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Source of water for the irrigation scheme—the Ord River dam

Ord River cropping progress

by G. A. Robertson, Officer in Charge, Kununurra

The Ord River irrigation scheme needs little introduction to most Australians. Centred on the town of Kununurra in the East Kimberley, the project will eventually irrigate by gravity feed 76 000 ha of intensive cropping land—five times the area watered by schemes in the South-West.

The source of water for this irrigation scheme is the Ord River dam, about 30 km upstream from Kununurra. The huge lake formed by the dam, known as Lake Argyle, has a designed storage capacity of 5 700 million cubic metres—nine times the size of Sydney Harbour.

In addition, Lake Argyle has a huge flood storage capacity above its spillway. At maximum flood storage, this vast inland lake covers 2 070 square kilometres and holds
40 200 million cubic metres of water. For comparison, Serpentine dam has a capacity of 184 million cubic metres.

Lake Argyle has been full and continuously overflowing since 1974.

Insects

The initial development of the Ord River area was based on cotton production. However, successful cotton production required heavy applications of insecticides such as DDT, parathion and toxaphene. Under normal conditions, these insecticides kill a broad range of insects.

After a few years, the insect *Heliothis armigera* developed resistance to insecticides, devastating cotton crops and making conventional methods of insect control virtually useless.

Department of Agriculture entomologists found that if broad spectrum insecticides such as DDT were not used, *Heliothis* could be biologically controlled by a local insect known as *Trichogramma*. Imported *Trichogramma* strains were also released.

*Trichogramma* is a small wasp that lays its eggs inside the eggs of *Heliothis* and other moth species. As the wasp eggs hatch, the emerging larvae feed on the eggs of *Heliothis* and eventually kill them. During the last three years, up to 99 per cent of *Heliothis* eggs laid have been attacked in this way. Since this method of control has been operating, *Heliothis armigera* has not been a serious pest.

Similar biological control methods have been used for another serious pest, the green vegetable bug, *Nezara viridula*. Another wasp, *Trissolcus*, has been released in the area. *Trissolcus* is a parasite on the eggs of the green vegetable bug and similar bugs, and we hope it will maintain bug populations at a level where they are unable to cause serious damage.

Included in the strategy of biological control are other methods such as growing crops that are not susceptible to particular insects. It is also possible to grow crops in ways that discourage pests but encourage the parasites and predators of those pests, or to use insecticides that affect only the pests, and not beneficial insects. This system of "integrated pest control" is being used by farmers in the Ord River area.

Should suitable conditions allow pest species to surge in numbers, outstripping the ability of parasites to control them, a spray can be used to spread disease specific to a particular insect pest. In the case of *Heliothis*, a suspension of bacteria such as *Bacillus thuringiensis* or a virus suspension known as *Viron H* is sprayed on to the crop. These diseases attack the pests but do not affect the predatory or parasitic insects.

The result has been that crops such as sorghum and sunflower can be grown without the automatic use of insecticides. This has reduced on-farm costs, and also the level of insect damage.

For anybody who saw the vast numbers of crop-eating insects in the days of chemical sprays on
cotton (up to 30 pest insects a metre of row were often recorded) it is indeed a revelation to walk into an unsprayed sorghum crop and find negligible insect damage.

Sorghum

As the farmers in the Ord River Valley have gained increased confidence in growing crops with integrated insect control, so the area sown to sorghum has increased. Ord River sorghum is now used to produce most of the poultry meat, pig meat and eggs consumed in Darwin. Some sorghum is also being used in Katherine and other centres in the north of Australia.

For the first time, grain sorghum was bulk-loaded for export from the port of Wyndham, some 100 km from Kununurra in October 1977, and shipped to Singapore. Intraco, a large food importing company, is handling the importing side and arranging for the grain to be sold for poultry and pig feed in trading arrangements with Singapore for grain and other agricultural products from the Ord River area.

The Ord River area is well placed to trade with Singapore, there being very little difference in distances between Wyndham to Singapore and Wyndham to Perth.

Sorghum can be grown throughout the year on the Ord River Irrigation area, although the highest yields are obtained with plantings in March/April. The March/April crop can be harvested, slashed and allowed to regenerate so that a second harvest can be taken before the wet season begins, usually in late December.

Yields of sorghum have improved as cultural techniques have been developed to exploit the natural advantages of the area. Texas 610 has been the main hybrid grown for many years but this year several new hybrids are showing promise and some should eventually replace Texas 610. These new hybrids are the first actually bred for the tropics and released by seed-producing companies.

Average yields are about 5 tonnes a hectare but recently some farmers have produced up to 7 tonnes a hectare over large areas. Although such yields are not as high as those achieved in some irrigated areas in Australia, they should improve as more emphasis is placed on breeding hybrids suitable for the tropics.

Conditions on the irrigation area ensure that the sorghum produced has a relatively high protein content. Protein levels are usually around 10 per cent which is a good figure for feed sorghum. The dry season crop produces clean grain, free from stains and infections.

Other grains

Yields from Department of Agriculture trials with wheat and maize have indicated that these crops may also become important in the area. In the 1976 dry season, several wheat varieties from Australia and overseas yielded over 5 tonnes a hectare in Department of Agriculture trial plots. Most of the high-yielding wheats had protein contents above 12 per cent. Little work has yet been done on the quality of this protein.

Oilseed crops

Perhaps the most promising crops being grown on the Ord are the oilseeds, sunflower and safflower. Both crops have been very susceptible to insect damage. Early budgets for these crops used to allow up to ten sprays with insecticides; even then, damage by insects was the major limit to yield.

Under the integrated control programme, insect damage to sunflower and safflower in commercial crops has been negligible. Not only have growing costs been reduced by the obsolescence of the insecticide but yields have improved markedly. Commercial crops of
Sunflowers and oilseeds show promise

Rice research is developing both varieties and cultural practices

Harvesting sugar cane for next year’s planting
both sunflower and safflower have yielded more than 2 tonnes a hectare. Hybrid sunflowers in particular have shown potential for commercial yields of 2.5 t/ha with oil content exceeding 48 per cent. At current prices, sunflower could become the basis for the development of a stable agricultural system on the Ord.

**Rice**

Ord River long grain rice is now being grown commercially, and marketed in Perth. Initial problems such as a chronic zinc deficiency in the Kununurra clays have been overcome and the 1977 wet season rice crop produced the first rice that was of a quality high enough to allow it to be marketed alongside other premium long grain rices.

There is still considerable scope for improvements in the rice varieties being grown. Comprehensive rice research is developing both varieties and cultural practices. This should continue to improve the economics of rice production in the area.

**Sugar cane**

The crop which gives the most exciting yields at the moment is sugar cane. Although the current programme on sugar cane has only been in progress for three years, several north Queensland varieties have produced nearly 20 tonnes of sugar a hectare in 12 months. These yields are exceptionally high by world standards and if achieved on large areas, a sugar cane industry in the area will be inevitable.

An 80 ha pilot sugar farm is growing sugar cane on commercial lines to establish likely farm yields. The 80 ha farm is about twice the area of the average-sized Queensland cane farm.

**Other crops**

Research is continuing on a broad front. Legumes such as mung beans and soy beans are showing promise under conditions of reduced pest numbers.

Peanut research has now shifted from the heavy soil types onto the sands surrounding the irrigation area. Peanut yields on the heavy soils had always been high but it has been extremely difficult to dig and separate the nuts from the hard-set soil. It is hoped that the same yields can be achieved on the sandy soils where digging should not be a problem.

In conclusion, the Ord River Irrigation area is well on the road to recovery following the severe insect problems associated with cotton culture. The lessons learned by both farmers and scientists have paved the way for a new understanding of the way insect pests react with their host plants and with the rest of the environment. In turn this understanding is producing a system of agriculture where pests can be controlled without widespread use of broad spectrum insecticides.