

Opportunity & Responsibility - The Challenge of Natural Resource Management

Farrer Memorial Oration, 1995

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Farrer Oration

EN Fitzpatrick

Summary Tonight I want to take this opportunity to reminisce for a few minutes about how it was and how it has changed. Then to use this as a platform to look at the future ,

- to *identify the opportunities* provided by the change in the world population and economic growth
- to *identify the demands which are likely to be made on the natural resource base*
- to *identify the cost to the natural resource base already incurred* with the advances which have been made,
- to *identify the key issues* which will need to be addressed if our agricultural industries are to achieve their potential; and.
- we as individuals and as a nation are going to *accept our responsibilities* in preserving our natural resources for both our own heirs and successors and, *internationally* as resources which are valuable to the international community

As it was in the beginning;

The immediate post war years were over when I started work with the Department of Agriculture in 1951. It was a period when we had absolute faith in the clover ley system of farming . The argument was about the ratio of pasture to crop, there were Fordson Chamberlain McCormick Deering (IHC), Massey Harris Ferguson tractors. 20 and 24 run combines disc ploughs, scarifiers, wheel driven headers and harvesters.

WA was 40 years on from the last time wheat had been imported into this State in 1910. It was only 20 years from the period when horses had been the main source of traction and almost a decade of that period had been devoted to a devastating war and its aftermath.

The challenges were in New Land Development and plant nutrition and legume establishment.

Trace elements were the new magic.

Clover disease of sheep had temporarily disappeared as an overwhelming problem but would reappear again a decade or so later.

Agricultural chemicals were just starting to become available; DDT 2-4-D parathion were the 'in' names.

We were yet to learn about their dangers; some real and some imagined.

Rabbits were still a major problem to agriculture particularly in the south west forested areas.

Dairying for butter fat production was still a substantial industry and Departmental dairy advisers went out as far east as Narrogin and Woogenellup.

The War Service Land Settlement Scheme was in full flight.

Experimental work was just beginning on the new Esperance Plains field station; it was an outstation of the Salmon Gums station.

The Ord River Scheme was still an engineers dream although an agreement had been reached in 1946 to develop Kimberley Research Station. It was yet to become a Departmental nightmare. The Ord is a scheme with great potential but was probably 30 years before its time.

Our knowledge base was very thin.

It was a time of confidence in agriculture's future. Wool was still king Gold was still on the old gold standard. Kalgoorlie was a dead town to visit, surviving but not thriving. Iron ore exports were prohibited by legislation. Nickel and mineral sands had not been identified . Australia was not a coal exporter and substantial supplies of oil and gas were still to be discovered.

The big industrial event of the early 50's was the establishment of the BP oil refinery at Kwinana.

The environmental movement would not appear as a political force for another 30 years. If it had of existed I wonder whether Kwinana could have been developed as it has been.

Agriculture as we know it in WA was to be forged in the 20 year period between 1950 and 1969. It was a unique period of good prices and favourable seasonal conditions. Then in 1969 a combination of drought; low wool prices and restrictions on the area of wheat which could be sown brought development to a sudden halt.

However it was not all hedonistic. The Departments Soil Conservation Service had been established. It was to struggle to be heard for the next three decades although there were many farmers who were convinced of the need for action even then and much was achieved.

The focus on development was probably reflected in the difficulty for people who counselled caution to be heard. The late Tom Smith for instance warned of the potential salinity problems of the clearing of the catchments of the Collie and Tone and Warren Rivers but this advice was ignored. Some years later many millions of dollars were spent on establishing clearing controls in those areas.

I sometime think of the things I never saw a I worked as a young research officer in different parts of the State.

For instance I spent a lot of time in the Margaret River and Mt. Barker areas looking at nutritional problems of pasture; and have to confess that the thought of these areas becoming premium wine producing areas never crossed my mind.

I spent a week with Jack Toms around Eneabba wondering what ever possessed people to clear some of the deep sands in that area but never saw any of the mineral sands that afterwards made a high school and University friend rather rich.

The Development of WA Agriculture

The Department of Agriculture has prepared a table to provide some facts about this period which summarises the changes over the last 40 years.

Table 1
Agricultural development in Western Australia

	1945-46	1949-50	1969-70	1989-90	1993-94
Cleared area (million/ha)	5.61	5.77	14.16	15.58	not available
Crop production (thousands of tonnes)					
Wheat	571	1,050	1,815	4,800	5,643
Barley	15	22	273	628	944
Oats	74	132	281	529	437
Lupin			2	619	791
Total	660	1,204	3,575	6,576	7,815
Livestock (in thousands)					
Sheep	9,786	10,923	33,633	38,422	31,951
Cattle					
Beef	659	693	1,499	1,562	1,683
Dairy	174	172	182	110	123
Livestock production)					
Wool (000's tonnes)	36	41	171	236	176
Beef and veal (000's tonnes)	108	161	402	506	439
Mutton and lamb (000's tonnes)	1,378	1,384	4,534	5,284	4,505
Whole Milk (m. litres)			255	267	344
Livestock exports (in thousands)					
Sheep	-	-	300	2,441	4,521
Cattle	-	-	-	-	52

Source: Australian Bureau of Statistics

The table is self explanatory in the extent of the changes which have occurred:

- Cleared area has almost trebled,
- Crop production has increased six- fold,
- Lupins have appeared as a major crop in the last two decades due to the work led by John Gladstones
- Sheep numbers have trebled ,
- Beef cattle numbers have increased by 250%.
- Dairy cattle numbers fell to 1989/90 but have started to rise again reflecting the major changes which have occurred in product mix and the increasing market opportunities in Asia.
- Production increased ahead of numbers for wool beef and dairy cattle reflecting the improved husbandry and feeding breeding.

The other thing which happened in the development period was that *the number of farmers fell.*

When I have compared WA's agricultural performance with that of other States the difference in property size is evident reflecting a period of adjustment which took place in association with the opportunities which the development of new areas for agriculture provided. This was not possible in the other southern states.

But I do not intend to spend all of this evening reminiscing although the temptation is very strong. I would like now to refer briefly to the way other things have changed as a basis for looking to the future. It is strange that when you are living through change you often do not recognise the extent of that change.

It is clear now that there have been massive changes during the last 40 years. In particular there have been major changes in the population of the world and in the balances of economic power.

Perhaps one of the indicators of that change is the Japanese car industry. In the early 1950's the REDEX round Australia car rallies were held. Some Japanese cars were entered and as we all expected they broke down quite early in the race. Little did we realise the impact that industry would have over the next 30 years nor how the Japanese economy would grow.

There has also been a major change in the importance of agriculture in the Australian economy. It has fallen from being the dominant export earner to being only a relatively junior but important partner in the nation's export performance

The result has been a reduced interest in it by our political masters and to a degree an irritation with it. It is subject to severe income fluctuations caused by climatic or market problems which need Government intervention to cover short term cash shortfalls. Many senior politicians do not understand these fluctuations, nor do they recognise the importance of the sector to the nation's long term economic importance.

Agriculture has been affected by falling terms of trade for virtually all of the post war period. In the past decade and a half it has had a particularly difficult time with reduced government support and increased subsidised competition on export markets. The progressive impact of the corrupting effect on world commodity markets of the subsidies provided by the European Community and the USA has weakened much of the industry.

These problems have been compounded by the effect of the collapse of the USSR and its satellite communist economies and the inconsistent buying pattern of the Chinese on the wool market

In addition the agricultural industries have operated in a high cost environment where micro-economic reform has not proceeded as far or as fast as was expected.

As a result the industry can no longer self fund serious events such as the 1983 drought, the current prolonged drought in the north of NSW and central and south west Queensland or the repair of degraded resources.

The Present

Unfortunately the advances in production which have been made over the past 150 years have not been without significant environmental cost.

Views on what is important from an environmental view point differ. There are those who tie themselves to trees to protest native forest; others fight for the last remaining undisturbed habitat of this or that threatened plant or animal; others seek to preserve wilderness areas; not so you and I can wander through them in splendid isolation but so they can remain there undisturbed.

I am totally convinced that the fundamental issues are the protection of the soil and water resources of the nation.

Table 2
Value of lost production due to land degradation

Cause	Value (\$ million per year)
Waterlogging	180
Erosion	80
Soil structure decline	200
Soil acidity	300
Salinity	200
Deterioration of water resources	450
Total	1,410

Source: Land and Water Resources Research and Development Corporation Canberra

Some indication of the damage which has been done to the soil and water resources of this country over time is reflected in an assessment made by the Land and Water Resources Research and Development Corporation shown in Table 2 above. This assessment gives an estimate of annual losses of production due to degradation of land and water resources.

The total annual loss is \$1.4 Billion or around 5% of the annual output of agriculture in this country. The big losses are in the water resources and due to soil acidity, salinity and structure decline

Soil erosion is a visible problem and although smaller in cost can have a major visible impact. In its extreme it has blacked out Melbourne in mid afternoon. But the other issues listed are much more insidious and can be difficult to address due to equity or financial reasons

Awareness of these and related problems resulted in Commonwealth Government commissioning the development of reports on sustainable resource use in the early 1990's.

No costings have been made on the cost of achieving this aspiration but the community considers it a must; a view which is difficult to argue with when the

inevitable changes which will occur in the world economy in the next 50 years and the pressure which this will place on the world's natural resource base are taken into consideration.

This resource degradation can be looked at in a number of ways.

- One is that if we had that amount of additional wealth to spend today on achieving a totally sustainable agriculture it would fund a huge programme.
- Alternatively the additional wealth that would be generated by this added production would make a significant contribution to our national and individual wealth

However tonight I would only like to emphasise that unless we are prepared to take direct action that figure is going to double or treble and that the rewards for action now far outweigh the costs to the community of that action.

The Future

Population

There are two reasons why Australia must be concerned about the degradation of its natural resource base and more particularly about its soil and water resources. They are *opportunity and responsibility*. Since human greed is one of the strongest forces for advancement in the World we should look at opportunity first.

There are four sources of the information on which the remainder of this talk is based . These are reports of the Australian Bureau of Agricultural and Resource Economics (ABARE); The World Bank World Development Report, 1992; a report by Dr Gus Hooke of The Australian Academy Sydney entitled 'Long Term Market Outlook for the Australian Dairy Industry' based on the United Nations' estimates of economic and population growth and; a book written by Michael Young as part of the Man in the Biosphere series. The title of the book is 'World Resources and Sustainable Investment'.

First I would like to look at estimates of growth in the population and economy of the world, primarily in the next 25 years but also out to 2050. The work to 2050 has been done by Gus Hooke using a World Production Model. This is also the basis of the forecasts of actual Gross World Production for the years beyond 2000.

If we look back to remind ourselves that time passes and passes quickly 2020 is as far forward as 1970 is behind us and 2050 is equivalent to 1940. As I look around the room I see that many think that 1940 is part of ancient history; just a little while after Cleopatra had that much publicised affair with Mark Anthony. However to some of us here it is a real time date which doesn't seem all that long ago. In fact the Medal which I am honoured to receive tonight was first awarded in 1941.

If the forecasts are accurate however the World will change more and at a greater pace in the period to 2050 than it has in the last 55 years.

Table 3 reflects the exponential rate of that growth of population through the 20th century.

Table 3
World Population Growth 1650 to 2025

Year	World population (in millions)	Difference (in millions)	Period (in years)
1650	500		
1750	800	300	100
1825	1,000	200	75
1900	1,750	750	75
1950	2,800	1,050	50
2000	6,000	3,200	50
2025	8,400	2,400	25

United Nations ,World Demographic Projections 1950-2025

There were approximately 1.75 billion people on earth as the 20th century dawned. In the first 50 years the rate of increase averaged 21 million per annum as the population rose to 2.8 billion. In the second half the rate accelerated to an average of 64 million per annum to be near 6 billion at the turn of the century. It is forecast to achieve an average of 80 million per annum in the first 25 years of the next century as the population rises to over 8 billion.

The English economist Malthus lived from 1766-1834. While the earlier figures would have to be suspect, the population during Malthus' lifetime was between 900 million and 1.2 billion. Malthus asserted that population always increased up to the limits of the means of subsistence. He was concerned with the capacity of the agricultural resources of his time to support the rapidly growing population. His analysis was probably right but he had no idea of the unused resources which then existed in the world nor of the scientific opportunities to increase that productivity. Whether he will be right over the next 50 years is yet to be seen.

Table 4 gives more details of population growth from 1950 with estimates to 2020. The dominant position of India and China in these statistics is clear even as early as 2000 when they will have some 37% of the world population between them.

Table 4
World Population Growth (millions)

	OECD	East Asia**	China	India	Total Asia	Latin America	Africa	Middle East	CIS***	World Eastern Europe
1950	542*	158*	555	358	1,376	165	224	NA*		2,516
1980	780	320	996	675	2,369	359	479	98	351	4,437
1990	853	386	1,153	827	2,862	441	643	132	378	5,309
2000	907	456	1,310	1,008	3,392	523	856	171	396	6,245
2020	970	557	1,504	1,311	4,298	670	1,413	262	443	8,054

Source United Nations *World Demographic Estimates and Projections* * 1950 figures are approximations for Europe and East Asia. Data not available for the Middle East ** East Asia is Hong Kong Singapore South Korea Taiwan Indonesia Malaysia Philippines Thailand *** CIS is the previous USSR

The World Economy

If we look at growth in the world economy and the distribution of wealth between regions and between nations there are further major changes. I would like to begin by focusing on Asia.

Table 5
GNP as Part of Total World Product
(\$US trillions)

	World total	Asia	OECD	Latin America	CIS Eastern Europe	China	India
1980	20	2.5	12.3	1.9	2.2	0.8	0.4
1990	27	4.1	15.8	2.2	2.8	2.0	1.0
2000	40	11.6	20.7	3.4	2.1	5.5	1.8
2010	60	20.1	27.8	5.3	3.3	9.7	2.4
2020	90	34.5	35.6	8.7	5.7	16.6	6.9

Source: Australian Bureau of Agricultural and Resource Economics Estimates.

An estimate made in 1989 by Gus Hooke was that Asia would produce 25% of the world gross product by 2020 and 40% by 2040. The forecasts in Tables 6,7&8 come from ABARE and might also be conservative. They estimate that the region will produce 29% of the world's gross product by 2000 and 38% by 2020. It is clear that the 29% figure is very achievable.

Table 6
Regional GNP as Percentage of World Gross Product

	Asia	OECD	Latin America	CIS Eastern Europe	China	India
1980	12.7	61.5	9.3	10.8	4.3	2.0
1985	15.4	60.0	8.5	10.8	6.1	3.3
1990	18.2	58.4	8.0	10.5	7.4	3.7
1995	24.4	56.3	8.4	5.5	10.0	4.1
2000	29.0	51.7	8.6	5.2	13.8	4.6
2010	33.5	46.3	8.9	5.5	16.2	6.1
2020	38.3	39.6	9.7	6.3	18.5	7.7

Source: Australian Bureau of Agricultural and Resource Economics Estimates

Table 7
Changes in Asia

Year	Asia		World	
	Part of world GVP(per cent)	Population (in millions)	GVP (\$ trillion)	Population (in millions)
1980	12.7	2,369	20	4,437
2020	38.3	4,298	90	8,054

Sources: World Bank's *World Development Report 1992* and *Global Perspectives' World Production Model*
United Nations *World Demographic Estimates and Projections*

2020

By the year 2020 there will be as many people in Asia as there were in the world in 1980.

The estimates of the gross value of production have been developed by Gus Hooke using a world production model. He argues that these estimates are reasonable and may be conservative having in mind the freeing up of world trade. Even if the actual figures are wrong the direction is right and the changes will be massive.

The outcome is that Asia's gross value of production would be \$ US 34 trillion or 70%; more than the total value of production of the world in 1980.

The estimates suggest that the currently developed world will not suffer from a fall in living standards. However their share of a substantially bigger world economy will have fallen.

The OECD countries of which Australia is a part, are forecast to increase their total gross product from \$US 15.8 trillion in 1990 to \$US 35.6 trillion in 2020. They will only have a population increase in that time of around 14% but their share of the world gross product will fall from 58.4% to 39.6%

Table 8
World Gross Product

	1800	1990	2050
	\$US billion (1990 dollars)		
World gross product	100	27,000	250,000
Farm output	70 (70%)	1,600 (6%)	10,000 (4%)

Source: World Bank *World Development Report 1992* and Global Perspectives' *World Production Model*

2050

If we now look at the figures through to 2050 the change becomes more dramatic. The world population will have reached 10 billion and will be levelling off. The gross world product is expected to increase at an unprecedented rate as the developing countries of Africa and Asia close the gap with the high income countries.

The average annual rate of growth to 2050 in this estimate is forecast to be at a high level of 3.0%; A rate of 3.8% is used for the first 40 years then it is reduced off to 1% by 2050

This is the key figure in the calculation and the gross numbers will depend on that forecast.

This assumption gives a gross product in 2050 of the world economy of \$ US 250 trillion measured in 1990 dollars.

Farm products demanded by the population are forecast to be worth \$US 10 trillion, an increase from \$ US 1.6 trillion in 1990

It is expected that prices for farm products will rise in the period by one third in real terms in order to draw out the quantity of product needed by the population from the farm sector.

This increase in price is forecast to be needed because the total resources of land and labour devoted to agricultural production will fall over time and agriculture's share of the total research effort is likely to fall if the current falling real price trend were to continue into the next century.

This fall in the resources available will be driven by competition from industry, urban development and other alternative uses.

Accepting these estimates and allowing for the increase in price but assuming the product mix is much the same as is produced at present the total product required compared to 1990 would be between 4 and 5 times the present level of farm output.

The ranking of economies in the world will also change dramatically. In 1990 the US economy was 21% of the world economy. China had the second biggest economy with 10% (including Hong Kong). Japan was third with 8% and Germany fourth with 4%. India was just under 4%.

In 2050 China and India are expected to be the major economies with 18% and 12% of the world gross product respectively. The US is expected to only have 6% of the much larger world economy.

Table 9
Present and future national economies

Country	1990		2050	
	%	\$ trillion	%	\$ trillion
USA	21	5.7	6	15
China	9	2.4	18	45
Japan	8	2.2	2	5
Germany	4	1.1		
India	4	1.1	12	30
Indonesia	2	0.54	4	10
World GVP Total	100	27	100	250

Source: World Bank's *World Development Report 1992* and *Global Perspectives' World Production Model*

According to the forecast China will in fact have an economy the size of the world economy in 2000 with a population the size of the total world population in 1900. Even if the population of China is 1.8 billion an economy of \$ US 45 trillion would give an annual income per head of population of \$ US 25 000.

Table 10 shows both the estimated consumption per head and the income expected per head. The incomes range from \$US 15 000 in Africa to \$US 30 000 in the USA.

This may be hard to accept but it is the view of a professional global analyst. It is an indicator of the direction and magnitude of the potential changes. And so to go back to my beginning the opportunity which these changes could present to Australia and to Australia's agriculture are massive, even if the estimates prove to be generous.

Table 10
World Consumption and Income

	1990	2050
Per Capita		
High income countries	\$ 750	\$ 750
Whole World (average)	\$280	\$ 750
Total	\$ 1,600 billion	\$ 10,000 billion
Income per head of population		
USA		\$30,000
India		\$17,000

Source: World Bank's *World Development Report 1992* and *Global Perspectives' World Production Model*

Resources

But what of the resources to achieve these international aspirations.

In his book 'World Resources for Sustainable Investment' Michael Young defines Net Primary Productivity (NPP) as the amount of energy left after subtracting that used for respiration of primary producers (mostly plants) from the total that is fixed biologically.

He estimates that nearly 40% of potential NPP is used directly, co-opted or foregone because of current human activity. He claims that those people currently alive use 40% of the world's terrestrial primary production.

The forecast doubling of the world population over the next 50 years and the rises in living standards implies a massive increase in the demand we will place on the global resources

Young calculates that if all the people who live in the world today enjoyed the same life style as North American and West European people a 5 fold increase in the rate of resource consumption would be necessary.

For all the people who are expected to be alive in 2050 to have that standard of living a 10 fold increase would be necessary. This is in keeping with Hooke's estimates of total resource demand

If Hooke's forecasts are correct the life styles will be approaching those levels with an average incomes per capita of between \$US 15 000 and \$ US 30 000

The inevitability of population growth is shown by the following calculations:

- If all the people in the world only replace themselves after 2010 the population will stabilise in 2060 at 7.7 billion ;
- if this is delayed until 2035 then stabilisation will be at around 2095 at 10.2 billion;
- delay to 2065 will result in population stabilising around 2100 at 14.2 billion.

Hooke is of the view that population increase will flatten towards 2050. Nevertheless when we see the attitude of two major religious groups at the recent Conference in Beijing we would have to despair of the population ever stabilising !

In 1988 the FAO raised questions about the availability of resources to continue to feed the world's growing population by the year 2000. The authors of that report stated that this would require:

- technological improvement through the application of knowledge that existed at the time
- crop yields to increase 30%, particularly to meet the increased use of grain for animal feed
- cropped arable land to increase by 80 m. ha. in developing countries
- irrigation to increase by 20%
- the use of fertilisers tractors and improved seeds to double.
- the use of chemicals to increase by 3% per annum.

- a gross investment of \$1 500 billion in the primary sector and support industries to be made.

Indications based on outcomes suggests these requirements are being met. This calculations did not allow for more than maintaining the status quo.

They did not allow for a major increase in wealth and a consequent increase in both consumption and consumption patterns. The free resources that were available in 1988 have now been largely used up.

Land Resources

It is estimated that the world contains 13.1 billion hectares of land of which 1.5 billion (11%) is arable and currently used to grow crops and 3.3 billion (25%) is used for grazing.

In 1992 each hectare of arable land had to support 3.8 people. There was great variability between the regions of the world. The figures were Asia 7.0 Western Europe 4.9 Africa 3.7 Oceania 0.4. China 11.9 and Australia 0.4

By 2050 the increasing populations will raise the ratio. This pressure increase will be due to increase in both population and income. The biggest impact will be in Asia and Africa with the smaller impacts in North America Europe and Oceania. In China persons per hectare of arable land is expected too rise to 34 but will still be less than 1 in Australia and less than 2 in the US.

By 2050 China with 16% of the world's arable land will have 18% of the people and is forecast to produce 18% of the world gross product

As referred to earlier the projected world demand for farm output will require an increase of from 4 to 5 times the current level of output by the agricultural sector. This will have to be achieved through increases in productivity, and diversion of arable land from production of animal food to production of human food. Regardless of that it is both a huge challenge and a huge opportunity.

Resource Costs

The achievements of agriculture in providing the current level of production have not been without cost. Looking more widely than Australia there are serious environmental issues which have to be faced around the world.

The problems with the high input systems in Europe are well documented. The problems being experienced by the Australian irrigation industries are not unique but are occurring in many irrigation areas around the world. These are primarily problems of overuse of the resource, rising water tables and increasing salinity.

Possibly the most dramatic example is the Aral Sea area in the Commonwealth of Independent States. This is an inland sea rather similar but smaller than the Caspian and some distance east of the Caspian. It is in a desert area. The supply of

water to it has virtually been cut off by irrigation. The salinisation of the irrigated soils is so great that between seasons when no irrigation water is being applied the land is white with salt over huge areas. The resource is so over used that a village which was once on the sea shore is now 30 kms from the waters edge.

The problems of the Australian irrigation areas cannot be ignored. They are not of the same order as the Aral Sea but there are serious issues to be addressed. The Shepparton area of Victoria is currently the most productive and vertically integrated irrigated area in southern Australia. However its productivity is threatened by rising water tables and in some areas salinity. In 1985 120 000 hectares of the 500 000 hectares under irrigation were affected by shallow water tables (within 2 metres of the surface). The area affected is forecast to increase to 270 000 hectares by 2020 and to 315 000 by 2040.

The community and the Government have worked closely together to develop and implement a plan for managing this changing environment. Nevertheless the outcome is now inevitable. Action now will slow down the development of the problem. This will occur on all the southern irrigation areas of the riverine plain on either side of the Murray. Affected areas will either have to be sub surface drained or farmers will have to learn to farm in a salinised environment.

In addition water use is so high in the Murray system flow rates in the river have been seriously affected. The impact is such that the reduced flow conditions which would occur at the Murray Mouth only in severe drought now occur six years in ten. These low flows only occurred in one year in every twenty under natural conditions. If expansion had been allowed to go on unchecked these flows would have occurred in seven years in every ten. As a result the Murray Darling Basin Ministerial Council capped the level of diversion at 1991 levels; an action which has surprisingly had widespread support in the irrigation community.

There are also problems in the semi- arid pastoral areas due to degradation of the soils and vegetation

It is estimated that the carrying capacity of the WA pastoral regions has been seriously reduced in comparison to the non degraded condition:

- in the Kimberleys to 49%; the Ashburton to 69% and the Gascoyne to 74%

In western NSW 15.5 million sheep were grazed on the natural shrubs and grasses in 1887. Following the drought of the late 1800's the numbers fell to 5.0 million in 1902 and today the area carries 8.0 million . In this period the natural vegetation was irreversibly changed and in many areas soils irreversibly damaged.

These figures coupled with those earlier tonight point to degradation and pressures which are likely to lead to reduced productivity rather than the increased productivity that is required for the future.

In addition in much of the developing world there is potential for reserving more land for conservation. Currently there is massive forest exploitation in the developing countries but there is increasing concern at these practices.

Separately in the developed world there is competition for land for production forestry, for aesthetic recreational, nature conservation and as a means of preventing or reversing land degradation.

Equally there is competition for land from urban development and industrial use. In China the rise in the number of people to arable land ratio will be partly due to rising population but will also result from an estimated halving of the available arable land. Industrialisation and rising incomes are forecast to increase the transfer of land to uses which are more profitable than agriculture.

All of this adds up to real pressure on the existing natural resource base used for food and fibre production with little or no opportunity to increase that resource base.

Farm Size in Australia

The long period of financial stringency has reduced the capacity to innovate and re-equip properties. It has also slowed down the normal adjustment process which has been a part of Australia's agriculture since the beginning of European settlement.

This has contributed to an extensive structural problem in Australian Agriculture. A high proportion of the properties are too small to be fully commercial in today's economic environment. In some cases it is possible for these operators to balance their enterprise with off farm income but in many areas this is not possible. As a result additional pressure is put on the resource base as they struggle to make a good living.

A recent survey by ABARE of Australian broad acre agriculture, which is accepted as being the backbone of Australia's agriculture, showed that two thirds of the operators only produce 30% of the product and on average have low farm cash incomes. Many of these farmers are at risk financially even though their equity is satisfactory. In this situation there is little discretionary expenditure available with inevitable exploitation rather than conservation in times of stress. Table 11 presents key estimates obtained from this survey

The survey also showed that there was a serious aging of farm machinery which is reflected in the following figures:

- the average age of the main tractor on crop farms was 11 years
- the average age of the main tractor on livestock farms was 16 years
- the average age of the header on crop farms was 15 years

An alternative measure was expenditure on plant and equipment. The following figures shows the major fall over the thirteen year period measured. The figures are in constant 1993/94 dollars.

- 1979/80 \$50 000
- 1990/91 \$11 100
- 1992/93 \$20 000 (improved incomes and a fall interest rates)

Table 11
Farm Characteristics Broad acre Agriculture (1993/94)

		Smallest third	Middle third	Largest third
		Less than	70-147,000	147,000 +
Total cash received (\$)		70,000		
Farm income (\$)	cash	9,480	26,150	87,780
Negative cash income (%)	farm	34	23	15
Farm Business Profit (\$)		- 22,660	- 15,040	27,020
Off farm income (\$)		18,470	12,560	11,400
Farm size		X	2X	8X
Debt level		36,000	108,000	300,000
Equity level		High	High	15% have less than 60%
Industries		beef	mixed crop/livestock	crop
		sheep	beef	mixed crop/livestock
		beef/sheep	sheep	beef
			beef/sheep	

Source Australian Bureau of Agricultural and Resource Economics *Farm Financial Performance Outlook and Analysis*

A similar but much more serious picture of small property size occurs in the pastoral areas. Small property size and consequent pressure on the natural resources is more of a problem in the semi arid areas. In these areas the fragility of the soils and vegetation and the low rainfall means that recovery can take decades or may not occur at all.

The intensive horticultural areas such as those in the Sunraysia of Victoria the Riverland of SA and the Murrumbidgee in NSW have similar but perhaps less tractable problems of property size. Tables 12 and 13 show ABARE survey results.

This structure is substantially the result of Government soldier settlement schemes following two world wars.

In areas where a property size of around 40 hectares is regarded as necessary for long term security in the dried fruit and viticultural industries 90% of farms are less than 25 hectares in area.

Also 50% or more of the land resource is controlled by the owners of small properties. with low net income who are unlikely to have the income to restructure their farms to introduce new technology, to investigate markets etc. Many of those near bigger towns are now hobby farms where the major income is earned off farm.

There is a major future for Australian exports to Asia in horticulture, yet a large part of the most valuable production resource in which the community has a major investment in irrigated supply and drainage is isolated from this opportunity by its structure. Tables 12 and 13 illustrate the situation.

Table 12
ABARE 1990/91 Horticultural industry - farm incomes

Tree and vine crops (ha)	Growers (%)	Farm cash income	Farm business profit	Off farm income
Riverland				
less than 10	55	12,067	-17,819	11,575
10 to 15	23	14,146	-13,118	8,972
15 to 25	14	22,650	- 6,191	6,668
greater than 25	8	30,335	82,477	7,345
Sunraysia, Victoria				
less than 10	55	10,364	-15,877	8,401
10 to 15	16	22,516	-13,671	7,602
15 to 25	14	27,014	- 5,771	5,179
greater than 25	10	116,403	52,154	9,329

Source :Australian Bureau of Agricultural and Resource Economics

Table 13
Farm numbers by property size by area occupied

Farm size (ha)	Riverland		Sunraysia, Victoria	
	No.	Area (ha)	No.	Area (ha)
0- 9	543	3,746	2,761	16,032
10-19	567	8,857	412	5,456
20-29	164	4,100	105	2,625
30-49	89	3,500	77	3,560
50-99	51	3,825	36	2,700
100 +	95	9,500	31	3,100
Total	1,509		3,422	

Source: Australian Bureau of Agricultural and Resource Economics

A Solution

If sustainable land use is to be achieved throughout the agricultural industries an integrated programme of redevelopment needs to be undertaken which provides opportunity for producers to adjust into a viable enterprise or adjust out of agriculture.

If the Governments' priority is a economically and ecologically sustainable agriculture in the 21st century it really has to give up total reliance on 'getting the levers right' and allowing 'market forces' to work. While that policy may have worked

had it been in place from the beginning but it wasn't. It does need to be part of the future policies and programs which must be developed. These programs in many areas will need to be proactive. As is so often the case time and money are alternatives when solving a problem. In agriculture in much of Australia we no longer have time.

In many areas overall regional development plans developed and agreed by local communities and owned and substantially funded by those communities are needed. In other areas normal adjustment will still solve the problem and should be facilitated.

In the South -West Queensland pastoral areas the community and Government have jointly developed and are implementing a redevelopment plan. The Sunraysia area is working on one. The Sunraysia is an interesting case because it provides an opportunity for developing a thriving, productive, export focussed, vertically integrated, horticultural industry which could double or treble its contribution to both the regional and national economy.

Adjustment of size alone is not the solution. There is a need to ensure management skills are also developed, new technology is introduced as appropriate and long term plans are in place to manage the natural resources of the property in concert with regional resource management plans for the particular region.

There is a need for the process to be owned by the relevant community, and there to be opportunity for those who adjust out of an existing farm. A large part of the success of the restructuring which occurred in WA during the 50's and 60's was due to opportunity existing for those who moved from small well developed farms in established areas to larger undeveloped properties in the new areas.

In addition flexible financing arrangements are needed. While plans need to have the objectives clearly set out implementation should not be inhibited by inappropriate rules drawn up by people who are not responsible for achieving the final outcomes.

I believe there is a strong case to set up a Resource Development Bank to deal directly with community groups, free of bureaucratic constraints and with funds to implement the range of relevant programmes for the area. This would include implementation of regional natural resource management plans, resource management, training, technology implementation and size adjustment programme.

Conclusions

Australia's agriculture is on the edge of a period which promises major opportunities.

It is forecast that:

- China will move ahead of USA in 2005
- India will move ahead of Germany in the mid 1990s
- India will move ahead of Japan in 2015
- Indonesia will pass Japan around 2025

A huge opportunity exists in the markets which are developing in a more populous and wealthier Asia. By 2050 it is forecast that China will dominate the world market for agricultural products due to its rising population, rising productivity and living standards and reduction of its available land area. If these forecasts are borne out China will have a GNP in 2050 of \$ US 45 trillion; and Indonesia will have become a major economy with almost 5% of the world's gross product and a GNP of \$ US 11 trillion.

Already these patterns are forming and by 2020 they will be well established. China will have already reached nearly 18% of the world economy, Indonesia about 4% and India will be around 8%. The world economy at that time is forecast to have a total gross value of \$ US 90 trillion meaning that China's GNP will be 50% of the total value of today's world economy.

By then we should also have a freer trade environment in the world and almost certainly a large part of the real price increase for agricultural products will have occurred.

This growth will put unprecedented pressure on the National and World natural resource base.

At the same time there is a national aspiration for the development of an ecologically and economically sustainable agriculture in this country..

Australia's capacity to exploit this opportunity will depend on the extent that we preserve the productive base of our natural resources. To date there is no integrated programme in place to provide reasonable certainty that we will be successful.

There is a need for a coordinated and pro-active programme with Governments providing financial support as appropriate. There is a case for it to be driven by a body external to Government working closely with community groups.

This body could be a Resource Development Bank with a wide ranging charter from resource conservation to regional redevelopment

The task is very large . It will take many years but early action is necessary. It will not suit the normal political mould of having something to put a plaque on before the next election.

There is often comments that there isn't enough funds available to fund any such initiative. This means that it does not have a high enough priority.

In the Federal budget for instance there has been an increase in social security payments of approximately \$A13 billion in 1989/90 dollars between the 1989/90 budget and the present budget. It represents an increase in cost to each person in the population of about \$600 per annum or \$ 2 150 compared to about \$ 1550 in 1989/90.

This is not due to increased aged invalid or sickness pensions or to unemployment benefits but to new programmes that have been introduced since that time.

Similar but not so dramatic illustrations can be drawn from State budgets. The NSW decision to bid for and fund the Olympic games comes to mind. In WA the decision of the present Government to put a tax on petrol to fund the road programme could be pointed to. It is a case of focussing on our built infrastructure rather than the natural infrastructure. One is replaceable the other is not.

Unfortunately it is political fortunes rather than national fortunes that drive the budget process
