AN ASSESSMENT OF THE VERSATILITY OF AGRICULTURAL LAND IN THE RURAL CITY OF WANGARATTA

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User Note

The map information provided in this publication is suitable for broadscale planning purposes, rather than specific site investigation. The scale of the map affects the precision of mapped boundaries. Any enlargement of the map will result in distortion of the information and is unlikely to improve its accuracy. The authors strongly advise that further detailed investigation be carried out prior to new development proceeding.

Please note that this study has been prepared by Agriculture Victoria for the Rural City of Wangaratta. However, the Department of Natural Resources and Environment has not formally endorsed this report and reserves the right to comment freely on any strategic plans or planning scheme amendments prepared as a result of this study.

Department of Natural Resources and Environment Customer Service Centre
8am to 8pm Moday to Friday - 136 186

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REAR MAP POCKET

Explanation of the criteria used in the land capability assessment table

Rainfall – Rainfall is used as a guide to determine the cut-off point for particular forms of dryland agriculture. In general, less than 250 mm is not suitable for dryland agriculture, at least 650 mm is preferred for commercial forestry, and greater than 350 mm is preferred for dryland grazing or cropping.

Slope – Gentle slopes, very gentle slopes and plains are well suited to most forms of agricultural production with respect to machinery access and operation. Moderate slopes are generally suitable but more considered management is required to manage soil erosion risks and develop vehicle access tracks. Steep slopes above 20% are only suitable for forestry applications and require careful planning to ensure safe machinery operation. Steep hills and crests do not allow safe machinery access and are prone to soil erosion. Steep hills and crests above 33% slope are not considered suitable for agriculture.

Salinity – Most agricultural crops have a low tolerance of soil salinity. Therefore, where saline discharge areas are mapped by previous DNRE surveys, the land is considered unsuitable for agricultural production.

Soil type – Soil type can provide a guide to the general soil properties such as texture, stone and gravel content, nutrient status and drainage characteristics. These properties are important in determining the ability of the soil to support various types of agriculture.

Topsoil depth – Topsoil generally has good moisture holding capacity, a higher nutrient status and better drainage characteristics than the subsoil. Therefore deeper topsoils are sought after for horticultural production. As the majority of topsoils are shallow throughout the study area, this limits the forms of agriculture that can be practised. However, mounding of topsoils is frequently used to establishing vineyards and horticultural enterprises. Topsoils deeper than 20 cm are ideal for all agricultural pursuits but are essential for vegetable production. Topsoils of 10-20 cm are considered suitable for mounding to establish other horticultural crops such as stonefruit. Where topsoils are less than 10 cm in depth, the area is considered suitable for viticulture, broadacre cropping, dairying and forestry.

Depth to hard rock – Rock that outcrops near or at the soil surface will decrease the area of land suitable for cultivation. Hard rock layers can also restrict productivity through a reduction in the volume of soil that be exploited for water and nutrients. At 20 cm below the surface, hard rock layers can significantly increase the risk of production losses through insufficient moisture and nutrient availability in dry years. Rock outcrop may also impede machinery access and operation.

Estimated subsoil permeability – Very poor subsoil permeability results in restricted vertical movement of water and air through the soil profile. This can effect soil drainage and result in waterlogging of the soil horizons above the impermeable layer, leading to poor root growth or vine death in severe situations. High to moderately permeable soils are considered most suitable for irrigated horticulture. As subsoil permeability declines, soil conditioning, irrigation layout, scheduling and monitoring becomes progressively more important in maintaining optimum soil-water conditions.

1 PURPOSE OF THE STUDY

The background and purposes of this study stem from the preparation and review of the Wangaratta New Format Planning Scheme. Land capability information regarding agriculture, and the demand and service needs of rural residential zones needs to be prepared in order to justify changes to the planning scheme. This will direct new policies for development in the Rural Zone and changes to the location or backzoning of the Low Density Residential, Rural Living and Township zones across the Municipality.

The review of high quality agricultural land is timely given the release of the Final Report on the Victorian Planning Provisions by Helen Gibson. The report identifies existing problems for the protection of agricultural land under the current Rural Zone provisions and advocates the development of an Agricultural Zone, which would apply to areas identified as high quality (versatile) agricultural land.

The review is also pertinent due to the changing nature of agriculture in the region, which is intensifying with grapes and alternative crops (i.e.) mint as well as the replacement of traditional intensive uses of hops and tobacco. It can be argued that much of the land in the Rural City of Wangaratta will support some form of agricultural development given sufficient input and management. However, the additional costs associated with the management of marginal land will ultimately determine the economic feasibility of any new development. It is possible to identify landforms and soil types that are highly advantageous for agricultural production, and ensure that these areas are protected from competing land use. It is prudent to steer potential investors to these areas.

This study has mapped high quality (versatile) agricultural land and provided a guide to the range of agricultural enterprises that may be pursued. In addition, the report contains a summary of key landform and soil descriptions. This information can be used to direct planning policy and decisions, and encourage new agricultural investment opportunities through Council's Economic Development Unit.

4.4 Devonian granite and granodiorite (annual rainfall 350-750 mm)

Land system	Pg, Hg						
Landform pattern	Undulating plateau with steep dissected slopes, low hills with rocky crests						
Geology	Devonian granite						
Annual rainfall (mm)	350-700						
Elevation range (m)	240-480						
Landform component	a	b	c	d	f	g	x
	Rocky Crest	Steep slopes / rocky escarpment	Moderately steep slopes	Moderate slopes	Gentle slopes	Very gentle slopes	Undulating plateau
Slope range (%)	1-20	>32	20-32	10-20	4-10	0-4	5-15
Major soil type	Uc Shallow uniform sands	Uc Shallow uniform sands	Gn Reddish brown gradational soils	Dr Red duplex soils	Dy3.41 Bleached yellow duplex soils	Dy3.41 Bleached yellow duplex soils	Dr Red duplex soils
Soil depth (m)	<0.5	<0.5	1.0	1.0	1.5	>1.5	1.0-2.0
Permeability	High	High	High	High	Moderate-low	Low	High to moderate
Land degradation susceptibility	Gully erosion: high Sheet erosion: high	Gully erosion: high Sheet erosion: high	Gully erosion: high Sheet erosion: high	Gully erosion: high Sheet erosion: high	Gully erosion: high Sheet erosion: high	Gully erosion: high Sheet erosion: high	Gully erosion: high Sheet erosion: high
Agricultural versatility class	3	5	4	3	3	2	4

1 METHODOLOGY AND CONSTRAINTS

The assessment of land versatility for agriculture in the Rural City of Wangaratta has primarily been a desktop study. Existing sources of information have provided the bulk of the soil and landform descriptions, however limited field sampling was also undertaken.

Landform component mapping (1:100 000 scale) has provided the base for the assessment of land versatility (refer to rear map pocket). Precision of the mapping is dependent upon the accuracy of base geological mapping (1:100 000 scale), slope classes which have been constructed from 1:25 000 digital elevation modelling, and the accuracy of previous soil and land surveys (1:500 000 – 1:25 000 scale). Subsequently, the information is considered suitable for broadscale planning and policy decisions. Specific on-farm or on-site development will require more detailed assessment as enlargement of the map (to a scale finer than 1:100 000) will not improve the precision of data, and is likely to be misleading to the user.

2.1 Delineation of Landform Components

A landform component is an area of land that is distinct from adjacent components because of specific geology, slope class and soil type. For this study, landform components were identified using a combination of radiometrics, digital elevation modelling, land system mapping (Department of Natural Resources and Environment), geological mapping (Department of Minerals and Energy), and limited ground truthing.

The slope classes used are modified from McDonald *et al.* (1990). Detailed physical descriptions of each geology type and landform component are contained in Section 4 of this report. The landform components underlie the agricultural versatility classes presented as maps in the rear map pocket.

2.2 Delineation of soil types

The identification and description of soil types relied predominantly on previous studies including: A study of the land in the catchments of the Ovens and King Rivers (Rowe, 1984), and Report on the Murray Valley Area (LCC, 1980). In addition, 30 representative field sites were selected from the Victorian soil sites database or through strategic sampling to verify existing landform and soils information. No soil chemical analysis or permeability measurements were undertaken during soil sampling.

Soils within the study area have been described using the Northcote Factual Key (Northcote, 1979).

2.3 Land versatility for agriculture

The assessment of land versatility provides a guide to the type of agriculture that can be supported by a specific land component. As the versatility of the land increases, so will the opportunities for agricultural diversification. Therefore, areas of high versatility are most valued as they can provide alternatives when downturns occur in specific agricultural markets.

Because of the complex interactions between soil, landscape and climate, purely objective assessments of land can sometimes be misleading. To this extent, a level of subjectivity has been used to determine the capability of land components to support various types of agriculture.

Agricultural versatility, as determined in this report (1:100 000 scale information) provides a general guide to the versatility of land for agriculture and is useful in protecting what is considered to be high quality agricultural land. This information is desirable for the development of local planning policies and the identification of zones and overlays.

4.7 Tertiary basalt capping over Lower Carboniferous sediments

Land system	Mahaakah		
Landform pattern	Plateau with low hills		
Geology	Tertiary basalt capping over Lower Carboniferous conglomerate, sandstone, siltstone, shale or Upper Devonian rhyolite and rhyodacite		
Annual rainfall (mm)	1150-1350		
Elevation range (m)	800-1000		
Landform component	d	e	f
	Moderate slope	Gentle crest	Gentle slope
Slope range (%)	10-20	2-15	4-10
Major soil type	Gn4.13 Friable brown gradational soil	Gn3.14 Red gradational soils on basalt	Gn4.13 Friable brown gradational soil
Soil depth (m)	2.0	2.0	2.0
Permeability	High	High	High
Land degradation susceptibility	Sheet erosion: low	Sheet erosion: low	Sheet erosion: low
Agricultural versatility class	3	1	3

In assessing the versatility of land for various forms of agriculture, the study has considered a number key questions:

1. *Climate* What forms of agriculture are suited to the climatic conditions present?

2. *Landscape* Will the landscape and soil conditions present result in drainage problems, impede machinery operations or management, for different forms of agriculture? Will different forms of agriculture result in unacceptable land and water degradation?

3. *Soil* Are the inherent soil conditions capable of supporting different forms of agriculture?

To answer these questions, a land versatility assessment table for agriculture has been developed (Table 2.2). The table has five versatility classes that are related to five enterprise groupings (Table 2.1). The enterprise groupings are commonly distinguished from each other by characteristic soil and landform properties. Therefore, the versatility class is determined by comparing the existing soil and landform conditions present, with the growing conditions required for each of the enterprise groups. Where no limiting conditions are present, the land has a high versatility and will support many forms of agriculture. Where few or many limitations exist, the land has a moderate to low versatility and will support fewer forms of agriculture.

These enterprise groupings not only reflect the landform and soil limitations that impact on the various forms of agriculture, but also highlight areas with the flexibility to diversify into new and competitive industries. Definitions for the five versatility classes and enterprise groupings are contained in Table 2.1.

4.8 Quaternary colluvium (Ordovican parent material)

Land system	Myrtleford		
Landform pattern	Low hills with broad colluvial fans and slopes		
Geology	Ordovician greywacke, sandstone, siltstone, shale and mudstone		
Annual rainfall (mm)	750-1250		
Elevation range (m)	230-350		
Landform component	d	f	g
	Moderate slope	Gentle slope	Very gentle slope
Slope range (%)	10-20	4-10	0-4
Major soil type	Gn4.14 Reddish brown gradational soils	Gn4.14 Reddish brown gradational soils	Gn2.64/Gn2.74 Weakly bleached yellowish brown gradational soils
Soil depth (m)	1.5	1.5	1.5
Permeability	High	Moderate	Moderate
Land degradation susceptibility	Sheet erosion: moderate Gully erosion: moderate	Sheet erosion: moderate Gully erosion: moderate	Sheet erosion: moderate Gully erosion: moderate
Agricultural versatility class	3	3	2

Table 2.1 Definitions for agricultural versatility classes

Versatility class		Description	Enterprise groups
1	Very high	High to very high productivity mostly on alluvial floodplain. Suited to a wide variety of horticultural and cropping applications. Note: Flooding risk needs to be considered in floodplain areas.	Irrigated horticulture, Irrigated broadacre cropping, Dairying, Broadacre cropping, Broadacre grazing, Viticulture
2	High	Moderate to high productivity on the wider alluvial plain. Generally suited to grazing, viticulture and opportunistic cropping. Note: Waterlogging is an issue on the wider alluvial plain.	Broadacre cropping, Broadacre grazing, Viticulture, Forestry
3	Moderate	Moderate to low productivity on moderate to gentle slopes. Commonly suited to grazing and viticulture.	Broadacre grazing, Viticulture, Forestry
4	Low	Low to moderate productivity on steep to moderate slopes. Typically utilised for forestry and marginal grazing.	Forestry
5	Nil	Very low productivity or severe landform constraints exist (e.g. very steep slopes, rock outcrop). Considered unsuitable for agriculture and forestry.	Not suitable for agriculture

4.9 Quaternary colluvium (Devonian rhyolite, rhyodacite, granite parent material)

Land system	Evans		
Landform pattern	Low hills with colluvial fans and slopes		
Geology	Devonian granite, rhyolite and rhyodacite		
Annual rainfall (mm)	1000-1250		
Elevation range (m)	260-700		
Landform component	d	F	g
	Moderate slope	Gentle slope	Very gentle slope
Slope range (%)	10-20	4-10	0-4
Major soil type	Gn4.14 Reddish brown gradational soils	Gn4.14 Reddish brown gradational soils	Gn4.81 Yellowish brown gradational soils
Soil depth (m)	1.5	2.0	1.0
Land degradation susceptibility	Sheet erosion: low	Sheet erosion: low	Sheet erosion: low
Agricultural versatility class	3	3	2

Table 2.2 Criteria influencing land versatility assessment for agriculture.

Criteria influencing various forms of agriculture		Land versatility class (enterprise grouping)				
		1	2	3	4	5
Climate*	- rainfall (mm)	water supply	>350	>350	>650	<250
Landscape	- slope	0-4%	0-4%	4-20%	20-32%	>32%
	- salinity	nil	nil	nil	nil	nil
Soil	- type (Principal Profile Form)	Um, Gn,	Um, Gn, Dr, Db, Dy, Dd	Uf, Um, Ug, Gn, Dr, Db, Dy, Dd, Dg,	Um, Uf, Gn, Dr, Dy, Db	Uc, very shallow soils, saline soils, stony soils
	- depth to hard rock (cm)	>100	>100	>50	>50	<50
	- subsoil permeability	high to moderate	high to slow	high to slow	high to slow	Very high or very slow

* The availability of a supplementary water supply has not been assessed as part of this study. Therefore for class 1 and 2 access to a supplementary water supply is assumed.

Note: The above table has been developed from local and regional data to provide a general assessment of land versatility for the various enterprise groups. The assessment does not provide sufficient information for site specific evaluation. Additional site specific factors that would require consideration prior to development may include: site size and layout; availability of supplementary water supply, winter-spring flooding, frost risk and soil factors such as surface textures, pH, organic matter content, nutrient status and sodicity.