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Comparison of economic returns from grain crops

H. M. Fisher,
Wheat and Sheep Division

New crop varieties and production methods, or changes in prices and costs, can result in marked changes in relative profitability.

To determine which grain crop is most profitable, farmers need to know not only the current costs of production and ruling prices for grain, but also the relative yields of crops in their districts.

It is not possible for most farmers to compare crop yields accurately because true comparisons require controlled conditions and need to be made over many seasons and soil types.

The comparisons may also be affected by the varieties used and the manner of growing the crops, such as time of sowing. Where new varieties are involved a farmer may have little or no experience of performance on his own farm, so cannot make a comparison.

The Department of Agriculture has reliable information on relative yields from its regional variety testing programme. These yields, combined with likely costs and prices, have been used to predict the most profitable crops for different areas of W.A.*

Five years ago there was little challenge to wheat as the most profitable crop, with barley and oats giving about 60 per cent and 50 per cent respectively of the returns from wheat.

With new varieties and changes in prices and costs, a review was needed.

Variety trials
Since 1966, over 2000 crop variety trials have been sown throughout the cereal areas. They are sown systematically at some 45 different sites each year.

Most of the trials have been with wheat, oats and barley varieties but lupin varieties have also been widely tested in recent years. Others have been field peas, vetches, linseed, rape, safflower and sunflower.

The trial sites are chosen in a pattern to test the effects of the environment. From north to south the cereal belt is divided into five zones and from east to west there are three rainfall regions.

Crop trials at each site are usually sown side by side on the same soil type with the same land preparation and as nearly as possible on the same day. Most sites are on farmers’ properties in crop paddocks so that each site is treated essentially the same as the adjacent crop.

Every effort is made for each crop to give the best yield the season will allow. Rates of seed superphosphate, trace elements and nitrogen are based on practical requirements for the area.

Yields from these trials have been used to calculate crop profitability because they have provided direct comparisons between varieties and crops.

**Varieties**

Over the last 10 years several new varieties have appeared, including Dampier and Clipper barleys, West oats, Glenelg linseed, Unicrop lupins, Span rape and Derrimut peas. Wheat varieties have remained relatively stable, with Gamenya as the main variety, although the recent introduction of Egret should improve yields in the soft wheat areas.

Trials in 1972, 1973 and 1974 have contained the new varieties likely to be available to farmers over the next few years. Results of these trials should therefore allow a useful comparison of profitabilities.

An important problem is the choice of varieties to be compared. Yields of varieties vary according to area and growing conditions and it is obviously not satisfactory to choose a single variety of each crop for overall comparison. For example, Gamenya wheat could reasonably be compared with Swan oats if both were sown in early June but the yield of wheat might be underestimated if the crops were to be sown early; Falcon or Darkan wheats often yield more than Gamenya when sown early because they are less affected by Septoria.

**Relative crop yields**

The best comparison is therefore one in which each crop is allowed to perform to the best of its ability.

Accordingly, from each crop at each site the highest yield achieved by an individual variety was used in the calculations for this article.

Table 1 shows how the yields compared in different regions. In this case the “average maximum” yields of different crops have been expressed as a percentage of wheat.
yield. Only those cases in which the different crops could be directly compared with wheat have been used.

Table 1 compares to variations of actual yield in tonnes/ha. In comparing yields on the old bushels per acre basis, one tonne per acre of yield converts to approximately 15 bushels per acre of wheat, lupins or peas, 18 bushels per acre of barley and 22 bushels per acre of oats.

The results show that in the three years 1972 to 74 barley averaged 3 per cent more yield than wheat overall; in the high rainfall areas, barley yielded an average of 9 per cent more than wheat. In some areas, such as both northern and southern zones, average barley yields rose to 15 per cent above wheat yields.

This result includes the poor barley yields of 1974. The longer term yield advantage of barley over wheat is expected to be about 10 per cent overall, rising to 20 per cent in some southern areas.

Oats by contrast yielded 9 per cent less than wheat overall, but tended to equal wheat in tonnes per hectare yield in southern high-rainfall areas.

Lupins and linseed were the other crops tested over the three years. The yields were less than two thirds of wheat’s yield.

In earlier trials, peas gave similar yields to lupins while vetches and rape produced lower yields. Sunflower and safflower gave extremely poor yields in most areas.

Relative yields vary with conditions as well as area. This is illustrated by the effect of broad changes in sowing time shown in Table 2. Barley apparently improves relative to wheat with later sowing while oats tend to decline.

Farm yields
Actual trial yields have been used in calculating net profit. Substituting actual farm yields should not appreciably alter relative net profits, assuming that the percentage relationship between yields of crops on farms is the same as in trials.

However, farmers’ own records of yields from wheat and other crops may not allow a fair comparison because of the different conditions under which the various crops are usually grown even when sown in the same paddock.

It is therefore suggested that to compare crop yields on his own farm a farmer should first establish his actual average wheat yield per hectare then apply the appropriate percentage figures from Table 1 to obtain the corresponding yields of other crops for the same conditions.

Costs
Escalating costs constantly threaten profitability of all crops. The relationship of costs for different crops remains fairly constant, however, unless unusual factors arise such as the need to combat a new insect pest or disease in a particular crop.

Table 3.—Production costs of crops.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Variable costs $/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linseed</td>
<td>61</td>
</tr>
<tr>
<td>Safflower</td>
<td>57</td>
</tr>
<tr>
<td>Sunflower</td>
<td>54</td>
</tr>
<tr>
<td>Wheat</td>
<td>52</td>
</tr>
<tr>
<td>Lupins</td>
<td>52</td>
</tr>
<tr>
<td>Field peas</td>
<td>51</td>
</tr>
<tr>
<td>Rape</td>
<td>51</td>
</tr>
<tr>
<td>Barley</td>
<td>50</td>
</tr>
<tr>
<td>Oats</td>
<td>48</td>
</tr>
<tr>
<td>Vetches</td>
<td>46</td>
</tr>
</tbody>
</table>

To compare profitability the farmer needs to know the likely cost of growing each crop, to establish differences in costs between crops.

Estimated costs of growing different crops are shown in Table 3. Details of the method of calculating these costs are available from the author.

The figures show that production costs do vary considerably. Wheat, lupins, field peas, rape and barley are estimated to cost just over $50 per hectare to grow. Costs for oats and vetches are lower but linseed, safflower and sunflower are more costly to grow.

Table 3 considered in relation to prices in Table 4 also indicates the overall yield needed to cover variable costs. For example, with lupin grain returning $65 per tonne at the farm gate, about 0.8 tonnes per hectare would have to be produced to cover variable costs.

Prices
In the profitability estimates, the most important item, and the one most likely to fluctuate relatively between crops, is the price received for the grain.

Prices used are shown in Table 4. As indicated the “on farm” price is obtained by deducting $10 per tonne from the f.o.b. price to cover cartage from farm to siding, rail freight to port and general handling charges. Only an estimate is required as most crops have similar charges and it is necessary mainly to establish relative returns at the farm gate.

Crops as alternatives
In this analysis only returns from production of grain for export are considered. The major crops are those with export potential and export prices for grain largely determine the profitability of each when grown on a large scale.

However, there will be other uses and outlets for particular crops and other factors which could affect profitability. The higher value of lupin residues after harvest compared with cereal stubbles for stock could add to profitability and be very important to some farmers. Residues from other crops, such as linseed, may have little value.
Crops have been considered only as alternatives for growing on the same area of land sown at the same time. No account is taken of special benefits from sowing certain crops always in specific situations or at particular times. Oats, for example, may well grow better than wheat or barley when sown early in wet situations where diseases reduce the yield of wheat and barley. Lupins and cereal rye may grow better than wheat on some poorer sandy soils. Also, early sowing of lupins or oats may fit in better with overall management and allow better use of machinery and other resources.

Individual farmers will know the value of each of these aspects for their own circumstances and can allow for them in their own comparisons.

This article discusses only the basic broad area situations on farms where a range of crops can be successfully grown for grain for delivery.

Comparison of returns

Net returns can be compared by combining the on-farm prices, comparative crop yields and relevant costs.

The comparison is simplified by considering net returns from different crops as a percentage of net returns from wheat. For example, a net return of 50 per cent of wheat means that for every $100 profit made from wheat, the crop concerned will return only $50 if grown on the same land under the same conditions.

The graphs (Figure 1) indicate the relative profitability of different crops over broad regions. Results for peas, vetches, rape, safflower and sunflower are based on direct comparisons with wheat in the five-year period up to 1972. The estimates previously made for 1971 are also shown.

Figure 1 shows the overall dominance of wheat (priced as Australian Standard White grade) as the most profitable crop.

Barley (manufacturing grade) is undoubtedly the next best proposition in most areas. In both northern and southern zones (not shown) the return nearly equals wheat return. Taking into account the better first advance paid for barley compared with wheat the crop is an attractive one for many areas. Prospects for barley improve further under some conditions, including sowing later or on saline soils.

Linseed is very profitable in high rainfall southern areas. The high yielding Glenelg variety from Victoria has contributed much to linseed’s profitability. Continued good returns will depend on high prices for linseed such as those over the past two or three seasons.

Rape has also given good returns under disease-free conditions. However, reduced yields due to blackleg turn. Taking into account the better first advance paid for barley compared with wheat the crop is an attractive one for many areas. Prospects for barley improve further under some conditions, including sowing later or on saline soils.

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### Table 4.—Estimated prices, 1976/77°.

<table>
<thead>
<tr>
<th>Crop</th>
<th>Price/tonne at port</th>
<th>Freight etc</th>
<th>Price/tonne at farm gate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
<td>$100</td>
<td>$10</td>
<td>$90</td>
</tr>
<tr>
<td>Barley</td>
<td>$85</td>
<td>$10</td>
<td>$75</td>
</tr>
<tr>
<td>Oats</td>
<td>$70</td>
<td>$10</td>
<td>$60</td>
</tr>
<tr>
<td>Lupins</td>
<td>$75</td>
<td>$10</td>
<td>$65</td>
</tr>
<tr>
<td>Field Peas</td>
<td>$70</td>
<td>$10</td>
<td>$65</td>
</tr>
<tr>
<td>Vetches</td>
<td>$70</td>
<td>$10</td>
<td>$60</td>
</tr>
<tr>
<td>Linseed</td>
<td>$140</td>
<td>$10</td>
<td>$130</td>
</tr>
<tr>
<td>Rape</td>
<td>$120</td>
<td>$10</td>
<td>$110</td>
</tr>
<tr>
<td>Safflower</td>
<td>$120</td>
<td>$10</td>
<td>$110</td>
</tr>
<tr>
<td>Sunflower</td>
<td>$120</td>
<td>$10</td>
<td>$110</td>
</tr>
</tbody>
</table>

Estimated prices for 1976/77—prices for field peas, vetches, safflower and sunflower are assumed to be related to similar grains sold on a commercial scale.

Individual farmers will know the value of each of these aspects for their own circumstances and can allow for them in their own comparisons.

This article discusses only the basic broad area situations on farms where a range of crops can be successfully grown for grain for delivery.

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Rape has also given good returns under disease-free conditions. However, reduced yields due to blackleg

Fig. 1.—Net returns from a number of crops relative to the return from Wheat in high, medium and low rainfall areas. Current estmates (black) compared with 1971 estimates (white) illustrate the effects of new varieties and cost and price movements.

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disease are common, lowering profitability below that shown in the graphs. The future of rape hinges on the development of suitable high-yielding, blackleg resistant, low erucic acid varieties and sustained high prices for the grain.

Oats delivered for export are much less profitable than wheat in all areas. The estimated return from oats is little more than half that of wheat in the southern high rainfall areas and diminishes further in the north and to the east. The comparison takes into account the higher yield of the new variety West; returns from Swan would be 5 to 10 per cent lower.

For sweet lupins, prices are not sufficient to offset rather mediocre yields and high production costs. The crop is therefore barely profitable in many areas and generally gives lower returns than the cereals and oilseeds.

New varieties of lupins have improved yields in recent years and there are good prospects for export of lupin grain. However, a substantial lift in yield or price is necessary for the crop to be profitable over large areas.

Field peas are similar to lupins in profitability but with the limited outlet, prospects are not encouraging.

Vetches, safflower and sunflower are too low yielding to be successful in the main cropping areas.

Impact of change
Further changes in costs can be expected but because they are likely to be similar for all crops the effect on relative profitability should not be great.

One effect of rising costs for low return crops would be to reduce return as a percentage of wheat even further.

Yields will vary according to season, but it is unlikely that relative yield of crops overall will change very much until new varieties are introduced which improve the yields of particular crops relative to others.

The major change likely in the immediate future is in relative prices of grain. Figure 2 shows how prices have changed over the last three years and illustrates particularly the fall in price of oilseeds relative to other crops.

The effect of future price changes is indicated in Table 5, which shows the approximate prices required for different crops to "break-even" with the return from wheat at given prices.

The prices shown in Table 5 represent the average prices required for the crops to be economically competitive with wheat over broad areas. Considerable variation can be expected within areas so that some allowance is necessary for situations in which particular crops will give better or worse returns than average.

An important point to consider is that while certain average yields may be expected, some crops vary in yield more than others and risk of failure is greater. Generally oilseeds and legume crops are a higher risk than cereals. Some allowance to offset such risk is necessary to assess these crops.

### Table 5—"Break-even" prices ($/tonne at port) for different crops to equal return from wheat.

<table>
<thead>
<tr>
<th></th>
<th>Barley</th>
<th>Oats</th>
<th>Lupins</th>
<th>Linseed</th>
<th>Rape</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) Wheat at $80/tonne f.o.b.—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High rainfall area</td>
<td>73</td>
<td>79</td>
<td>118</td>
<td>164</td>
<td>191</td>
</tr>
<tr>
<td>Medium rainfall area</td>
<td>80</td>
<td>89</td>
<td>133</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low rainfall area</td>
<td>77</td>
<td>85</td>
<td>118</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(b) Wheat at $90/tonne f.o.b.—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High rainfall area</td>
<td>83</td>
<td>90</td>
<td>133</td>
<td>184</td>
<td>217</td>
</tr>
<tr>
<td>Medium rainfall area</td>
<td>90</td>
<td>101</td>
<td>151</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low rainfall area</td>
<td>87</td>
<td>97</td>
<td>133</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(c) Wheat at $100/tonne f.o.b.—</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High rainfall area</td>
<td>92</td>
<td>100</td>
<td>149</td>
<td>204</td>
<td>242</td>
</tr>
<tr>
<td>Medium rainfall area</td>
<td>100</td>
<td>112</td>
<td>168</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low rainfall area</td>
<td>96</td>
<td>108</td>
<td>149</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Current estimated price 1976/77</td>
<td>85</td>
<td>70</td>
<td>75</td>
<td>140</td>
<td>120</td>
</tr>
</tbody>
</table>

Fig. 2.—Changes in prices of major grains and seeds over the last three years, and estimates for 1976/77.