					MF+VF		Wavy abrupt
2	48	SCL	10YR4/3	1% HR	None	None	WKCSAB	FM	mod	Mod low	FF+VF		Smooth clear
3	70	SCL	10YR5/3	2% on surf of horizon nothing below	mfd 75YR4/6 5/6	Common	WKCSAB	FM	mod	Low	FVF		Smooth clear
4	90+	C	25Y6/2 5Y6/2 6/3 (25Y6/3)	None	mfd 75YR5/6	Common	WKCPL breaking to WKCAB	FM	poor	Low	None seen		

Profile Gleyed From 48cm
Slowly Permeable Horizon From 48cm
Wetness Class II
Wetness Grade 2

Available Water Wheat 135 mm
Potatoes 110 mm
Moisture Deficit Wheat 113mm
Potatoes 107 mm
Moisture Balance Wheat 22mm
Potatoes 3mm
Droughtiness Grade 2 (Calculated to 120 cm)

Final ALC Grade 2
Main Limiting Factor(s) WE / DR

Remarks

SITE NAME		PROFILE NO	SLOPE AND ASPECT	LAND USE	Av Rainfall	604mm	PARENT MATERIAL					
Pinvin		PIT4 (ASP64)	Level	Plo	ATO	1473day C	River Gravels					
JOB NO		DATE	GRID REFERENCE	DESCRIBED BY	FC Days	127	PSD SAMPLES TAKEN					
80/98		8/10/98	SO 9570 4882	GMN/SYH	Climatic Grade	1	None					
					Exposure Grade							

Horizon No	Lowest Av Depth (cm)	Texture	Matrix (Ped Face) Colours	Stoniness Size Type and Field Method	Mottling Abundance Contrast Size and Colour	Mangan Concs	Structure Ped Development Size and Shape	Consistence	Structural Condition	Pores (Fissures)	Roots Abundance and Size	Calcium Carbonate Content	Horizon Boundary Distinctness and form
1	35	MSL	10YR43	1% St (Est)	None	None					C F+VF		Smooth/ abrupt
2	50	MSL	25YR46	35% HR (s&d)	None	Common	MD CAB	FR	Moderate	Good	F VF		Smooth/ clear
3	120	MSL	75YR56/05YR56	None	None	Few	MDCP	FR	Moderate	Poor	None seen		

Profile Gleyed From	Not gleyed	Available Water	Wheat	151mm	Final ALC Grade 2	
Slowly Permeable Horizon From	No SPL		Potatoes	104mm		
Wetness Class	1	Moisture Deficit	Wheat	113mm		Main Limiting Factor(s) DR
Wetness Grade	1		Potatoes	107mm		
		Moisture Balance	Wheat	38mm		Remarks
			Potatoes	3mm		
		Droughtiness Grade	2	(Calculated to 120cm)		