"Paradise" and "Cloverdowns": following natural systems

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TWO properties, "Paradise" and "Cloverdowns", are farmed by the Melvin family near Dowerin in the central wheatbelt of Western Australia (see Fig. 1, Hobbs 2003). The annual average rainfall is 350 mm and, before Europeans settled the area, it was well vegetated with perennial vegetation. The sandplain soils were dominated by mallees *Eucalyptus* spp., Kwongan or heath (predominantly Myrtaceae, Proteaceae and Leguminosae), and patches of York Gum *E. loxophleba* woodland. The heavier soils such as the brown sandy loams and red brown loams were clothed in woodland of Salmon Gum *E. salmonophloia* and York gum. The gravelly sands were covered by Tamma scrub which was dominated by sheoak *Allocasuarina* spp.

Most of the native vegetation was removed as the area was developed for wheat and sheep farming. Like much of the central wheatbelt, the extensive removal of native perennial vegetation and its replacement with predominantly annual vegetation has seen the development of widespread problems of land degradation. "Paradise" and "Cloverdowns" were not exempt from these problems. The poorer sandplain soils comprise 60% of the properties' 1 760 ha. Economic returns of conventional farming systems from these soils were poor. Wheat and lupin yields were about a quarter of those from the better soils. They also had a lower capacity for carrying sheep. In addition, conventional cropping regimes led to erosion by wind and water, as well as increased infiltration to the ground water, leading to rising water tables and the risk of soil salinization and waterlogging on the more productive, heavier soils on the valley bottoms

By 1983 the family had been advised that, because of the extent of the sandy soils on their properties, the farms would not be able to support them all. This situation caused a great deal of soul-searching and I invested money earned shearing to see how farming was practiced in the Middle East which has a similar Mediterranean climate to that of southwestern Australia. Since returning to the properties, and based on what I saw in the Middle East, I have been developing a farming system based on alley farming.

THE ALLEY FARMING APPROACH

Alley farming is based on the maintenance of rows of trees and shrubs with the production of crops and pastures between the rows. The perennial vegetation provides food and shelter for livestock, protection against wind erosion and uses more water, reducing rainfall infiltration and rises in water tables. On "Paradise" and "Cloverdowns", Tagasaste *Chamaecytisus palmensis*, which is grown as a fodder crop, *Acacia saligna*, *Atriplex amnicola* and *Eucalyptus* spp. are used to provide the permanent strips of vegetation which resemble hedgerows. The rows were established using one year old open-rooted seedlings raised on the properties and planted by machine in late winter. Advantages of this system are that the vegetation usually survives the first summer, requires no fencing and can be grazed in the autumn following establishment. A number of arrangements of rows and alleys are being tried.

In the late 1980s, the first system was tried on the poorer soils on "Paradise". This arrangement consisted of hedgerows of three rows of trees and shrubs made up of Tagasaste, eucalypts and *Acacia saligna*. Each hedgerow was planted against the prevailing wind or along the contour of the land and the rows making up the hedgerow were placed two metres apart with 30 metres between rows. Seventeen per cent of the paddock developed for alley farming is taken up by the rows with trees at a density of about 300–800 stems/ha depending on the distance between trees in the rows.

The alleys between the hedgerows were planted with pasture which consisted of a mixture of summer-active perennial grasses, winter-active annual grasses, clover and a winter-active legume. Lupins were grown in the fourth year over the pasture to replenish nitrogen in the soil and provide a cash crop. We believe that we will increase our yields of lupins because of shelter provided by the hedgerows.

Since the first alley farming configurations were established on "Paradise", other arrangements have been tried. This is an experimental approach to farming which will be refined as more is discovered about the system, and as markets for agricultural products and other influences change.

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Where the soils are better and more suited for cropping in the alleys, the alleys are anything from 60 to 200 m wide. As a result, the amount of land given over to hedgerows is reduced. For example, when the alley is 200 m, the land occupied by trees and shrubs in the hedgerows is about 3%. However, it is unknown if hedgerows occupying only 3% of the landscape will have any influence on water infiltrating the ground. Monitoring the impact of different alley systems on infiltration and salinity is an important part of my trials.

The density of trees and shrubs planted in the alleys is dictated by the suitability of the soils for farming. On the heavier soils suited for cropping, spacing of hedgerows is wider and the value of the trees and shrubs is mainly in the provision of shelter, particularly against wind erosion. Where the soils are poorer and not suited for cropping or perennial pasture, the hedgerows are closer. In this arrangement the trees and shrubs are essential for fodder for sheep and cattle and so palatable species predominate (Table 1).

Alley farming with the hedgerows planted with species which are palatable provides important feed during the late summer and autumn which is usually a period when feed is scarce. In addition, the combination of cattle and sheep is practical, because the cattle browse the vegetation and prune it to a height which the sheep can then browse.

CONCLUSIONS

Three of the species used in the hedgerows are native. We believe that the hedgerows provide habitat for birds and other native animals, including insects and spiders. They also link patches of remnant vegetation. Hopefully, by providing extra habitat for birds, spiders and predatory insects, the hedgerows will be a source of biological control of crop and pasture pests and reduce the need to use chemical pesticides.

We believe that in developing alley farming on "Paradise" and "Cloverdowns", we are more closely following the natural systems of the area before clearing began than the conventional systems in use until the late 1980s. There is evidence that alley farming uses less energy in the form of fossil fuels and fertilizers, is more efficient in water use, is more productive, and degrades the soils less than conventional agricultural systems. We do know that the changes we are implementing provide us with a more secure livelihood and are leading to a sustainable and ecologically compatible farming system.

REFERENCES

Hobbs, R. J., 2003. The wheatbelt of Western Australia. *Pac. Cons. Biol.* **9**: 9–11.

Table 1. Options for alley farming from experience on "Paradise" and "Cloverdowns" ranging from supply of stock food to provision of shelter for cropping operations.

	Green feedlot	Feed/crop	Crop/feed	Crop
Alley width (m)	10–30	30–60	30–60	60–200
Stem/ha	1 000–3 000	100–300	100–300	40–100
Hedgerow shelter	Tagas/*Ac. salig*	Tagas/*Ac. salig*	Mallee	Taller eucalypts
Fodder	Tagas/*Ac. salig*	*Atriplex*	Acacias	Acacias
Hedgerow height (m)	4–5	4–5	4–5	10–15
Alley production	Perennial pasture	Lupin/wheat	Wheat/pasture or lupin/wheat	Wheat/pasture or wheat/peas