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Changes in cropping methods

The transition to increased cropping has been accompanied by changes in cropping methods. And innovation still occurring at all levels of crop production promises a fascinating future for the grain industries in Western Australia. It is not hard to recognize the most significant changes. Research Officer M. L. Poole of the Department of Agriculture's Plant Research Division, lists some of them:

Machinery
Recent years have seen the introduction of big-horsepower tractors pulling cultivating gear, air seeders and triple-hitch combines, allowing farmers to cover bigger areas faster. Farmers do not need to work at night as much now, and many work under much better conditions with air-conditioned dust-free cabs fitted with stereo and CB radios.

The machinery places high demands on mechanical know-how and increasing stress on trained farm labour. On the fringe of the machinery revolution are blade ploughs, chisel ploughs, zero tillage drills and axial flow headers.

It will take some years of farm use to assess the place of these new implements in Western Australian farming systems. In the meantime the farmer will be faced with a bewildering array of decisions on tractor sizes, machinery types and prices.

Reduced tillage
The run of dry years and the widespread use of grass-control herbicides has led to reduced tillage. In lower rainfall areas many crops are now planted on a plough-seed system. This involves a single pass of a plough or scarifier, followed by seeding about a week to ten days later. If ryegrass is a problem it is handled with pre-emergent herbicides applied between ploughing and seeding, or with post emergent chemicals. By world standards this is “minimal” tillage for crop establishment.

Minimum tillage
The use of minimum tillage (chemical weedicide) techniques is expanding, particularly in the western and central wheatbelt.
Earlier problems have been overcome and the "sprayseed" system can now be used with confidence, provided backup chemicals for insect and in-crop weed control are used when necessary.

The area treated has increased tenfold in the last five years, to 230,000 ha.

As the area of the farm in crop rises, farmers will become increasingly aware of erosion hazards. Practices such as minimum tillage will be adopted on erodible soils, particularly where wind erosion is likely on the sandy surfaced soils of the wheatbelt and where water erosion could occur on the steep slopes of the high rainfall areas.

In experiments at Avondale and Mt. Barker Research Stations, comparing conventional and minimum tillage systems under continuous crop, equivalent high yields are being obtained. These trials are planned to run for many years.

**Herbicides**

Five years ago the only herbicide used in any quantity was 2,4-D and most farmers did not own a spray rig. Today farmers are using a range of sophisticated, highly selective herbicides through boom sprays.

More than 3 million ha of Western Australian farms were sprayed with herbicides this year.

Many farmers are still learning the uses and limitations of herbicides. Money is still wasted through lack of knowledge of rates and times of application of herbicides and spraying techniques. This also is changing. As farmers become more familiar with the products, herbicides will become a standard part of crop production.

Control of annual ryegrass, wild oats and a wide range of broad-leaved weeds can now be achieved reliably and economically. This has reduced dependence on cultivation as a weed-killing tool. It gives the farmer better control of planting time and allows him to sow more crop.

Pre or post-emergent herbicides can now control all serious weeds except brome and barley grass in the year of cropping. By including herbicide grass-control programmes in the year before cropping, it can now be said that complete control of weeds is possible with herbicides. The decision to adopt these programmes is now an economic rather than a technical one.

**Pasture manipulation**

Pasture manipulation techniques which allow selective control of grasses in the year before cropping are being developed.

These techniques are in their infancy but they open the way to completely new farming systems, with special advantages in the higher rainfall areas.

Pasture manipulation involves taking grasses out of the pasture early in the growing season. Hopefully this will have the effect of:

- reducing takeall in the following crop year;
• increasing nitrogen buildup from clover which should become dominant in the sward;
• providing better quality summer feed; and
• eliminating grass weed problems in the crop year.

New varieties
The continual release of new wheat varieties is allowing cropping to improve its profitability in many districts compared with sheep enterprises. When old and new varieties were compared in five trials in 1979, the assessed rate of improvement in yield from the release of new varieties was equivalent to 9.6 kg per ha per year. This trend is likely to continue.

Much more dramatic is the contribution varieties such as Egret and Tincurrin are making in the high rainfall areas. The outstanding performance of early-planted Egret shows great promise for cropping in the high rainfall areas. Trials have demonstrated also the importance of correct management systems.

Egret shows very high yields, much superior to Gamenya when planted early. But planted late June, lower yields.

Farming systems combining early planting with minimum tillage, pasture manipulation and varieties like Egret offer new cropping opportunities in the high rainfall areas. The impact of these advances have yet to appear in crop production statistics.

Continuous crop and crop-pasture rotations
Department of Agriculture trials and farmer experience have shown that many soil types may be cropped continuously without causing long-term harm to soils and yields. Yields are usually slightly lower than those obtained after good clover leys, but reasonable yield levels can be maintained with applications of nitrogen fertiliser. It is not necessary to apply ever-increasing amounts of fertiliser. The decision whether to continuously crop and apply nitrogen or have clover ley years becomes an economic rather than a technical one.

IMPLICATIONS FOR CROP AND PASTURE PRODUCTION
Low rainfall areas
Big machinery and herbicides now allow a farmer to plant all of his farm to crop in a short time if he wishes. There are no longer any physical or technical barriers to this.

Faced with a situation of cropping being much more profitable than sheep in these regions, conservation of his land resource and desire not to put all his eggs in the cropping basket is the only thing holding him back.

We, farmers and researchers, are in the process of developing crop production techniques for these areas—continuous crop or in-out rotations, herbicides, reduced tillage and stubble retention—which will in the future allow safe intensive cropping. On many soils this is possible now.
Water is the main factor limiting yields in this region and the opportunities for large improvements in yield are not high. Bigger farm profits must come from more area of crop.

Some results taken from a fallow re-assessment trial showed that each 1 mm of rainfall stored in the soil (heavy land) led to a 10-16 kg/ha improvement in yield. Fallows of various lengths and kinds stored different amounts of water. It is possible to place a value on the water stored compared with sheep carrying capacity foregone. At carrying capacities of two to four dry sheep per hectare fallows appear more profitable than carrying stock.

In this region there has been a shift from a pasture to a stubble grazing pattern in summer. Stubbles are often undergrazed, leading to stubble clearance problems at planting, and summer weed problems. Stubbles are assuming much greater importance in sheep nutrition.

Medium rainfall areas
In this region there is no clear case for fallowing. Sheep carrying capacity at five d.s.e. per hectare brings sheep closer to cropping in profitability but cropping is still well in front. Using nitrogen fertilisers successive cropping in this region is quite feasible, although a couple of years of clover now and then will greatly improve nitrogen supply and soil structure.

On the pasture side, the greater weed killing efficiency of new machinery, herbicides and longer runs of years in crop is causing very sparse pasture in the year after crop. Grasses in particular suffer. So farmers face less area of pasture on their farms and poorer pastures on those areas. Stubbles assume much greater importance during the dry period.

High rainfall areas
This area has only 16 per cent crop at present. Hills, rocks, waterlogging and erosion hazards place upper limits on the expansion of cropping but it is likely that at least 50 per of this country is suitable for cropping using new techniques.

Although sheep carrying capacity is high in this region it is also the area with the most potential for high yields. Average yields in excess of 2 tonnes of wheat per hectare are quite possible. The Shires from Toodyay to Cranbrook are the highest yielding year after year. The combination of continuous crop, minimum tillage, new herbicides, new varieties and pasture manipulation offers enormous possibilities for cropping in this region.

The effect on pasture will be:
- Less total area of pasture, more stubbles;
- Recent years have seen the introduction of big-horsepower tractors...
• Very poor pastures the year after crop;
• Heavy stubbles causing pasture and crop management problems;
• A change in grazing patterns with less grass, more clovers and herbs. The extreme will be pasture manipulation systems with the possibility of removing grasses completely from pasture and crop phases.

THE FUTURE
On the basis of what has been achieved already, one is tempted to speculate on what might happen in the future. For example:
• Direct seeding systems where seeding is the first operation carried out on the first rains with all weeds killed post-emergence. Some farmers are attempting this already.
• Complete elimination of weeds in continuous crop systems. (At Avondale Research Station after three years continuous crop and use of selective herbicides, it would have been possible to plant the 1980 crop without weed control of any kind.)
• Continuous crop systems based on cereal-grain legume (i.e. lupin) rotations. This already looks good in Departmental trials and on a few farms in the Geraldton region.
• Aerial spraying of knockdown herbicides in minimum tillage systems. Already under trial.
• Applications of lime and use of specific nitrogen fertilisers to control increasing acidity problems on some wheatbelt soils. Already under trial.
• Varieties resistant to Septoria allowing much greater choice of planting time in high rainfall areas. In the breeding pipeline.
• Biological control of crop weeds and insect pests. Already under trial.
• Self-contained spray rigs that can be used at night.
• Energy saving systems where the farm either provides its own energy from grain alcohol, oilseeds or straw, or crop establishment systems which save energy by using less petroleum fuels. Both options are receiving worldwide attention.

More than 1,800 Western Australian farmers used the direct drilling system this year.

Farewell to the plough?
This season, Calingiri farmer F. McGill sowed 800 hectares of crop on his properties, under somewhat difficult seasonal conditions, without using a plough. The crop was all planted by the direct drilling system, using the "Sprayseed" chemical to kill the weeds.
More than 1,800 other Western Australian farmers also used the system. This represents about 20 per cent of the State's grain growers. Many of them are still in the exploratory stages, testing the system for themselves. But Mr McGill's experience tells him that once a farmer has become accustomed to direct drilling, he moves into bigger areas quickly.
He asks: "Why would farmers throw over a system that has been used for thousands of years, a system they know and are used to, in favour of this new and somewhat radical technique?"
His own answer, after 13 years of experience, is: "Because it allows me big savings on fuel, labour and machinery, it can give me a big increase in feed availability, it is good for my soil, and it allows me to increase the productivity of my farm."
He told the Seminar he is convinced that, whether farmers like it or not, they will be forced to adopt minimum tillage techniques because of energy and manpower shortages, "across the board" cost increases, and because of the need to preserve their soil.