

The Secretary
Senate Rural and Regional Affairs and Transport Committee
Department of the Senate,
Parliament House
Canberra ACT

Climate change and the Australian agricultural sector

I make this submission to your Committee's Inquiry into Climate Change and the Australian Agricultural Sector as a private individual for whom rural geography and planning was a principal area of teaching and research for more than forty years, most of this as an academic at the University of Melbourne and Charles Sturt University, and who is currently involved in climate action as a retirement interest. My observations are based on reading and data across the subject matter so I will not reference it but I hope to give enough pointers for your committee's staff to investigate further.

The agricultural sector

Although the agricultural sector has been central in the history of opening up Australia to European settlement and in our economic history, the sector as it is now needs to be seen in perspective. Our agricultural sector is now a lot less significant in our economy than it has been (or than it is popularly perceived). Given the poverty of our soils and the challenges of our climates, it is perhaps surprising that the sector has been so significant in the past.

On the global stage we are a relatively small player, accounting for about one per cent of global value added by agriculture and less than four percent of the value of global trade in unprocessed agricultural products. To a considerable extent this means that Australian agriculture has to be a price-taker rather than a price-maker in global agricultural markets, which is as important in the size of our gross farm product as drought-affected production.

Because ours is a fairly 'open' economy, our agriculture has limited control over prices, even in domestic markets which account for about two thirds of our production. An open economy means also that our sector must compete with imports that are increasing, not because of drought, but because of Australia's unprecedented affluence. It means also that farmers have to accept often-diminishing proportions of market prices, without the higher subsidies and other protections and support given to agricultural sectors in some competing countries.

Within Australia the sector accounts directly for about three percent of GDP in a good year, and four percent of employment which suggests that labour-productivity is lower than in other sectors. Returns on equity within the sector also appear to be lower generally than in other sectors and this is without taking into account the low returns on public investment such as in water storage and reticulation. The sector does not appear to be especially efficient, which renders it vulnerable to changes such as in prices or climates.

The agricultural sector does have extensive linkages to industries in other sectors but it would be fanciful to suggest that this sector supported more than about ten per cent of GDP via these linkages, except perhaps in some local economies. Most production comes from a small number of large enterprises which increasingly deal with markets and suppliers in large, often distant towns which is where most processors also (little of the sector's output undergoes much processing) are located these days. The sector's linkages are thin.

Although Australian agriculture is relatively small, it has long been a heavy emitter of the greenhouse gases which are already driving the current period of global warming and which stand to exacerbate this. Australian Greenhouse Office data expressed as carbon dioxide equivalents show that in a country whose total domestic emissions are very high (ie ignoring emissions that are induced in other countries by our energy exports) our agricultural sector accounts for seventeen per cent of emissions (nearer a quarter if other rural industries are included).

A large part of the sector's emissions are of methane and nitrous oxides caused by biological activity, notably in livestock (twelve per cent of domestic emissions). However, the sector produces considerable carbon emissions through machine operations and internal transport. These emissions within the sector may be greater than emissions attributable to movements around Australia of agricultural produce by the country's transport sector. Contrary to the view that our 'food miles' cause 'huge' emissions, movement by the transport sector of all agricultural produce (processed as well as unprocessed) accounts for emissions similar to those due to lighting, about one per cent each of domestic emissions.

Likely impacts of climate change on agriculture

The (probably conservative) latest forecasts of the IPCC, which have been articulated by the CSIRO in its *Climate Change in Australia* (2007) are for increased temperatures (especially during daytime, in spring and inland) and declines in rainfalls (especially in spring, in the south and inland). Given the probability of increased variability in weather from year to year climate change is likely to render our climates still warmer, drier and more unpredictable.

For the agricultural sector across Australia, this presages climate-driven declines, generally, and greater variances between good and bad years across Australia in both yields and production in most industries. The report, *Climate change impacts on Australian Agriculture*, from ABARE (2007), enlarges on this and indicates that while agricultural output will decline globally some of our major competitors may not be as challenged by this as Australia. It may be our competitors rather than us who benefit from any supply-driven or demand-driven increases in global prices.

However, it is very difficult to know how climate change might affect agriculture in different regions of Australia. Although the CSIRO's projections suggest a southward shift in climatic zones of perhaps 1000 kilometres in southern Australia by 2070, but less in the north, it seems that there may not be corresponding shifts in agricultural zones.

For example, using indices of potential pasture production calculated on the National Agricultural Monitoring System's (NAMS) website as a proxy for potential crop-and-pasture production in areas in the Murray-Darling basin, a climatic shift equivalent to Albury coming to have a climate similar to Tamworth's present climate may have little impact on potential temperate pasture production around Albury because potentials for this are already depressed by temperature and moisture limitations.

Similarly using NAMS-calculated indices of potential tropical pasture production as a proxy for tropical crop-and-pasture production and applying the CSIRO climatic projections for {the few} areas in the north which have soils and terrain that might be suitable for more intensive agriculture, it appears that even in the limited areas where rainfalls might increase, seasonality will not decrease. The prospects for more intensive agriculture in the north remain very limited and very localised.

As for the pockets of land around the coast and in irrigated areas which currently generate a third of the sector's production by gross value, shifts in climatic zones offer few prospects for sustainable production in the north and very real prospects of reduced production in the south where reduced rainfalls, increased evaporation, and increased variability from year to year mean that moisture availability will decline generally and storage of water for irrigation will become more uncertain from year to year than it has already become.

If there are bright spots for the future they would seem to be in a few areas in the southeast, such as in the Hunter and Latrobe valleys and in elevated areas such as the Wingecarribee in NSW, where pockets of prime agricultural land will still receive reasonable – if more unreliable – rainfalls. Although these areas will have diminished rainfalls it appears to me that the better lands in them should have prospects for more intensive agriculture, so long as more effective means of supplementing rainfalls can be developed.

However, because of essentially 'urban' demands for rural lands near to large urban places, the prime agricultural land in the Hunter, Latrobe and Wingecarribee has largely been subdivided into allotments that are unlikely to offer the economies of large scale needed to enable commercially viable agriculture. Unfortunately, these demands have driven land prices far beyond what commercial agriculture can afford, which severely limits future prospects for agriculture in these areas.

Prospects for more intensive agriculture in these better endowed areas are limited also by lack of suitable labour, services and suitable infrastructure. The Dutch talk of the 'centre functions' – regional aggregations of marketing, processing and transport facilities and expertise – needed to enable suitable land to be used for intensive cropping and livestock. . The equivalents seldom exist at present in the agricultural lands of Australia, in part because of the increasingly 'scattered' nature of so many farms with similar production systems.

Mitigation and adaptation

It is now clear from the latest round of IPCC reports that some greenhouse-gas induced climate changes globally and across Australia are certain. Exactly how much and how rapid these changes will be in different regions remain matters of conjecture, not least because some undeveloped countries (not to mention the heavy emitters such as Australia) are adding substantially to the greenhouse gas content of the atmosphere. The Australian agricultural sector must adapt to climate change and as a heavy emitter has an obligation to reduce its greenhouse gas emissions.

Neither mitigation nor adaptation will be easy for Australian agriculture. The sector has gone so far already in adapting to climates that are normally dry, often hot and subject to extremes of drought, flood, fire and plagues and it is hard to see where further it may go. The sector has also become so reliant on oil for its fuel energy, and to a large extent on ruminant livestock for its economic base that it may be difficult (as it will be for Australians more generally) to be weaned off these dependencies.

Obviously, new strains of dry-resistant crops and burp-less livestock should be sought. Perhaps now is the time to look again at a national fodder conservation scheme. More radically, the sector should be looking hard at opportunities for things such as growing industrial hemp and farming of [non-ruminant] kangaroos. It should be looking too at ways of getting the sector as a whole to follow early adopters of water saving practices, including a return to rotations (eg wheat-sheep) and better design of farms so as to capture water.

Unfortunately, a part of the history of Australian agriculture has been a story of resistance to new practices, for lack of information, for lack of will and for lack of funds. To the extent that the sector is economically vulnerable it needs public assistance with things such as disseminating information, demonstrations, education and access to funds. This argues for a national scheme for rural reconstruction at least comparable to the one which enabled the dairy industry to restructure from the 1960s.

It may well be that there will be needs for holdings to be restructured in some regions, to enable them to be worked more efficiently and to adapt to change. This would certainly be the case in the better endowed areas noted above where subdivision and land prices have rendered commercial agriculture almost impossible for now. Innovative approaches to rural consolidation (such as encouragement to non-farmers to lease unproductive land at low rentals to commercial farmers) need to be explored.

A problem with developing policies to promote more efficient land structure is that the progressive elimination from agricultural censuses by the ABS and its forebears of small holdings with (probably) low estimated values of agricultural output (EVAO) since the 1960s (see box) has made increasingly difficult a comprehensive knowledge of land use and land structure in regional and local areas. This problem is compounded by the fact that so little data from these censuses is openly accessible for regional and local areas.

'Rural holdings' of 1 acre or more to 1972/3,
'Rural holdings' of 1 ha or in 1973/4 and 1974/5,
'Rural holdings' of 10 ha or more in 1975/6
'Rural holdings' grossing \$1500 or more in 1976/7,
'Establishments' grossing \$1500 or more in 1977/8 to 1980/1,
'Establishments' grossing \$2500 or more 1981/2 to 1984/5,

'Establishments' grossing \$20,000 or more 1985/6 to 1990/1,
'Establishments' grossing \$22,500 or more in 1991/2 and
1992/3,
'Establishments' grossing \$5000 or more, in the years since.

In NSW, some local councils have undertaken rural lands studies for planning purposes, which demonstrate how incomplete ABS data is on rural land holdings and land use. Given that small holdings may be part of the sector's response to climate change (I say 'may' because, contrary to views in some quarters, large towns will continue to rely on broad-acres agriculture specialised according to regional comparative advantage to provide secure future supplies of food and raw material), there is a need for more comprehensive data on rural lands and for its publication.

Another policy problem is for infrastructure. While oil has been cheap (in real terms) there has been little need for the sector to economise in its use particularly of transport, which has hastened the demise of local support systems in many rural areas. The passing of 'peak oil' may necessitate a return to more collective facilities, including probably more use of rail. To the extent that the geography of agriculture may be affected by climate change Governments will need to be involved in planning for new public and private infrastructure, ranging from rail tracks to centralised training and marketing facilities.

Infrastructure for water storage and reticulation is an area that will need special attention. Over the years many studies have suggested that when external costs are taken into account irrigation to supplement rainfalls is far more efficient than irrigation used effectively to 'make deserts flower'. The sector will need to review its dependence on large scale (and long-distance) irrigation schemes and to examine particularly how it might achieve surface or ground conservation of water that may be used over periods of years rather than over periods of seasons.

Finally, with the passing of peak oil, fuel energy will be a particular challenge for the sector, both for mitigation and for adaptation. Because it is highly mechanised the sector relies heavily on oil for fuel energy. The geographically dispersed nature of agriculture means that other fossil fuels and grid-sourced electricity cannot be got cheaply to farms. However, farms receive vastly more solar (and wind energy) than their fuel energy needs, so there is great potential for them to use renewable energies. This reinforces the importance to Australia of improving technologies for capturing and storing renewable energies..

Concluding observations

The prospect of continuing and possibly accelerating climate change will require the Australian agricultural sector to restructure its systems of production and distribution, possibly quite rapidly, potentially affecting every aspect of the sector with flow-on effects to other sectors and regions. The challenges may require planning perspectives than are longer than at present and these must involve Governments, both to give direction and to facilitate the resources needed. It will be better for us all if we embrace those challenges rather than go into denial over them.

Yours sincerely

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