# INTEGRATING WEED CONTROL WITH OTHER LAND MANAGEMENT PRACTICES

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Traditional farming practices in the grain growing industry have undergone major changes in recent years. The effect of these changes and the new management requirements necessary are summarized under the following categories:

1. The changing pattern of grain growing and inclusion of new cropping practices such as minimum cultivation, conservation tillage and continuous cropping.
2. The importance of economic weed and grass control to these different systems.
3. The major weeds relevant to these areas of grain production.
4. The long term effects of continuous use of a wide range of herbicides and the problem of herbicide resistance.

It may be necessary also to review a number of previously published papers to ascertain their level of acceptance and relevance. Also to look at further areas of research needed and the publication and circulation of results. Future research may go much further into areas such as plant technology and biological control. Gene transfer and gene resistance techniques to incorporate resistance in plants to insects and herbicides are currently being carried out at CSIRO.

The historic method of 2, 3 and 4 year rotations with pasture and fallow phases have largely been replaced by an estimated 90% of farmers in the Wimmera and Mallee who now apply one or more of the above mentioned practices. In many instances more than one system may be in operation at the same time requiring competent management of weeds and grasses in problem areas.

The remaining 10% who continue the traditional practices give a useful comparison of the different systems.

The changes in farming practices have resulted in a different emphasis in management. With the introduction of pulse and oilseed crops into the rotation, annual and perennial grasses which were previously acceptable as stock feed now need to be controlled. Much of this control needs to be implemented during the pasture phase where livestock is an integral part of the overall farm plan. Where continuous cropping is practised and no livestock are carried the spraying program is more specific. While this is a higher cost operation the current buoyant grain market prices make it attractive economically.

## MINIMUM CULTIVATION

This system has replaced conventional fallowing with chemical weed control, using knockdown herbicides and grazing. The use of livestock is a very worthwhile alternative as the carrying capacity of the property is greater than is possible under a fallow rotation cycle. It also gives the enterprise greater flexibility of production and is acknowledged to be less damaging to soil structure.

## CONSERVATION TILLAGE

Conservation tillage in some ways has similarities to ‘minimum cultivation’, but includes extensive use of the sulfonylurea and/or glyphosate group of herbicides to control weeds and grasses. They are applied during winter months thus greatly reducing grazing potential but gives effective early weed control.

Current research into long term use of sulfonylureas on alkaline soils has raised questions as to what (if any) adverse effects this practice may have on soil and future productivity. This concern is most relevant to the higher pH soils of the Victorian and South Australia Mallee areas.

Some farmers are looking at alternative herbicides particularly when sowing wheat, while barley seems to be less affected.

There is a definite need for more research in this area.

## CONTINUOUS CROPPING

Farmers using this system are producing a wide range of crops—cereals, pulses and oilseeds. The rotation of these crops and the selection of the correct soil type is critical to ensure maximum yields and avoid chemical residue in the soil from affecting subsequent crops.

A direct benefit to the long term cropping program where good grass control is evident is the control of root diseases. The most common root diseases in cereal crops are carried over by being hosted and multiplied in grass then immediately transferred to the next susceptible crop.

Barley grass in particular but brome grass and ryegrass are also prevalent.

The cereals most affected are non CCN resistant varieties of wheat e.g. Meering and schooner barley.

Each of the cropping systems outlined has special requirements for weed and grass control. Some are more specific but all require a high degree of competent

management and recognition. Good record keeping is also essential because in many cases a variety of herbicides or mixtures of chemicals are required.

Deciding which herbicide to use is becoming a complicated exercise because of the very extensive range of similar products available. Some of which have a residual effect in soil and may cause damage to the ensuing crops particularly legumes and oats.

Table 1, which is reprinted from an information sheet circulated on herbicide resistance, illustrates the point. The products have been classified into groups associating the various chemical characteristics and mode of action.

There are several factors which influence the farmer's decision as to which product or mixture of products is best suited to a particular crop situation.

Much of the information is obtained from the retailer or chemical company representatives, and may be biased towards a particular product especially if the company is offering incentives for successful sales.

**Table 1.** Herbicide groups with the same or similar modes of action.

| | |
|---|---|
| High risk | |
| Group A: | Hoegrass®, Nugrass®, Digrass®, Verdict®, Targa®, Fusilade®, Puma S®, Tristar®, Correct®, Sertin®, Achieve®, Gallant®, Topik® |
| Group B: | Glean®, Chlorsulfuron, Siege®, Tackle®, Ally®, Associate®, Logran®, Nugran®, Amber Post®, Londax®, Spinnaker®, Broadstrike®, Eclipse®, Renovate™ |
| Moderate risk | |
| Group C: | Simazine, Atrazine, Bladex®, Igran®, Metribuzin, Diuron, Linuron, Tribunil®, Bromoxynil, Jaguar®, Tough® |
| Group D: | Trifluralin, Stomp®, Yield®, Surflan® |
| Group E: | Avadex® BW, EPTC, Chlorpropham |
| Group F: | Brodal®, Tigrex®, Jaguar® |
| Group H: | Saturn® |
| Low risk | |
| Group I: | 2,4-D, MCPA, 2,4-DB, Dicamba, Tordon®, Lontrel®, Starane®, Garlon®, Baton®, Butress®, Trifolamine® |
| Group K: | Dual®, Kerb®, Mataven® |
| Group L: | Reglone®, Gramoxone®, Nuquat®, Spraytop® Sprayseed® |
| Group M: | Glyphosate, Glyphosate CT®, Roundup CT®, Touchdown®, Pacer®, Weedmaster® |

Groups G and J not included. List of commonly used products only. List of product does not necessarily imply State registration.

Newly developed products are usually introduced by an extensive advertising campaign as well as information nights, seminars and field days where comparisons and results can be illustrated. Most farmers avail themselves of these services in order to keep up with latest developments.

Previous experience is a major reason for selection and cost is a very important consideration.

## MAJOR PROBLEM WEEDS OF THE MALLEE AND WIMMERA

Brome grass, skeleton weed, amsinckia, wild radish and ryegrass are some of the main concerns affecting crop production in the Mallee and Wimmera areas.

In a pulse crop the control of grasses is usually carried out using Group A herbicides (Table 1). Broadleaf control has several herbicides available (Groups C and F), but because of problems of compatibility combining the control of grasses and broadleaf weeds in one operation is not usually recommended making it necessary to cover the paddock twice.

The increasing presence of skeleton weed is causing problems, particularly in the Mallee where large areas are becoming unsuitable for pulse production because of the presence of skeleton weed.

This indicates a failure to recognise the damaging potential of other forms of skeleton weed (forms B and C) which replaced the biotype (form A) controlled by rust.

The introduction of the rust fungus and subsequent almost complete absence of skeleton weed during the period 1970–90, coincided with a very large increase in the area sown to pulse crops. During this period a number of improved varieties of pulses were released (Dundale peas, Desivic chick peas and lupins suited to high alkaline soils) enabling farmers to diversify into the alternate cropping systems which are now universally in operation.

While skeleton weed can be controlled in cereal crops using Group I herbicides, the extra nitrogen required to be added to superphosphate and the reduction of options available to sow pulse crops as alternatives, has a direct negative economic effect on the farm operation.

Amsinckia and wild radish require mixtures of chemicals to control them in pulse crops and have a wide range of herbicides available for use on cereal crops.

The methods used for weed and grass control has often meant a change of strategy is required in order to maximize longer term benefits of a spraying management program.

The inclusion of pulse crops has been responsible for the introduction of new equipment to enable direct sowing into stubble. A popular method is the 'Jaenke' tyned

implement which is adapted to suit current machines and makes prior cultivation unnecessary. However, proper grass control requires a pre-sowing herbicide such as trifluralin at an increased rate to allow for some absorption by the stubble. Normally pulse crops are sown following a cereal crop but where brome grass is a problem the reverse may be necessary, i.e. sow the pulse crop, eradicate the brome grass, then follow with a cereal crop.

Brome grass control using a knock down herbicide in spring pasture before seed set, then grazing heavily has proved effective. However a late rain sometimes brings a second crop of brome grass which requires further attention.

In cropping phase if heavy infestation is expected, sowing may be delayed to enable either an extra cultivation or additional application of Roundup/glyphosate.

The use of trifluralin as a pre-sowing method has proved very successful in the control of weeds like ryegrass and hogweed. This system is probably the most widely used and is relatively cheap and effective.

Where a wider range of broadleaf weeds are expected some farmers prefer to spray pre-emergence with Glean. This often eliminates the need for post-emergence spraying.

## HERBICIDE RESISTANCE

A number of papers have been presented to previous conferences on this topic, but at that time it was not widely recognized as a problem in areas of the Mallee and Wimmera. Recently however there have been many articles in rural newspapers and industry magazines emphasizing the importance of herbicide resistance in ryegrass in particular. There is a definite need for more practical demonstrations of the problem now that an awareness has been created and the vast amount of information available needs to be promoted. The high cost of herbicides for grass control and the necessity for them to be successful should be sufficient incentive for farmers to address the issue.

Current research indicates a need for improved recognition and preventative measures to be implemented.

A positive effect of herbicide resistance can be illustrated using the present evidence of certain canola crop varieties showing resistance to triazine. While this may assist the implementation of a weed control program, there are problems such as residual effects which have to be considered especially when selling on domestic or international markets.

Another important factor is the problem of eliminating 'rogue' plants from the following crop as most marketeers have strict tolerances to foreign seeds. Presently almost all 'rogue' pulse and oilseed plants can be successfully sprayed out of cereals, but if herbicide resistant varieties are consistently sown in an effort to combat weed and grass control measures, then we may be replacing one problem with another.

## FUTURE NEEDS

Having outlined the changes in agricultural practices and the present management options available to practitioners, maybe we should 'crystal ball' and try to assess our needs and options for the future.

With the emphasis on quality of produce there is a great need for research into the problem of chemical residues in soil, water and produce. As mentioned earlier, consumers both domestic and on the international market are becoming very quality conscious. Any trace of chemical residue in food products either raw or processed is met with a resounding rejection. This puts a great responsibility on the producer to become proficient not only in the use of a very wide range of herbicides but also to understand their side effects and characteristics.

Farmers are in the unenviable position of having no option but to use these products in order to maintain production while at the same time risking their livelihood should they make the wrong decision.

Almost all of Australia's major exporting markets have nil tolerance to herbicide and pesticide residue in grain. They have developed highly sophisticated testing equipment which enables extremely accurate analysis of the product.

With the changing delivery and storage patterns within Australia there is a definite need for improved methods of treating and testing grain in order to avoid rejection upon delivery.

Agricultural Departments and the industry should be taking a positive step to introduce cultivars more suited to today's requirements.

There is scope for more refinement in the planning of crops-making sure the right type of crop is sown relative to soil type, rainfall, nutrition requirements and market demand.

The present programs of 'Farm Plan' and the extensive use of MEY check groups is heading towards this ideal.

Future research projects on all aspects of agricultural production should take full account of the economic impact of the research.

Since the funding for agricultural research has been rationalized, there is a much closer relationship between the needs of the industry and the type of projects being undertaken.

The GRDC is now responsible for a budget of tens of millions of dollars contributed by industry and Government towards the continuing need for research and improvements over the complete agricultural industry.

Embryo transplants such as currently being done with lupins to instill herbicide resistance may well be the beginning of a new era in plant technology and research.

## CIRCULATION OF INFORMATION

Much of the information presented to previous weeds conferences and current research projects, is circulated via targeted communications. The publication of GRDC 'Ground cover' has a wide circulation and is well received.

Similarly the 'Wimmera and Mallee Farmer' journals meet a very receptive market as they present the topics in a very readable form. Industry magazines such as CRT 'Agri News' and WM Sunraysia Ag-journal, are useful mediums as they allow farmers to familiarize themselves with current areas of research and recommendations.

In addition to this, there is scope for the use of electronic media to circulate information. The current trend of many farmers to use computers as a primary source of record keeping and fax machines for market information means there is a directly accessible method of communication available to the research industry.

## COMMUNITY PARTICIPATION

The involvement of community groups in weed control and crop management ventures has proved very successful. 'The Birchip Cropping Demonstration Group' is widely recognized for its practical application of a wide range of cropping, herbicide, and rotational trials. The results of this group's activities are widely circulated and their annual field day is very well attended.

Similarly a silverleaf nightshade containment program which has been in operation at Hopetoun since 1974 has successfully controlled the spread of silverleaf nightshade. This joint venture between a small group of adjoining landholders and the Department is a good example of how community based programs can work to the benefit of all surrounding landholders.

Further developments in technology such as Geographic Positioning System which is extensively used in agriculture overseas, would greatly enhance the ability of farmers to maximize production by positively identifying the most productive areas of their farm.

Soil analysis techniques already available used in conjunction with GPS also gives a variety of options to plant the most suitable and economically attractive crops available. The importance of the economic impact of research projects must be recognised by all participants. The traditional image of farming as a way of life has been superseded by the necessity for farms to be operated as a commercial business needing to remain viable in a difficult and competitive environment. Food production must still remain the most important option and it is necessary for everyone involved in any aspect of the industry to be positively focused on the future.