Agriculture

Growing Wheat

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Wheat is the most important cereal grain in world commerce. The framework for all winter crop production in Victoria is based on the principles and practice of successful wheat farming.

This Agriculture Note gives an overview of those principles.

See the Victorian Winter Crop Summary for an up to date guide to wheat varieties and last season's yield results. Additional information is available in other Agriculture Notes and in other publications, some of which are mentioned here.

Distribution of production

The area sown to wheat in Victoria has been increasing over the last 10 years. At the last census, 2005, it was estimated that 1.3 million hectares were sown to wheat but DEPI estimates for more recent seasons indicate that 1.6 million hectares has been sown each year. North west Victoria is the centre of wheat production in this State. The Mallee and Wimmera regions together account for about 75 per cent of total production.

Average production estimates have been compromised by well below average rainfall conditions in 2002, 2004, 2006, 2007 and 2008.

Table 1. Estimated wheat production for Victoria 2011

Region	Production (tonnes)	Area Hectares
Mallee	1,096,410	783,150
Wimmera	953,534	414,580
Northern Country and North East	745,125	275,972
Southern Victoria	336,000	140,000

Total	3,131,069	1,613,702

Wheat quality

A key profitability issue for the industry is ensuring that research continues to deliver improvements in wheat quality in order to increase market share in a competitive world arena. From the farmers viewpoint, continuous yield improvement is also important.

Wheat quality encompasses the suitability of particular varieties grown in certain environments for particular end uses. Standards for harvest segregations for quality are maintained by Grain Trade Australia and are based on consumer demand.

All wheat varieties in Australia have a classification based on processing and end product quality which along with a range of physical standards contributes to a marketing standard or segregation.

Segregations which account for the majority of the Victorian harvest are Australian Hard 1 (minimum protein 13.0%), Hard 2 (minimum protein 11.5%), Australian Premium White 1 (minimum protein 10.5%) and Australian Standard White (No minimum protein). Special categories of segregations are Australian Noodle, Australian Soft 1 and Australian Feed. Varieties not meeting the specifications of these segregations will be received as Australian General Purpose.

Information on the varieties appropriate to each segregation is available from the Grain Trade Australia web site; www.graintrade.org.au/commodity_standards

The high protein wheats sought by domestic millers for traditional bread products generally come from the Mallee. Deliveries which meet the receival specification are segregated as Vic Hard. Elsewhere, generally longer growing seasons give higher yields but also greater variability in wheat quality. Most of this wheat is segregated either as APW or ASW.

Feed wheats by definition are not suitable for milling, but often have the potential for high yields when compared to milling varieties.

Feed wheats are most suitable for the 600-800mm rainfall or irrigation areas. In order to realise potential yields of 5-10 tonnes/ha, these varieties must be sown early (mid-late April) in paddocks where moisture and nutrition are not limiting and the potential for waterlogging is mitigated. Other agronomic requirements are similar to those of the milling varieties.

Paddock selection and Crop sequence

Historically wheat was grown in a rotation with pastures and a period of fallow, often bare cultivated. The advent of a range of pulse and oilseed crops, favourable economic outcomes from cropping and with a deeper understanding of management of disease and fertility issues, crops are normally sown every year in the same paddock.

Rotation is now rarely used to describe cropping systems as flexibility is the key to success. Changes in crop choice can be made at sowing time based on several factors.

Pulses, oilseed crops and barley offer disease breaks for many wheat diseases and indeed differing genetic backgrounds of wheat varieties sometimes allow wheat to be sown in consecutive years. Incorporation of disease resistances into wheat has also virtually eliminated some diseases, such as cereal cyst nematode, and allowed more frequent sowing of wheat.

Wide row sowing with precision guidance techniques, where crops are sown in the gaps between the crop rows from the previous season, can also allow wheat to be sown more frequently.

Choice of paddock to sow wheat is therefore based on a range of issues. Economics, risk of production due to disease or weed pressures, herbicide options, seasonal forecasts, stored soil water and achieving a balance of risk with other crop types are some of the considerations which form choice of crop.

Seedbed preparation

Fig 1: Wheat sown between the rows of stubble from a previous cereal crop.

Preparation of a seedbed to ensure good seed soil contact was an important element in successful crop establishment. Minimum and no till crop production systems have however proved that a fine tilth for a seedbed is not so critical.

Advances in equipment for minimum and no till systems has incorporated sowing implements with tynes and press wheels that create furrows. The furrow harvests water into the seed row and the press wheels ensure good seed soil contact.

Shared knowledge within farmer groups has led to many of the changes in farming systems and these groups are a good source of advice relevant to a particular district.

Sowing

Timeliness of operations is a gift that farmers owe themselves. Seasonal variability always modifies a calendar decision, but whether the season breaks early or late, farmers need to be prepared. Every year there is a weather limit on the window of opportunity for sowing. Sowing requisites and equipment need to be ready to exploit that window.

A season which breaks in April is ideal because of the opportunity to use all options. Long season (winter) wheat varieties are sown first at the optimum time of mid-late April through to mid May (SW and NE Victoria), and mid season varieties follow in May/June. If the 'break' is later, the same principle applies except that in an extremely late season farmers would forego sowing long season wheats.

Recent experience has demonstrated the benefit of sowing a portion of the crop dry if a seasonal break has not been received by late April. These crops germinate rapidly when rain falls and generally make the best use of limited growing season rainfall.

Varieties

Wheat yield and quality is an outcome determined by the genetic potential of the variety interacting with the environment. The same variety may perform differently on a different soil type and rainfall regime. In the past, few options were available and meeting the segregations available at a local silo often determined choice of wheat variety.

Farmers now have a wide choice of wheat varieties and a range of marketing options. Individual research is required to determine the best choices. Sources of information are;

- the companies which market varieties,
- National Variety Trials, an online database www.nvtonline.com.au,
- local advisers and agronomists,
- DEPI Winter Crop Summary

Virtually all wheat varieties are now covered by Plant Breeders Rights which means a royalty or fee is payable to the breeder or owner of that variety for each tonne of grain that a farmer produces. Collection point for the royalty or fee may differ between varieties and growers need to be aware of individual arrangements.

Depth of sowing

Deep sowing may delay or stifle emergence, while shallow sowing risks seed damage from herbicide uptake. The length of the first shoot (coleoptile) has a bearing on depth of sowing. If a variety is sown deeper than the natural growth extension of the coleoptile then the seedling may not emerge. Most current varieties are derived from so called semi-dwarf lines which have shorter stems and shorter coleoptiles than older varieties.

Seasonal differences in depth and availability of moisture influence decisions about depth of sowing. A sowing depth between 25mm and 50mm, depending on soil type and available moisture, is a useful guide to sensible seed placement. In moist conditions shallower may encourage faster emergence and crop establishment.

Seeding rate

To achieve total ground cover and establish the foundation for maximum yield, a crop density of 150-200 plants per square metre is needed. This equates to a seeding rate of about 60kg/ha in lower rainfall zones (up to 400mm annual rainfall) and about 80-90kg/ha in the higher rainfall zones.

Sowing rate can be calculated by knowing the seed weight, germination percentage and the required plant density. For example: wheat seed with a seed weight of 4.5gm/100seeds, germination percentage of 95 per cent and a required plant density of 170 plants/m^2 = 4.5 x (10/95) x 170 = 80.5 kg/ha.

The source of seed is very important. Most farmers grow and store their own seed for use in the following year. However, when introducing a new variety or extra seed, it is sensible to source the best quality seed. If certified seed is not available, a thorough inspection for insects, weed seeds or mixed grains prior to purchase is the obvious precaution.

Seed dressings

Seed dressings for the control of smuts and bunts should be applied to all wheat seed prior to sowing. Although major losses from these diseases are now rare, this is due to the routine use of seed treatments. Seed not treated prior to sowing may result in yield losses as high as 85 per cent. Information on seed borne diseases managed by seed dressings is available in the Agriculture Note; Bunts and Smuts of Cereals.

Some seed dressings can also suppress a selection of wind or stubble borne diseases, however some chemicals can reduce coleoptile length. For more information on this refer to the factsheet on Cereal Seed Treatments, from the PIRSA Factsheet Library. Advice on products and application rates is also available from cropping advisors or chemical resellers.

Crop nutrition

Soil tests are available to assist in the assessment of paddock nutrient status.

Adequate phosphorus is essential for the early growth of wheat. Most Victorian soils are low in available phosphorus, and much of the crop requirement will need to be supplied through the application of fertilisers at sowing time. Paddock history of phosphorus application and crop yields, in conjunction with soil test results and economics of application will determine the rates required.

The rule of thumb is a requirement for 3kg/ha of available phosphorus for each tonne of wheat anticipated. The application is then adjusted in the light of soil test results.

Table 3. Adequate soil phosphorous ranges (Colwell) for different soil types.

Soil test reading (Colwell)	Soil type
20 - 30 mg/kg	sand
25 - 35 mg/kg	loam
30 - 40 mg/kg	clay

Nitrogen availability is equally important. Besides its role in plant growth, the availability of soil nitrogen at grain fill, along with soil moisture, is the key determinant of grain protein. The farmer has a high degree of control over nitrogen build up and availability through the choice of crop sequences, use of long fallow and tillage methods. The availability of nitrogen in the soil will be affected by many factors: soil organic matter, paddock history including fallowing, soil type, moisture content, time of year and tillage methods. High yields are a drain on soil nitrogen. Conversely, low yield and summer rain to mineralise nitrogen can mobilise soil nitrogen for the next crop. Soil tests for N assessment should be done as close as possible to sowing time and at the same time each year.

Cropping advisors are a good source of support in determining fertiliser application strategies.

Crop management

Fig 2: Healthy wheat heads

Crops should be monitored to gauge early crop growth: emergence, seedling density, weed population, presence of insects and disease and general crop health. All these factors impinge on the potential grain yield. Records of rainfall received and soil water to maximum rooting depth at sowing and harvest will allow the farmer to assess the WUE (water use efficiency) of the crop.

WUE = kg grain/mm effective growing season rainfall/hectare.

Wheat has a potential WUE of approximately 20kg/mm/ha. A crop reaching 80 per cent or more of its potential WUE reflects good management.

Weed management

To achieve maximum potential yields, early planning for weed control is essential. Weed assessment of the paddock should commence the year prior to cropping. This will guide the farmer to choose the appropriate weed control strategy required: winter cleaning of pastures, control of grass weeds in broadleaf crops or chemical fallowing. Weeds encourage the transfer of disease and pests and use nutrients and moisture that could be converted into grain by the crop.

Once a weed problem is encountered there is a wide range of herbicide options available to control them. Not only is the immediate removal of weeds important but there is a need to avoid developing resistance to a particular herbicide or group of herbicides.

Rotation of herbicide groups is an important consideration as well as any potential residual issues for subsequent crop choices.

Consulting cropping advisors and resellers is recommended for both the choice of a tactical option to control weeds and to develop longer term weed management strategies.

Marketing

An estimated 50 per cent or more of the wheat produced in Victoria is consumed locally, within the state. This is as milling wheat, stockfeed and other uses such as starch production. The rest is exported where prices are very dependent on the volatile world market.

In years of high yields a greater portion of the crop will be available for export.

Deregulation in 2008 has meant that the dynamics of the Australian Wheat Market is less certain. Growers now have four major options from which to plan a marketing strategy; sell for cash, warehouse and sell later, store on farm and sell later or pool.

Plant breeders are producing varieties which offer a range of traits, one of which is grain quality. Wheat growers are responsive to market demands and choose varieties which offer the best financial returns. It is important for growers to determine which varieties are best suited for their district and one factor in that choice is which market will that product be suitable for and will that market accept the grain produced.

Further Reading

- Cereal Disease Guide and a range of agriculture notes on wheat diseases
- Victorian Winter Crop Summary
- SARDI Fact Sheet: Cereal Seed Treatments, from the PIRSA Factsheet Library
- Wallwork, H (ed) (2000) Cereal Leaf and Stem Diseases GRDC, ACT.
- Wallwork, H (ed) (2000) Cereal Root and Crown Diseases GRDC, ACT.

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