

# Oil and Agriculture: Now and in the Future

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## Summary

The oil price hikes of the early 1980s damaged many farm businesses. In spite of technology change since then farm businesses remain exposed to the myriad of economic consequences that would follow depletion of oil reserves and associated rises in prices of petroleum products. Broadacre farming has become increasingly crop dominant and so is particularly exposed to the ramifications of higher prices of petroleum products.

The economy-wide and global effects associated with depletion of oil reserves are more likely to effect WA farmers than the simple on-farm consequence of paying more for fuel and oil supplies. However, rising prices of energy will trigger development and utilisation of other technologies from which all sectors, including agriculture, will benefit. The speed and success with which these new technologies can be developed and their pricing to users such as farmers will determine how protracted are the adverse consequences of oil shortages.

## Introduction

The rapid rise in oil prices in the early 1980s surprised and damaged many farm businesses; not so much through the direct effects of higher fuel bills but through the economy-wide inflationary ramifications that spawned high interest rates. Following the commodity boom of the mid-1970s a large proportion of farm businesses purchased additional land at historically high prices. The debt burden created became intolerable for many farm businesses when interest rates soared above 20 per cent per annum. Many farms were forced to sell and financial hardship was commonplace in the mid-1980s.

So the trigger to the hardship was a rapid rise in oil prices. Since the mid-1970s until early 1979 the price of oil had fluctuated between 12 to 15\$US a barrel. Yet by the end of 1980 the price had surged towards \$35US a barrel. So in under 2 years the price had increased two and a half fold, triggering economic recession.

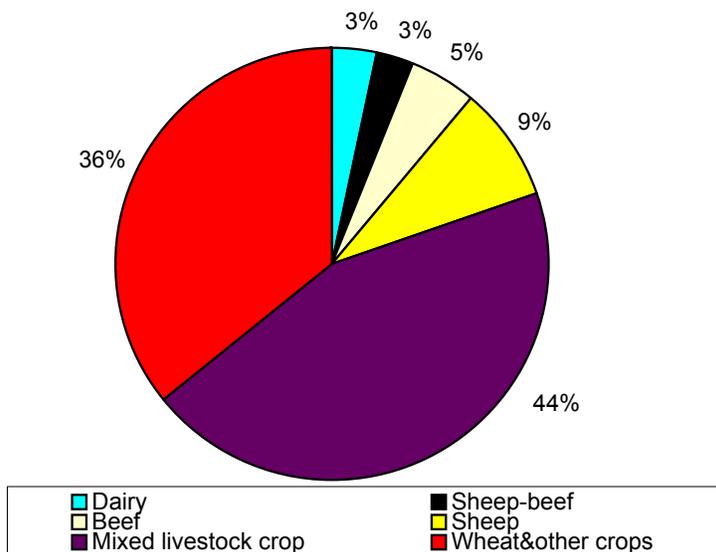
As oil supplies gradually become exhausted, their scarcity will trigger upward pressure on oil and oil-related products and unleash a sequence of far-reaching economic consequences. Before exploring those ramifications, the current dependence on oil by agriculture in WA is examined.

## Oil and WA Agriculture

### *Direct Use*

By far the main agricultural users of fossil fuels in WA are broadacre farmers (see Figure 1) mostly comprising mixed livestock-crop farmers and crop (mostly wheat) specialist

farmers. Together these farm types are responsible for 80% of petroleum product purchases by broadacre agriculture. Much of these purchases are for fuel and oil used in establishing and harvesting grain crops such as wheat, barley, lupins and canola.



**Figure 1.** Share of broadacre expenditure on petroleum products by WA agricultural industries in 1999/2000

Source: ABARE 2001 Farm Surveys

Within each of the agricultural industries shown in Figure 1 purchases of petroleum form an important, but perhaps not overly significant, proportion of cash costs associated with farm production, as shown in Table 1. The dairy industry is the least directly dependent on petroleum products. Dairy sheds mostly depend on grid electricity rather than diesel generators and dairy farms mostly grow continuous pastures, thereby avoiding fuel costs associated with the annual planting, harvest and transport to bin of crops. However, dairy farms have a strong indirect reliance on petroleum products through contracted daily collection and transport of milk from farm vats to processing plants.

**Table 1.** Expenditure on petroleum products as a percentage of total cash costs within various broadacre industries (1999/2000)

Industry	Expenditure on fuel, oil & grease as a percentage of total cash costs
Dairy	4.8%
Sheep-beef	8.6%
Beef	6.2%
Sheep	6.5%
Mixed livestock crop	6.7%
Wheat & other crops	6.8%
<b>All broadacre</b>	<b>6.8%</b>

The sheep-beef industry has the largest share of its cash costs being petroleum products. This industry mostly comprises pastoral stations so there are major expenditures on fuel for mustering and boundary fence and watering point monitoring and maintenance. Extensive grazing and the absence of machinery and inputs for planting crops and

pastures cause cash costs per hectare to be small and transport fuel becomes a major cost.

*Indirect use*

Direct expenditure by agricultural industries on petroleum products may not seem to be significant, however indirectly many agricultural industries are closely linked to oil-based products and services directly dependent on petroleum products. For example, some chemicals and fertilisers used in agriculture are derived from petroleum products or by-products. Also agriculture's reliance on road, rail and shipping services causes it to be indirectly linked to the transport sector's reliance on petroleum products.

Examples of current prices of various road and rail services used by various agricultural industries is shown in Table 2. Many agricultural industries are increasingly linked to other sectors due to the increased array of farm production inputs coming from off-farm sources rather than being generated on-farm and the greater variety of products from agriculture that require transport from farms. Where the production and supply of these off-farm inputs is linked to oil or oil-related products then changes in the oil price have flow-on effects to the cost of these off-farm services and inputs.

**Table 2.** Examples of costs of road and rail services in 2002/3

Type	Distance (km)			
	200-300	300-400	400-600	600-1000
Road train \$/km cattle	6.7	5.7	5.6	5.3
Road train \$/km sheep	6.1	5.1	5.0	4.7
		Distance (km)		
	50	100	200	300
Double \$/km	6.1	4.6	3.6	3.2
Triple \$/km	7.4	5.5	4.4	3.9
4 Deck sheep \$/km	8.5	6.2	5.0	4.5
Rail freight of grain \$/t	Merredin	Newdegate	Narrogin	Carnamah
	17.9	16.8	12.6	12.7

Table 3 lists the expenditure by various agricultural industries in WA on petroleum products and transport services. As shown in Table 2, agriculture's demand for transport services in turn increases the demand for petroleum productions. For road transport in WA in 1992/3 and 1994/5, petroleum products formed around 5 per cent and 2.6 per cent respectively of road transport's cost structure. At the national level in 1996/7 petroleum products formed around 3.2 per cent of the cost structure of road transport services. Hence when WA farmers purchase road and rail transport services they are indirectly purchasing millions of dollars worth of additional petroleum products.

**Table 3.** Expenditure in 1994/5 by WA agricultural industries on petroleum products and transport services

Expenditure on	Sheep dominant	Grains dominant	Beef cattle	Dairy cattle	Pigs	Poultry	Other Agric.
Petroleum products	20.5	37.0	3.1	1.2	0.2	1.4	0.4
Transport services	35.5	55.6	7.4	3.4	1.1	3.5	4.5

Source: Islam (pers. comm.) updated WA IO table

## **Economy-wide Effects of Rising Oil Prices**

For agriculture it is highly likely that the flow-on or economy-wide effects of rising oil prices will have the largest impact on agricultural industries rather than the direct and first-order indirect effects of farmers needing to pay more for petroleum products and oil-related inputs such as some chemicals and fertilisers.

Higher oil prices reduce the discretionary incomes of households and dampen consumer spending. Typically all major modes of transport become more expensive and people's reliance on these transport modes causes a larger share of their weekly expenditure to be devoted to transport services. Reduced consumption of various goods and services erodes the profit margins of companies, reducing their value (e.g. listed companies) and ultimately having multiplier effects on employment, dividend payments, investment, capacity to service debt and input purchases. So the likelihood that sustained very high oil prices will unleash recession pressures leading to global recession is very high.

In the face of higher oil prices many businesses will seek to pass on to their customers much of the additional costs associated with higher fuel bills. In a period of rapidly escalating fuel prices where prices of goods and services are frequently marked upward to recover additional costs of fuel and petroleum-related products, inflationary pressures rapidly rise further eroding the real purchasing power of fixed incomes and dividends. Hence, the troubling twin influences of cost inflation and recession pressures generate economic uncertainty leading to a lack of confidence that itself discourages economic growth.

Within farming regions, increasing costs of transport and travel will further reduce the attractiveness of residing in rural centres and increase people's dependence on electronic communication. Even in metropolitan areas changes in work and social habits are likely if fuel prices escalate considerably and remain at historically high levels.

Historically, global recessions have harmed open, small economies such as Australia. Australia's balance of trade (exports versus imports) usually is in surplus thereby reducing its current account<sup>1</sup> deficit. However, the Australian dollar has a well-documented relationship with investors' and financiers' levels of risk aversion and perceptions of global growth. As a commodity exporter with a large current account deficit, Australia faces a double impact when prospects for global recession emerge.

When oil prices eventually escalate in the face of dwindling world reserves and prospects for recession emerge then firstly, apart from energy resources, commodity prices tend to fall, at least in real terms. In Australia's case the international perception may remain that Australia is a primary commodity exporter and so when these prices come under recessionary pressure, support for the Australian currency will wane.

More importantly however, the Australian economy will find it more difficult to fund its current account deficit that currently is around A\$80 million dollars per day. In times of recession international capital flows into Australia tend to diminish as investors find safer-havens or retain their capital in their respective domestic economies. As an illustration, the Asian crisis in the mid-1990s led to Australia's current account deficit

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<sup>1</sup> The current account mostly includes merchandise trade (imports and exports), service incomes and costs (eg tourism, transport, incomes on investments).

widening from the 3 to 4 per cent of GDP to more than 6% of GDP. To attract capital often real interest rates rise as the Australian dollar depreciates.

The depreciating dollar assists agricultural industries that are export-orientated such as the grains industry by lessening demand reductions associated with global recession. However, imported inputs such as machinery, fertilisers, chemicals and fuel are made more expensive by depreciation of the Australian dollar, and interest payments on borrowings increase when real interest rates are raised to reduce the flight of capital. Further, in times of recession political pressures often arise that generate more protectionist agricultural policies that often harm agricultural exporters such as Australia. These policies reduce Australia's access to overseas markets or lessen the competitiveness of Australian agricultural commodities in these markets.

If cost-effective energy sources and technologies are not rapidly developed as oil stocks deplete then rising oil prices will stimulate both inflation and global recession. The economic consequences for agricultural industries will be mixed, depending on the export orientation of the industry and their dependence on imported goods and borrowings. On balance, most major agricultural industries in WA are likely to suffer economically from global recession and economic uncertainty.

### **Farm-level Responses to Rising Oil Prices**

Opposite to what many people may think, since the oil shock of the early 1980s broadacre farming in WA has changed to be, in one way, more rather than less dependent on petroleum products. A seemingly increased dependence on petroleum products has arisen through a major shift in the enterprise mix of broadacre farming. The shift has been particularly evident in the decade of the 1990s as shown by Figure 1.

The relative profitability of crops, particularly wheat, versus livestock has led many farmers to switch their land resources toward greater emphasis on cropping. As each hectare of crop requires more input of petroleum products than each hectare of pasture, the swing into cropping has increased most farms' dependence on oil. Hence, the crop dominance of farms exposes them to the impacts that flow from rising oil prices.

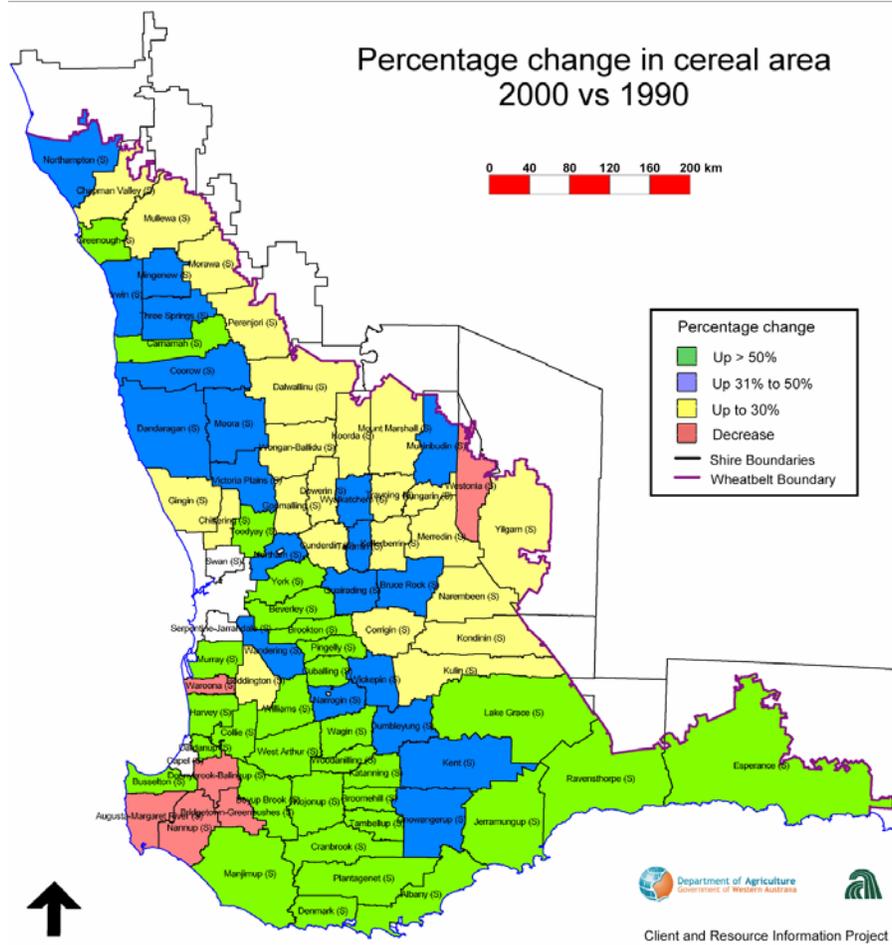
However, the oil shock of the early 1980s did hasten farmer adoption of crop establishment methods requiring less fuel. In the early 1980s conventional crop establishment required two and, in some circumstances, three passes of crop machinery over crop paddocks; working up, working back, then crop sowing. The emergence of herbicides and improved tractor and tillage equipment has allowed many crop establishment operations to be based on a single pass, thereby reducing per hectare fuel costs as shown in Table 3.

**Table 3.** Fuel use for crop establishment in 1980 versus 2000

Conventional in 1980 <sup>a</sup> (3 passes)	Direct drill in 2000 <sup>b</sup> (1 pass)	MinTill in 2000 <sup>b</sup> (2 passes)
20 L/ha	7 L/ha	13 L/ha

<sup>a</sup> Based on Herbert (1980) "Farm management information: gross margins", WA Department of Agriculture,

<sup>b</sup> Based on revised data first published in Pannell, D. and Bathgate, A. (1994) "MIDAS: Manual and documentation for the eastern wheatbelt model version EWM94-1", WA Department of Agriculture.



**Figure 1.** The shift into cereal cropping in the 1990s

Reductions in fuel use per hectare are due not only to changes in crop establishment methods but also to changes in the size and type of crop machinery that have increased field and fuel efficiency. For example, 4WD technology, wider working widths, less stoppages for fill up, more fuel efficient engines and better logistics in grain, fertiliser and chemical handling have all contributed to a reduced use of fuel per hectare of crop. Hence, although the shift into cropping has increased farm utilisation and therefore dependence on fuel, in fact the shift to a mostly single pass crop establishment has enabled many farms to reduce their dependence on fuel, in spite of becoming more crop dominant.

There are also technologies emerging that will offer farms further fuel savings. Controlled traffic systems reduce overlap in crop establishment and spraying operations and offer further improvements in field and therefore fuel efficiency. A beeline system that reduces traffic overlap by 10 per cent can deliver crop establishment fuel savings of between \$0.35 to \$0.70 per hectare at current fuel prices.

## **Economic Opportunities**

As oil prices increase it is well known that substitute and complementary energy sources will become increasingly utilised such as blended fuels, oil sands, synthetic oils and natural gas. Technologies that deliver further fuel economy will also become competitive.

Farmers may find market opportunities in growing high-yielding industrial oil crops suitable for use in blended fuels. Animal fat and other oils may also become attractive for processing into fuel components. Biodiesel fuels would become more competitive.

Rising prices of energy will trigger development and utilisation of other technologies from which all sectors, including agriculture, will benefit. The speed and success with which these new technologies can be developed and their pricing to users such as farmers will determine how protracted are the adverse consequences of the decline in oil reserves and associated shortages.

## **Conclusions**

The oil price hikes of the early 1980s unleashed considerable financial pain upon many farm businesses in WA. In spite of those consequences and subsequent changes to fuel technology, farm businesses in WA remain exposed to the myriad of economic consequences that would follow depletion of oil reserves, particularly rises in prices of petroleum products. Broadacre farming has become increasingly crop dominant and so is particularly exposed to the ramifications of higher prices of petroleum products.

The economy-wide and global effects associated with depletion of oil reserves are more likely to effect WA farmers than the simple on-farm consequence of paying more for fuel and oil supplies. However, rising prices of energy will trigger development and utilisation of other technologies from which all sectors, including agriculture, will benefit. The speed and success with which these new technologies can be developed and their pricing to users such as farmers will determine how protracted are the adverse consequences of oil shortages.

In the meantime there are farm and enterprise opportunities for farmers to lessen any initial impact of rising fuel prices such as adopting fuel-saving technologies (e.g. controlled traffic technology) and developing industrial oil crops for use in blended fuels.