IMPROVING WHEAT YIELDS - A POSITIVE APPROACH REQUIRED

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The theme of this session has concerned the production of a 10t/ha wheat crop. I believe this can be done. I feel we should adopt a more positive attitude to growing wheat. I believe the days are gone when you drill the crop, shut the gate and do not go back until the day you put the header into the paddock.

In the past the weather has been blamed for most of crop yields generally not living up to expectations. Indirectly this may be so but in my opinion the main reason for failures has been a general lack of awareness of the necessary husbandry factors required to grow a high yielding crop.

You will all have experienced the situation when you have ordered top quality seed from the merchant, prepared the ground well, drilled the crop carefully and thought you have paved the way towards a record yield. It is amazing how your hopes of a 6.7 t/ha (100 bu/ac) crop are dashed as nutrient deficiencies, weeds, pests, disease and weather prune the ultimate yield back to the usual 3 - 3.5 t/ha. This situation occurs largely because the crop is continually adjusting - usually downwards - to the changes occurring in the growing environment. If, however, you

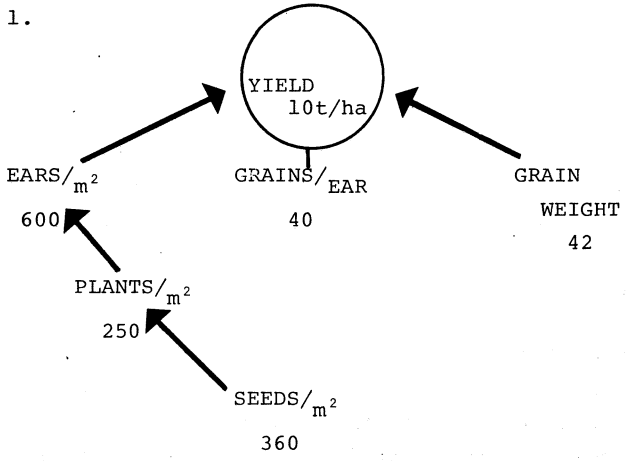
can exert sufficient influence on the crop by way of husbandry to ensure the downward spiral is avoided, then higher yields will be achieved.

Rather than feeling satisfied if your yield sneaks up a few kilograms from your past average, it may be a more positive approach to say to yourself, "Why don't I get the maximum yield for my farm?". If you understand the reasons for past failures then you can do something about avoiding repeat performances in the future.

COMPONENTS OF THE TEN TONNE YIELD

Figure 1 traces the chain of events that lead to the final yield components of a wheat crop.

FIGURE 1.



If we assume 10t/ha is our target we must aim for 600 harvestable ears per square metre, 40 grains per ear and a thousand grain seed weight of 42 gms. If our target is somewhat less the figures will of course be lower.

In order to obtain 600 ears we must aim for at least 250 plants per square metre established in an autumn crop. To obtain this number we will probably have to drill 360 seeds per square metre if we assume a 70% field establishment. In order to get the correct seed weight to sow, in kilograms per hectare, multiply the thousand grain seed weight by 3.6. At this stage three things become apparent. You must be able to count, you need access to weighing scales to determine what your seed weight is, and a quadrat to help sample the plant and ear numbers in your crop.

Seed merchants are now giving the thousand grain seed weight on the lines of seed but failing this it is a simple matter to weigh two lots of 200 seeds on some sensitive scales at the firm, chemist, M.A.F. or other source.

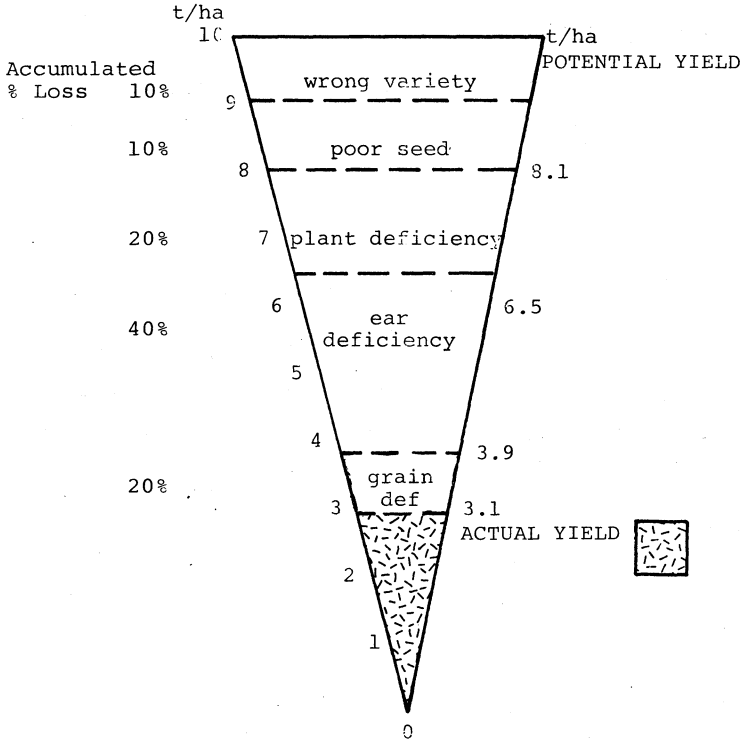
A necessary item is a simple one tenth of a square metre quadrat. This can be made from No 8 wire. It should be shaped like a two pronged fork with each prong 38 cms long. The distance between the prongs should be 22 cms if the crop has been drilled in 15 cm rows. Lay the quadrat across three rows of crop and multiply the number of plants and tillers by 10 to get the number per square metre. Take 15 to 20 samples per paddock to get the average for the crop.

YIELD LOSSES

Now that we have got the target figures in mind and the necessary tools of trade we can now examine our crop with some objectivity.

It can be seen that the losses in yield potential accumulate as various limiting factors show up during the growing period of the crop. Many of these limiting factors

FIGURE 2. YIELD LOSSES IN WHEAT



result from incorrect man-made decisions.

I shall highlight the main factors which I feel are contributing to poor yielding crops.

Variety

Firstly the correct wheat variety should be chosen for

your farm. If a variety is chosen that yields 10% less than another grown under the same conditions, then you are immediately limiting the potential yield of the crop, and it is not even in the ground.

If we assume that our potential for one particular variety is 10 t/ha, then by choosing the wrong variety we now have a yield potential 10% less - 9 t/ha.

Plant deficiency

The importance of sufficient plants per unit area has been stressed. If poor seed is sown which has poor germination then our target of 250 plants per square metre will not be achieved and again we are limiting our yield further. Drilling too late, too deep, and too fast will result in poor establishment. The adverse effects of pests such as slugs, grassgrub, wireworms and birds must also be avoided in attempting to obtain a satisfactory establishment. Our yield potential may be cut back a further 20 - 30% through management mistakes made at this stage and our yield potential may now only be 6.5 t/ha.

It would still be a good crop if it did yield at that level but more problems are likely to occur yet before the crop is harvested. The average number of plants per square metre in North Canterbury crops is about 150 - 200.

Ear deficiency

The main yield component is ears per square metre and it is important that further losses in potential are minimized at this stage of crop growth.

Some of the main factors causing ear deficiency are nitrogen shortage at tillering, speckled leaf blotch, and moisture stress, particularly in spring crops. Some of these adverse effects can be avoided through improved husbandry methods. Whereas 600 ears per square metre or more is a desirable level for a high yielding crop, most crops I have examined in North Canterbury usually only have 300 - 350 ears per square metre. This is the main factor limiting yields in this region.

Grain deficiency

Further losses occur from growth stage 5 onwards when the number of grains/ear and grain size is determined.

The usual numbers of grains per ear in our district is 25 - 30/ear against our target figure of 40. Grain size is the final component determined and is satisfactory in most crops providing the flag and second leaves remain healthy whilst the grain is filling.

Factors which play a part in limiting these components from growth stage 5 onwards include, moisture stress, nitrogen deficiency, weed competition, fungal diseases such as rust and mildew, grain aphids and wind damage.

Harvest and storage losses

Even when the crop is ready for harvest problems continue to occur as most farmers are well aware. If you have managed a crop successfully to this stage it is logical to ensure the crop is harvested when fit, with a well-adjusted header and stored in dry, hygenic conditions until disposal to the market.

It can be seen from the diagram that yield losses are cummulative and the gradual decline from our target of 10 t/ha to the average crop yield of about 3 t/ha is easily explained. A wrong decision early in the growth of the crop can have a more drastic effect on final yield than a wrong decision when most yield components are determined.

Although some compensation occurs within yield components, this compensation is usually only partial and gradual decline in yield potential still occurs.

For example. A crop may have insufficient plants per unit area and as a result produce more tillers to occupy the available space. However, these secondary tillers will not yield as well as more plants with more primary tillers so the crop yield potential declines.

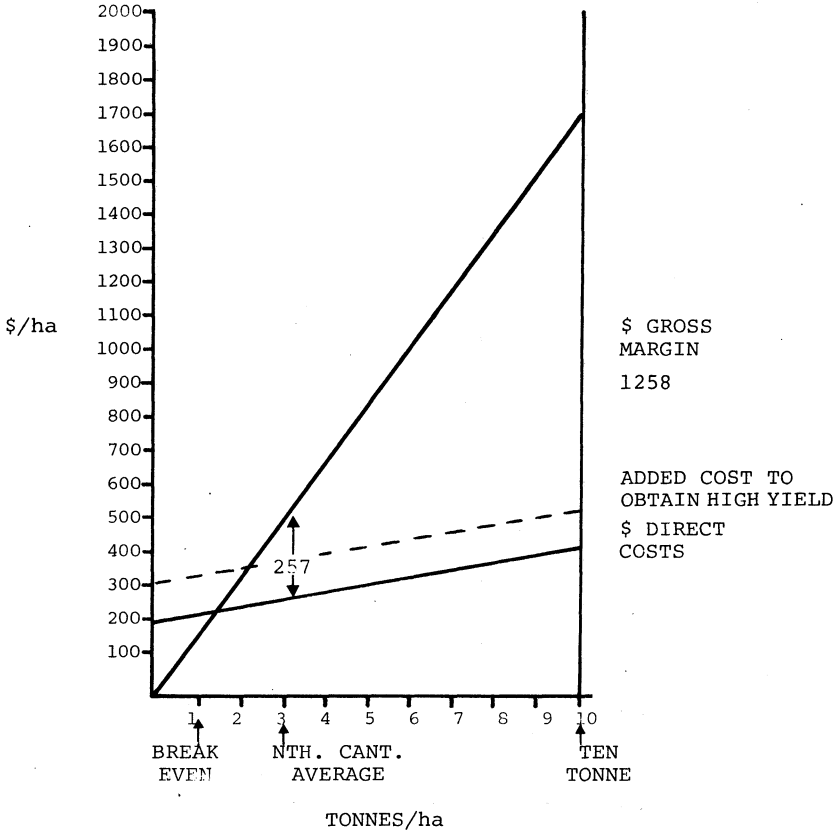
ECONOMICS

Figure 3 shows that the gross margin increases from $257/ha to $1258 as the yield increases from 3 t/ha to 10 t/ha. If we superimpose the added cost of disease control and nitrogen, another 1.02 t/ha is required to cover these inputs. If less nitrogen or disease control sprays are required, the cost will of course be less. There is considerable scope to improve yields profitably even allowing for the extra costs incurred in trying to maximize yields.

CONCLUSION

I have pointed out how some of the yield potential in our wheat crops is never realised due to insufficient attention by farmers to the husbandry factors affecting the yield

FIGURE 3. PROFITABILITY OF WHEAT



components. Furthermore I have illustrated the effect of increased yield on crop profitability with some allowance for increased inputs.

Scope exists for most wheat growers to dramatically increase their wheat yields using the principles outlined

in earlier papers and it is economically desirable for them to do so. I would like to list some of the main considerations that Messrs Batey, McCloy and I consider important in achieving a high yielding wheat crop.

OUR TAKE HOME MESSAGE

* Select a suitable paddock.

* Sow correct cultivar at correct weight per hectare - aim for 250 p/m^2.

* Drill in May 5 - 6 cm deep < 8 k.p.h.
- aphicide if necessary.

* Apply seed bed P, N and K as indicated by soil test and paddock history.

* Apply fungicide third week August to control speckled leaf blotch and eyespot.

* Apply N. G.S. 2 - 3 if poor plant population
G.S. 4 - 5 if good population.

* Weed spray and cycocel. G.S. 6 if required.

* Irrigate to f.c. at G.S. 9 - 10 Aut
G.S. 3 - 5 - 8 - 10 Sp or
as required.

* Apply fungicide late Nov/Dec for rust and mildew if present.

* Aphicide if required.

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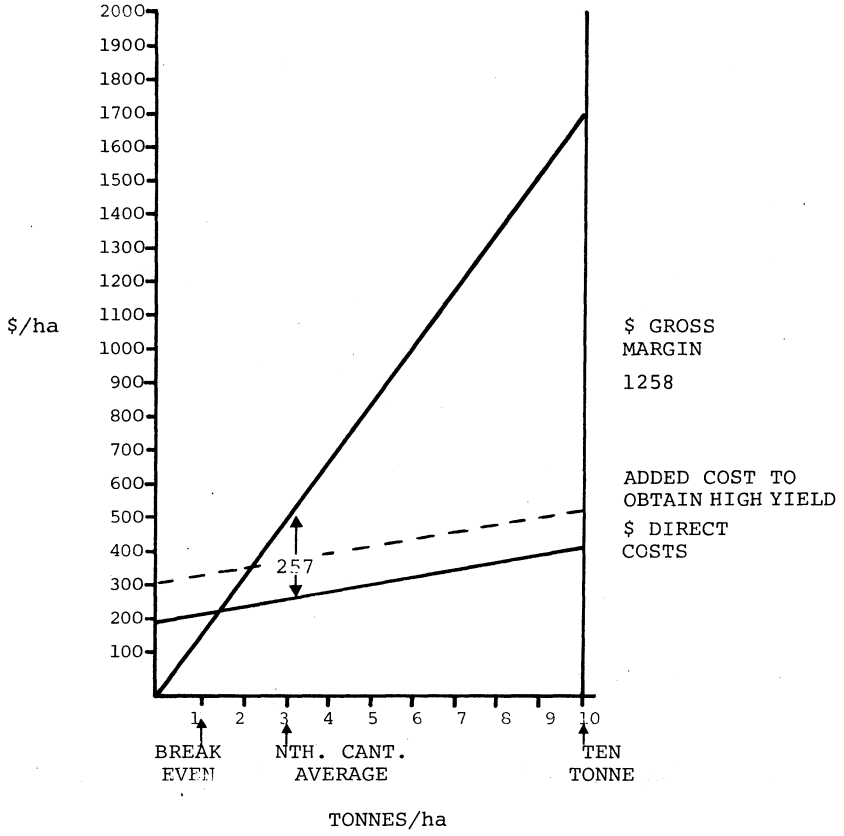

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* Harvest when mature and dry if necessary.

* Store in dry, pest + vermin free conditions.

G.S. = Feekes Growth Stage.