

Incorporation of intensive cropping into sustainable systems in the coal valley, Tasmania

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Summary. The Coal Valley has, by Australian standards, a long history of European settlement, and the pattern of land use and agricultural production has changed substantially over this time. It provides good examples, firstly of the problems in land degradation which have developed; secondly of the opportunities which now exist and are being sought out by an enterprising group of farmers, and lastly of the measures now being taken to achieve a sustainable, productive future.

Introduction

The national thrust towards Landcare and sustainable agriculture is being focussed at the regional level in Tasmania (10). Nearly two hundred years of cropping and land abuse have created a need for a new approach to land use. On the positive side, the cool temperate climate, with irrigation where required, combines with other advantages such as isolation to mean that many new opportunities are available for farmers to diversify. This paper examines how an enterprising group of farmers in the Coal Valley are trying to overcome past problems and work towards an economically and ecologically sustainable future with a mix of new and established enterprises. The principles involved, of looking for products and markets for which the district and its farmers have a comparative advantage and then fitting them into a workable system, should be of general application.

Methods

The Coal Valley, centred on Richmond, 30 km NE of Hobart, was identified as a suitable case study area. There was an active grower group in the Coal River Products Association (CRPA), a long history of settlement and a rapidly changing land use pattern with the recent availability of irrigation. CRPA members were interviewed and a group of four farms chosen for more detailed examination of enterprises and systems. This paper is a preliminary report as a survey of the resources and potential of the valley is underway at present, with support from the Blundstone Rural Development Fund and the Horticultural Research and Development Corporation.

Results and discussion

Historical

The valley was mainly settled by the 1820s, with wheat growing as the main enterprise (11). Land could be cleared cheaply and was accessible to water transport to take grain to Sydney. English cultivars and methods were used, in a near-monoculture. In 1850 about 25,000 ha in Tasmania, largely around Hobart and Launceston, produced more grain than NSW and Victoria combined. Cropping in this manner continued with little improvement until after the 1930s depression, by which time yields were reduced to low levels and soil erosion was widespread (3). Sheet and rill erosion of arable lands and massive gullying on susceptible soils (e.g. mudstone) in the valley were accompanied by similar degradation of overcleared, steeper grazing land on the valley sides. Weeds became another serious limiting factor to production.

Improved pastures and the post-war wool boom helped arrest the decline, together with rabbit control. Wool, fat lambs and beef became the major sources of income. Apart from small areas of orchards, mainly apricots, cropping remained basically cereals, with oats and barley generally replacing wheat in the mixed farming system. By the 1960s, agriculture in the valley was again in a depressed state as the average farm of 200 ha was too small to support a family. After the 1967 bushfires caused severe losses of fences, buildings and stock, a group of farmers formed CRPA to try to find a new direction for the valley.

Soils and climate

Soils are of varying quality (6), ranging from moderately acid duplex soils on tertiary sediments through alluvial sands and loams to black cracking clays on basalt and dolerite. The duplex soils have impeded drainage, often resulting in waterlogging over winter, and there are some salt affected areas where groundwater drains from the tertiary sediments. Soil variability is a problem in crop production as many existing paddocks contain areas of widely differing soil type.

The south-east of Tasmania, including the Coal Valley, is in a rainshadow (7), being sheltered by mountains from the prevailing rain-bearing low pressure systems approaching from the west. Good rains (over about 15 mm) only occur infrequently when a low pressure system develops off the east coast. Mean deviation of annual rainfall exceeds 20% (7), and while mean monthly figures for Hobart Airport (Table 1) at the mouth of the valley indicate a lack of seasonality, most of the effective rainfall is from May to October when it is more likely to exceed potential evapotranspiration rates. The 'break of season', however, can occur at any time from March to July. A study of rainfall variability is in progress.

Table 1. Monthly mean climatic data for Hobart Airport, 1944-89.

	J	F	M	A	M	J	J	A	S	O	N	D	Annual
Rainfall (mm)	39	35	39	46	42	29	48	48	41	51	46	58	522
Max. temp. (°C)	22.3	22.2	20.6	18.1	15.0	12.7	12.2	13.2	15.2	17.2	18.8	20.3	17.2
Min. temp. (°C)	11.8	11.8	10.6	8.8	6.4	4.4	3.9	4.5	5.9	7.3	9.0	10.6	7.9

Mean temperatures (Table 1) indicate the cool, maritime climate. While diurnal fluctuations increase further up the valley, the basic pattern is of winters cold enough to vernalize temperate fruits and biennial crops, and summers warm and dry enough to ripen most crops and give high germination percentage in seed crops. High radiation levels combine with mild temperatures to give high quality and yield potential in many crops. Wind is a limiting factor for most crops and while quantitative information is still being assembled, windbreaks appear necessary for most horticultural ventures.

The CRPA, identifying water supply in summer as the main factor limiting production, actively promoted the prospects for an irrigation scheme with successive governments. This resulted in construction of the Craigbourn Dam on the river near Colebrook in 1986. In Stage 1 of the scheme, farmers pump from the river and in Stage 2, a pipeline takes water from Richmond to Cambridge, serving farms en route. Later stages are planned to expand into neighbouring valleys, but demonstrated benefits from the existing stages will need to be combined with the political will to construct them.

New crops and evolving systems

While some farmers irrigated from on-farm storages with uncertain supply previously, the scheme has now made intensive cropping possible for most. The range of crops grown has expanded dramatically, as shown in Table 2 for four farms of widely differing size. These represent the one-third or so of properties which have rapidly taken up the new opportunities. Another third are making some use of the water, for example with forage crops or one or two new enterprises. The remainder, continuing as previously, will be under increasing pressure to change with rising property values and the need to pay for water rights.

The new crops are being incorporated into the existing system, where sown pastures are grazed by sheep or cattle for three to eight years, followed by about three to five crops in a flexible rotation sequence. In most cases, however, rotations are still evolving, and the current depressed wool and livestock prices mean that pasture establishment and maintenance have suffered. Generally, higher value

crops such as poppies (4) come early in a rotation, particularly where a good seedbed and weed control are required. Peas often come after cereals and crops such as Brassicas are incorporated wherever expedient. Perennial crops like fennel (8) and pyrethrum should usually be preceded by a cereal to assist broad-leaved weed control.

Table 2. Examples of diversified cropping on Coal Valley farms - 1991 programme.

	'Daisybank'	'Strathayr' (2)	University Farm	'Morville House'
Total area (ha)	600	1200	340	43
Non arable (ha)	200	800	60	15
Crops	peas (seed) poppies oats, barley cauliflower (seed) cauliflower (processing) Chinese cabbage (seed) parsnip (seed) lentils	peas (seed) poppies fennel pyrethrum cabbage (seed) turf wine grapes	peas (field) poppies oats, barley pyrethrum canola (seed) sugar beet (seed) dill, Clary sage ryegrass (seed) apricots cherries	barley fennel pyrethrum cabbage (seed) canola (seed) sugar beet (seed) dill

Cereals have been shown to still play an important role as high yields (over 10 t grain per ha) are possible (9) with the right cultivars and management, and they also can act as break crops and for winter grazing (1). Many farmers, however, have tried to continue with higher value broad-leaved crops, resulting in use of a wide range of expensive herbicides and the build up of 'problem' weeds such as Californian thistle, *Cirsium arvense*, whiteweed, *Cardaria draba*, and cleavers, *Galium aparine*.

While 'organic' farming methods are not being used to any significant degree, this will change if price differentials can be achieved. Some of the new crops do have ecological advantages, for example fennel which fits well into a mixed farming system as it provides useful winter grazing. This in turn reduces disease carryover on the crop and subsequent fungicide usage, and also prevents the crop from becoming too tall at flowering.

The Coal Valley is developing as a specialist seed producer, increasingly of hybrid vegetable and field crops where isolation is a key issue. CRPA is therefore undertaking a register of growers, with a map for each season to coordinate growers, seed companies and beekeepers. As well as biennial seed crops like cabbages and sugar beet, the mild summer conditions mean that annuals such as canola can be sown in late spring, in this case to speed development of hybrid cultivars for Canada and Australia.

The valley has been shown to produce high quality wines, and vineyards are being established on favourable north-facing slopes. Stone fruits, particularly apricots and cherries, have produced good yields for which there are 'market windows' on the mainland. These tree and vine crops are mostly being grown on selected parts of mixed farms, with advantages in, for example, winter grazing to clean up weeds and fallen fruit, and use of cereal straw as a mulch.

The University Farm, established in 1984, is playing an important role in the development of new crops and systems. It combines teaching and research with practice, and was amongst the first to grow new stone fruits, hybrid canola and essential oil crops (8) such as peppermint, fennel, dill and clary sage.

Essential oils are high value products which are ideal for Tasmania in that they can be produced to high quality standards, and exported without major freight cost. Pyrethrum is now grown for its natural insecticide after a major research and development programme by the University and Commonwealth Industrial Gases Limited and is a model for the development of a new crop. Being a perennial which should be kept nearly weed-free, there have been problems in weed control and soil conservation which are being addressed

Landcare

With the legacy of past land degradation to deal with, plus incorporation of new intensive crops into sustainable systems, CRPA has initiated the Coal Valley Landcare Group (10,5). Support has been obtained from the community, local and state government, schools, the University, Greening Australia and the National Soil Conservation Programme. The aim is to develop a catchment management plan for the whole valley and to have it implemented largely by the individual farmers. The group is running a series of demonstrations and trials to show people how to address the major problems. It is also promoting Whole Farm Planning courses, with the first in 1991. Particular emphasis has been placed on re-organisation of subdivision according to soil type where possible and to remove or restore areas with problems such as erosion. The earlier practice of fencing was to incorporate north- and south-facing slopes in the one paddock, leading to overgrazing and erosion on the former. Windbreaks, laneways and irrigator tracks are other major considerations, to incorporate the new enterprises into the farm system to the greatest overall advantage. The principles apply to both annual crops in a rotation, and to perennials where specific locations have to be chosen with soil, aspect, slope, drainage, irrigation and shelter in mind.

Of the demonstrations set up so far, one involves reclamation of a saline area on the University Farm by fencing off, tree planting or underground drainage, and monitoring of water table and salinity levels. A second involves fencing of an eroded north-facing hillside and either direct seeding or planting of trees and shrubs. Pasture establishment by aerial spraying and sowing is planned for a similar area in 1992. Improvements to a section of the Coal River are also planned as it is choked with willows, creating flooding, problems with operation of the irrigation scheme and loss of good land.

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