Management for the wheat crop

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Introduction

I will address wheat management in terms of the synthesis/balance of management practices, strategies for maximising economic return, and sustaining production and yield.

A dictionary defines synthesis as: "the putting together of all parts to make up the whole". Thus, I hope to bring together the important aspects highlighted in the previous papers and consider them in the context of maximising returns and sustaining or improving production and yield.

This will not constitute a detailed wheat management package, as I trust all growers in the audience already possess up to date examples of what is available. Rather, I will address the topic under the headings Planning, Crop Management, Harvesting and Storage, and Monitoring

Planning

Planning is essential for success in any business. Growing wheat is no different in that respect.

Early decisions must identify suitable paddocks or areas. These will depend on existing rotations and the type of wheat to be grown. Rotations vary widely but a sustainable rotation comprising legumes and a short time in grass (seed or pasture) will preserve soil structure and break cereal disease cycles. Paddocks coming out of pasture or legumes will suit milling and durum wheat types while biscuit and feed wheats can be sown later in the arable phase of the rotation.

The Autumn or Spring Wheat Recommended Lists, shown today by Bill Griffin, will greatly assist in cultivar choice - although a lack of availability of mill contracts may restrict the range of choice. These Lists are supported and funded by the entire industry and provide objective yield comparisons across the different cultivars available. I strongly recommend these to growers.

The other important factor to establish at the planning stage is the maximum realistic yield potential. All previous speakers have referred to this in one way or another. It is the cornerstone upon which all subsequent management decisions are based.

In his account of the physiological and agronomic limits to wheat yield and quality, Peter Jamieson made the point that in growing conditions typical of Canterbury, it is important to not push a crop beyond a realistic yield expectation with excessive inputs.

He pointed out that the potential of both yield and quality is set by the start of the grain filling stage and can be assessed by:

1. the quantity of dry matter present;
2. the N content of the dry matter;
3. the number of grains set.

Management and weather conditions during the grain filling stages determine the extent to which this potential is realised. Therefore, it is important to decide whether a paddock or an area is to be managed for 4-5 t/ha, 6-7 t/ha or 8-9 t/ha.

Growers uncertain of the yield potential of their situations should refer to their average yields over the previous three years, although examination of wheat trials under conditions similar to their own is also advisable. The maximum yield potential established by these trials may be a source of some surprise.

Crop Management

Management is the one factor over which growers have complete control and is also, as discussed by Peter Jamieson, one of the major factors which determines ultimate yield and quality.

The essence of good management is the making of sound and timely decisions.

This presentation assumes growers have a sound understanding of cultivation techniques, sowing rates and depths, seed placement and other aspects of crop establishment. I will discuss soil fertility, water use, and weed, pest and disease control.

Soil Fertility

Soil fertility is a complex factor and has been ably described by Warwick Scott in his video presentation as being more than merely N, P, K & S. It includes

numerous other components such as soil structure, depth and aeration to name but a few.

Availability of P, K, S and trace elements are each important in maximising the potential of the crop, but by far the most essential element is nitrogen. Whether it is supplied from the soil or a bag is unimportant; the quantities available and the timing of availability are, on the other hand, extremely important. In achieving maximum yield and quality, these two factors are paramount.

Growers have total control over the quantities of N available to their wheat crops. The correct amount to apply varies with the yield potential, paddock history and winter rainfall. N soil tests and/or the N index help to determine N reserves in the soil while N-sap tests provide a guide for applications from the bag.

Application quantities. Steps to establish quantities to apply are as follows:

1. Assess the likely yield of the paddock if no N was applied.
2. Estimate the realistic yield potential if sufficient N was applied.
3. The difference is the yield which must be supported by N.
4. Each tonne per hectare requires at least 25 kg of N.

Example: If the estimated yield of a paddock without applied N is 3.0 t/ha (perhaps following cereals), and the realistic yield potential is 7.0 t/ha, then 4.0 tonnes of yield must be supported by N. The amount to be applied is 100 kg (4.0 x 25 kg)/ha. If, however, the realistic yield potential is only 4.0 t/ha, then only 1.0 tonne needs to be supported by N and 25 kg (1.0 x 25)/ha needs to be applied.

Application Timing. Warwick Scott stated that it is possible to achieve high yields with high levels of grain protein. He also explained nitrogen's impact on yield and quality. A full understanding of these explanations is necessary if correct decisions regarding timing of N applications are to be made.

N must be in the ground and available to plants before GS 5 (refer Chart opposite). Later applications (GS 8-10) of approximately 30 kg/ha will not result in economic yield increases but can, on average, be expected to increase protein levels by 1.0%. Warwick Scott showed similar increases of 0.2% N ≈ 1.0% protein.

Autumn sown crops: Generally at GS 4, but where more than 60 k/ha is to be applied, dressing split between one third at GS 2 and two thirds at GS 5 should be considered. A minimum of 30 kg/ha should be applied at GS 9-10.1 (before ear emergence) to maintain quality and achieve high protein levels.

Spring sown crops: Generally should be split between sowing and GS 2 but in later sowings all the N should be applied to the seedbed, although quantities in excess of 40 kg/ha should not be sown with seed. To maintain quality and achieve high protein levels, 30 kg/ha should be applied at GS 9-10 (before ear emergence).

Water Use

Tony Davoren's excellent paper highlighted yield limitations in different localities. This emphasises that growers must be honest with themselves in determining yield potentials for their crops. In areas most affected by northwesterly winds maximum yields under irrigation are 6-7 t/ha while irrigation in areas not thus affected can result in 10.0 t/ha.

Where irrigation is not available on lighter soils in northwesterly wind prone areas, the maximum yield potential falls to 3-5 t/ha. Heavier soils in areas not affected by wind can, without irrigation, produce yields close to those of crops which have been irrigated.

Another important issue for growers with irrigation on lighter soils exposed to the northwesterly, is whether the irrigation system will be fully available for the wheat crop or only partially available. If the latter is the case, the maximum yield potential will be reduced as will the level of some other inputs, notably N.

A key point made by Tony Davoren was that improved irrigation management is the most important contributor to optimum yields and that the most common mistakes made by irrigating farmers are:

- beginning too late
- irrigating too frequently
- applying too much water
- stopping too soon

It is not appropriate for me to present a recipe for water use on wheat crops because growers with irrigation are well aware that the availability of water from the soil profile and rainfall varies each year. However, I would say that in order to maximise returns from the investment in irrigation, growers must use all available services to assist them in making correct decisions regarding timing of water applications and quantities to apply. This is especially critical in areas where the cost of applied water is high (eg the cost at Kirwee is over three times that at Irwell).

These services are available from people such as Tony Davoren and they should be used.

Weed, pest and disease control

Control of problem weeds, pests and diseases is essential if maximum crop potential and profit are to be achieved in wheat. While the costs of inputs which enable this control are significant, they should be likened to insurance premiums.

For example, the costs of a tank-mix of herbicide and fungicide, followed by a late fungicide after ear emergence are approximately $150/ha, whereas the total investment in that hectare of wheat is $700. Another perspective is that little more than half a tonne of wheat, at present day prices, will ensure that yield potential is realised at an acceptable level of quality.

Chemicals are necessary to achieve maximum yield potential, but growers must act sensibly and use them only as they are required.

Again, this presentation will not cover the detail of chemical control regimes. This was well covered by Matthew Cromey. I will only comment that the protection of the emerging ear and the maintenance of a clean green flag leaf are critical to the achievement of maximum yield potential

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Harvesting and Storage

This topic has not been discussed in any detail today, perhaps because it is not considered to be a major limitation to production and quality. I would agree, but would emphasise that it is an important component of the overall management regime which must not be overlooked.

There is little point in making the best use of all the technical information available if the crop is not harvested on time (or in some areas just before it is "ready") in order to preserve the quality which has been produced. This applies particularly to Otane, which is prone to low falling number tests if the mature crop is left standing in damp conditions.

Growers must ensure that hygiene in all harvesting, transport and storage equipment is under control. It is essential that all equipment, including grain augers, are cleaned thoroughly prior to the harvest of the new season's crop.

Safe storage conditions are also important, especially where the wheat may need to be stored for a period of time. Reports are beginning to circulate about mycotoxins and aflotoxins in grains stored for the feed industry. It may not be long before this is a major concern in respect of products intended for human consumption.

Monitoring

Important crop decisions cannot be made at the kitchen table or in the comfort of a heated tractor cab. The wheat crop must be inspected regularly.

Growers who use a growth stage chart (e.g., Fig. 1) and are familiar with it, are well placed to make timely decisions on applications of nitrogen and agrochemicals, but only if they combine that information with up-to-the-minute knowledge of the condition of their crops.

Remember the advice issued by Barnaby Googe in 1577: "The best dung for the ground is the master's foot".