Submission to the Productivity Commission Inquiry into the Impact of Competition Policy Reforms on Rural and Regional Australia (Tamworth meeting, 29th June, 1999)

I would like to start with an observation in relation to competition policy in general. Whilst I can fully appreciate that the thrust of this inquiry is predominately towards investigating competition within sectors, many government policies have tended to redirect resources between investment opportunities. For example, the capital gains tax exemption on owner occupied residences has drawn an increasing proportion of financial resources into housing property investment rather than other more employment-creating enterprises. By virtue of the most promising locations for such speculation, this taxation policy has undoubtedly become an additional factor working against most of rural Australia. I feel that it is thus critical not to look at the impact of competition policy changes solely on individual services, resources and sectors without examining it in the broader context.

I wish to turn to a specific resource issue which has fortunately begun to attract greater attention – water supplies for irrigation. It is an area where I have long advocated a change in thinking (Epps, 1995, 1997; see attached). The past rationale for water resource development at public expense was to develop new irrigation enterprises and create employment (see work of K. Campbell). Yet, in areas of the north west of NSW we have witnessed substantial gains in the asset base of those provided water entitlements, yet a declining population in those areas led, ironically, by the numbers employed in agriculture. Economic development is obviously not about supplying water, it is about adding value to a limited resource and returning a dividend to the investors, particularly the community.

Table 1 Population of Moree and Narrabri, 1986-96 (Source: ABS CDATA96) (Ag. empl. in brackets)

LGA	1986	1991	1996
Moree Plains	17,017 (2179)	16,915 (2133)	15,517 (1946)
Narrabri	15,532 (2096)	14,653 (1719)	14,101 (1590)

Despite opportunities in dryland agricultural areas being limited, producers have progressively achieved substantial improvements in efficiencies. However, the scope for new dryland enterprises and the resultant profitability are inevitably partly determined by seasonal circumstances. Therefore, to some extent, we see two inland Australias emerging – those with a substantial economy based on irrigation, and those not (although there may be several regions where integration of both systems will be significant, particularly in relation to intensive livestock operations). Given the potential to expand the scope of agricultural production through irrigation, there is the distinct possibility for population growth, as has been noted in Griffith, NSW. (Whilst this has largely been achieved through more intensive irrigated agriculture, the contribution of the poultry industry will become increasingly apparent.)

Led by the Working Group (1994), the CoAG water reforms were developed and followed by the states (Government Pricing Tribunal in NSW, 1995). These initiatives have begun to focus on the issue of fair pricing of water and, more importantly, on the value added to the resource. The recent report, *Water and the Australian Economy*, 1999, prepared by Australian Academy of Technological Sciences and Engineering and Institution of Engineers Australia indicated that, in 1995-96, the value added per ML of water ranged from approximately $65 for rice and $270 for cotton to $460, $550 and $640 for fruit, grapes and vegetables respectively. Not only is there an increase in value of output, but employment is increased in the more intensive industries.

Interestingly, the Coal River Valley irrigators, where users pay from $45 to $110 per ML (in a full cost recovery pricing and 10 to 20 times the cost of most irrigation water) have moved to higher value

crops such as peas, turf, and brassica seeds. Apart from lifting production value, this trend has increased local agricultural employment, although mainly casual, and, because of the general high value per unit weight, products such as the cabbage seeds are competitive in distant markets.

Governments cannot direct enterprise options, but clearly a full cost recovery including a partial recovery (depending upon useful life-span) of existing infrastructure costs and full recovery of new developments will go some way towards focusing on improving the value added to the water. However, the pricing must account for other related costs. The first of these is the transmission cost to point of use. However, these should be discounted by any quantifiable environmental benefit that may accrue in the passage of that water, particularly if that supply delivery was in accord with a typical natural seasonal flow (mimicking the natural system). The other side of the coin is the environmental cost of provision of irrigation supplies. Obviously a difficult item to assess, it is still critical. It is only when these full costs attributable to water impoundment and distribution for irrigation have been reconciled that tradeable water rights can operate in a realistic market. Unfortunately, we appear to have put the cart before the horse in most states on this matter.

With all costs accounted for, we are in a better position to achieve a competitive market for water. However, it is believed that there is a justification for water providers to draw a premium for each ML which will ultimately provide greater returns for irrigators and the community.

A premium on the price of water provides the opportunities for the repurchase of water entitlements on the open market by the government (Epps, 1997). This, combined with a trend to more efficient use of water, will provide further opportunities to enhance the environmental flows and may provide a cushion for ensuring a higher percentage of entitlements through drought periods (Epps, 1997). It will also provide the resources for greater government funded research into two areas:

* new horticultural and other associated enterprises, including the increased fostering of co-operative ventures for production, processing and marketing; and
* into new irrigation/production systems.

In relation to the latter, it has been demonstrated that substantial savings in water use can accrue through improved techniques, and new research is beginning to identify mechanisms whereby weed, fungal and pest control can be achieved through trickle and other water systems. This could very substantially reduce the land use conflicts that have occurred through aerial and other spraying techniques with many crops. The benefits that can accrue to soils with salinity problems are also obvious.

Should we ignore the demands of the environment, we do so at our great peril. Leadership is needed by government. By supporting research into improved profitability through new enterprises for producers, and increasing water use efficiency and value adding to water, there is politically acceptable justification for significantly increasing the environmental flows in river systems. Apart from research, there is also a critical role for government in ensuring a greater integration of agencies across the necessary sectors, and to provide leadership, information and co-ordination (particularly for related industries including irrigation equipment manufacture). Whether this can be broadly achievable is a moot question, but it *is* possible.

This overall approach, achievable through full cost recovery and the impost of a small premium (which would be more than recouped by irrigators in the medium term), has ramifications in relation to other aspects of service provision in rural Australia, particularly where there has been difficulty in providing additional, more interesting and challenging employment to maintain population levels. With appropriate leadership, and the government prepared to commit funds in advance to develop research initiatives, there is the opportunity to foster new rural industries in the fields of research, production of high value crops, further processing avenues, and manufacture of irrigation equipment

(if this can be most competitively produced in regional Australia). In all these areas, there is the opportunity for exports – in technology, product and equipment.

In conclusion, it is felt that a more competitive market for water has the potential to substantially improve the economy of those regions endowed with irrigation supplies. However, the move to full cost recovery (including infrastructure, transmission and environmental costs) must be a preliminary before the market for water rights can be a fully fair system in terms of the community's stake in this national resource. Then, by virtue of government supported research and funded through a levy on water, competition for water allocation has the potential to move much of the irrigated areas to a higher level of production and increase employment and population. This strategy, with appropriate leadership and integration can be:

* a win for the irrigators through increases in returns and more assured water supply;
* a win for associated new industries with export opportunities;
* a win for the environment through improved river management;
* a win for the community (in relation to employment, population and maintenance of services); and a
* a win for government at all tiers via greater national resource equity and a high benefit cost ratio.

Roger Epps, Senior Lecturer
Division of Geography and Planning
School of Human and Environmental Studies, UNE, Armidale, 2351.
Email <wepps@metz.une.edu.au> Fax 02 67 73 30 30

Queen Elizabeth Drive

THE SUSTAINABILITY OF AUSTRALIAN AGRICULTURAL PRODUCTION SYSTEMS: A REALISTIC OBJECTIVE OR SIMPLY A DESIRABLE AIM?

(refer p. 178)

ROGER EPPS*

SUMMARY Whilst the term sustainability has undergone considerable transformation from its original intended meaning, in the context of agriculture it is considered to have relevance to four aspects of the activity; the maintenance of production, financial returns, employment opportunities, and the stability of the ecosystem. This article's appraisal of market trends suggests that the key issue of substantially improved financial returns for Australian agriculturalists is at present unlikely for some enterprises. What is particularly discouraging is that downward trends have persisted, despite the many efficiency gains in agriculture. Further gains from technological developments and trade liberalisation will be limited for many agricultural sectors. Whilst initiatives to reduce land degradation have achieved a high public profile, greater effectiveness can be achieved in this area. There is some scope for significant improvements in the overall performance of agriculture, but the most achievable gains will probably be confined to those specific enterprises that can use geography to greatest advantage.

KEY WORDS: rural; agriculture; sustainability; prospects.

INTRODUCTION

In part due to the exaggerated returns for wool during the Korean War, agricultural produce dominated Australian exports in the early 1950s. In the four decades since then, agriculture's contribution to overseas trade has declined and the return to producers has also fallen. This difficulty has been compounded by steadily increasing costs. Public policy changes have also resulted in lower industry protection and reduced subsidies for inputs. The last two decades have seen agriculture's contribution to exports fall from 44.5 to 21.0 per cent, and its share of the Australian gross domestic product halved to 3.2 percent, reflecting the expansion of mining, manufacturing and services (ABARE 1994a). This trend has occurred despite multi-faceted investment in the industry and is largely due to global competition for market share and the recession of the early 1990s.

The rural population of Australia in general, particularly away from regional centres, remains very dependent upon agriculture and many towns have suffered high out-migration. Alternative economic activity is mostly limited. The majority of such towns lack the necessary combination of appropriate location and inherent resources necessary to support significant tourism, manufacturing or mining developments to reverse the out-migration flow.

To some, the widespread use of the word, 'sustainable', in association with a range of industries, has triggered hope. In the context of agriculture, if the land and existing enterprises can be sustained, or new ventures secured, would there be the opportunity to reverse the deteriorating circumstances in agriculture and provide a robust economic base to many rural economies and their populations? This article focuses on the likelihood of achieving sustainability, in its broadest sense, in Australian agriculture.

SUSTAINABILITY AND AGRICULTURE

Whilst the word *sustainability* was originally coined in the context of project management objectives in less-developed countries, the term is frequently used in association with many western activities, particularly rural economies. Sustainable projects were those where it was believed that indigenous people would be able to successfully provide all inputs as outside expertise was withdrawn (see Paddock & Paddock 1973). The use of the term has since broadened and could, in relation to agriculture, imply that:

- a conservative level of production can be maintained;
- financial dividends will remain sufficient to ensure the maintenance of living standards;
- the employment base for agricultural society would persist; and
- the sustainability of the rural ecology is also guaranteed. (see also Rose 1992; Mollah 1993)

For an agricultural production system to persist in its present form, all four components will play an important role and, indeed, significant improvements in most aspects are essential if this objective is to be achieved. The crux of the issue is improvement in profitability, as this is the major enabling factor for the remaining three elements. A review of trends over past decades, despite the production increases and gains in efficiency, casts doubt on the likelihood of this outcome.

* Department of Geography and Planning, University of New England, Armidale, NSW 2351, Australia.

PAST MARKET TRENDS

Due largely to global markets and the vicissitudes of production, the returns for most agricultural commodities have been erratic (Figures 1a and 1b). This is particularly the case with the sugar industry over the last two decades. To some extent, the upward trend in prices may appear encouraging, but they must be viewed in the context of increases in the consumer price index (CPI) and changes in the cost of production. Figure 2 shows both the path of the CPI and the annual index of real net value of farm production. The cyclical nature of the markets for the various commodities tends to mask the underlying declining performance of many enterprises. However, the trend of the real net value, which represents the difference between the prices received and paid by agriculturalists and deflates these by the change of the CPI, offers the most cause for concern. The actual net value has only averaged about $2.5 billion over the last decade, despite the impact of the recent wool boom (see Figure 1a).

Should the nation have been intentionally depreciating its agricultural stocks over the past four decades, perhaps such a decline would be anticipated. Admittedly, the recession over the last few years, exacerbated by the 1990s drought, has caused a decline in the asset base of many agricultural establishments. However, performance since the earlier drought at the start of the 1980s, as indicated by the real net value of farm production, has been considerably below previous results, despite an upward trend in output (ABARE 1994a).

This unfortunate outcome is despite a vast amount of research in many facets of agriculture in Australia over many decades. It also appears to contradict the expansion in training facilities and the increase in tertiary education amongst the agricultural community. It does not mirror the trend towards a particularly high level of productivity per unit labour. It is despite a considerable investment (much of it public) in infrastructure and in the agricultural enterprises themselves. Farm capital amounts to around $90 billion in broadacre and dairy industries alone (estimated from ABARE 1994b) to which must be added the capital in at least 30 000 other establishments, including all intensive horticultural ventures. When one also considers this result in the context of technological developments and the effort put into agricultural extension, the situation can only, realistically, be described as critical.

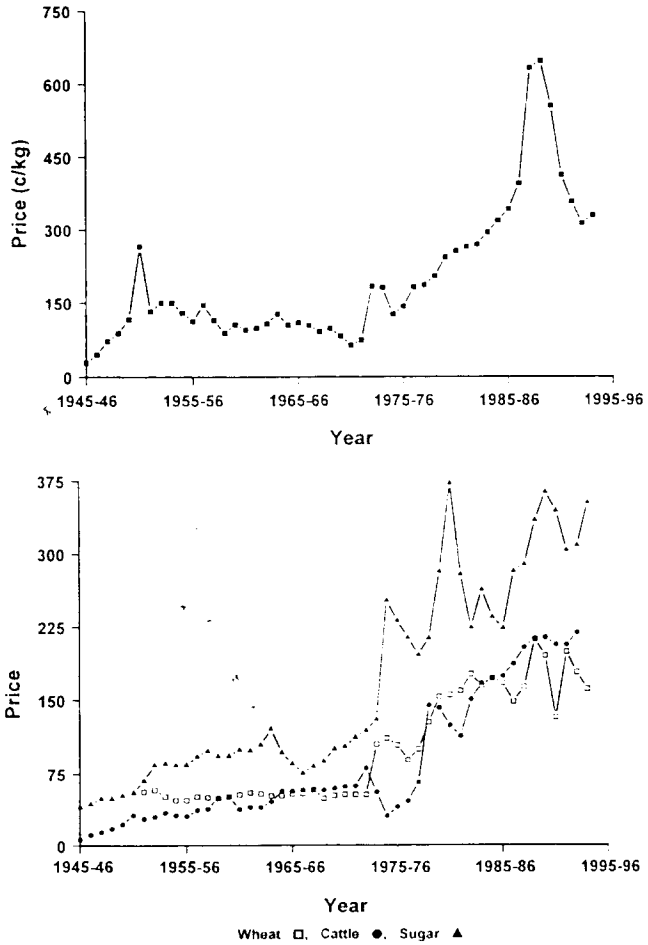

Figure 1: Market price trends since 1945 for (a) wool; (b) wheat ($/tonne), cattle (c/kg) and sugar ($/tonne)
(Source: ABARE 1994a.)

IS THIS THE TURNING POINT?

Is it possible that the nadir has been reached? Are there developments already in place that are likely to support a steady improvement in the health of the industry? There is the suggestion that flows of information to agriculturalists will improve further (AIAS 1992). Media reports to a considerable degree, and ABARE (1993a; 1994c) to a lesser extent, suggest that the outcome of the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) will produce benefits to agriculturalists. Technological developments should continue to provide more cost-effective management of livestock and crops and, with moves towards Total Catchment Management (TCM) and the Decade of Landcare in place, there is the expectation that the natural agricultural asset will be more wisely husbanded. Has the nation and its agriculturalists reached a stage where they can believe that the correct policies are in place and it is largely a matter of waiting for global affairs to cause a return to more prosperous circumstances? This can be assessed in part by reviewing the individual components, cited above, in which hope is vested.

Information

There can be little doubt that access to appropriate information is a precursor to sound management and decision-making. However, there are several key stages between making information available and seeing a resultant improvement in

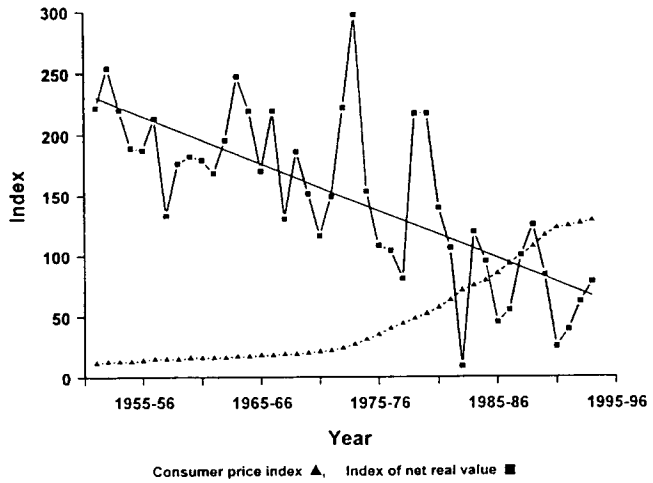

Figure 2: Trends since 1951 in Consumer Price Index and Index of Net Real Value.
(Source: ABARE, 1994a.)

outcome. At an individual farm level these can be identified as:

- a recognition that new ideas can achieve increased productivity;
- an acknowledgment that improvements can be achieved in one's own activities;
- knowledge of which ideas to incorporate;
- knowledge and necessary skills to enable implementation;
- the financial resources to permit implementation;
- the decision to direct resources to that development; and
- circumstances within the anticipated opportunity spectrum (economic, climatic) to ensure a satisfactory outcome.

Thus, it is evident that information availability in itself is only a small part of the whole picture. It could be argued that a manager with the other necessary resources and skills would have little difficulty in locating the essential information anyway. Aside from this, the other key issue, accelerated by systems such as Internet and the World Wide Web, is that information is becoming universal and those with the strongest locational advantages, in terms of production, have the potential to ultimately outperform competition in a 'level playing field'.

GATT

Much store has been placed in the satisfactory outcome of GATT (Oxley 1994) and its executive arm, the World Trade Organisation. However, there are several matters of uncertainty. The first is a concern about the effectiveness of the tariff reductions. They are only modest, ranging from 13.3 to 20 per cent for developing and developed countries respectively (ABARE 1994c). There are also other considerations which raise fears about the agreement's ability to bring about additional effective change, including:

- the fact that, through anticipating the outcome of the Uruguay Round of talks, some of the tariff reductions have already been effected;
- the tariff reduction relates to a basket of imports in individual countries, which may mean that some key Australian exports receive little benefit;
- the possibility of structured tariffs to favour particular trading partners or blocs;
- the possibility of demand for alternative, previously less accessible products increasing should more liberal trade eventuate;
- the possibility that this may encourage additional producers into the global market (at the expense, for example, of Amazonian forests);
- the manipulation of acceptable levels of residues and other checks on imports;
- environmental issues, such as protection for producers in environmentally sensitive regions; and
- possible market espionage, the impact of nationalistic promotion, and consumer preferences.

In 1994, the agreement represented the culmination of years of negotiating by representatives of many nations. A decade from now, few nations will be following the directions of the same leaders. Political opportunism, particularly harvesting votes from the affected producers and cultivating support through policies of protectionism and platforms of nationalism, is inevitable. The degree of trade liberalisation must remain a matter of some speculation.

Technology

There is a distinct likelihood that technology will continue to make some aspects of agriculture more efficient. The potential varies depending upon the nature of the enterprise. With careful management and appropriate monitoring of performance, improvements in output resulting from better genetic stock are possible. However, even with the technology currently available, it is probable that gains will only be marginal. For example, there has, for decades, been considerable effort directed towards developing a labour-free mechanism for shearing sheep. Even if a device could be developed that halved the cost of the shearing process, it would represent a saving to the industry of less than $1 per head as all other facets, such as mustering and penning the sheep, picking up, skirting and classing the fleeces would remain largely manual. This saving may represent a cost in other areas. With the demise of shearing, there would be a loss of suitable labour for crutching and other farm-based casual work, and of part-time income for some owners of smaller farms.

In other respects, technology, unless strongly underpinned by sound training and experience, may lead to a deterioration in livestock manage-

ment. The use of a measurement device to detect oestrus in dairy cattle, for example, may well be seen to short circuit the important skill of observation, a key requisite in the broader area of livestock husbandry. Technology can bring about savings in many respects, but it should be introduced on the basis of a budget calculated to recover the full costs, and must not expose agriculture to greater potential risk should it fail.

Australian agricultural production is not on the verge of a technological revolution. On the contrary, technology has had a cumulative impact on the industry for at least a century, since the introduction of borehole sinking, refrigerated shipping, shearing handpieces and the potentially enormous impact of the traction engine. Recent decades have witnessed the introduction of improved livestock pharmaceuticals, better irrigation technology, improved seed varieties and pesticides, sophisticated testing and marketing, more reliable forecasting, widespread development of electronic communication, and the use of consultants and computers in farm management. If these achievements are acknowledged and considered in the light of Figure 2, one cannot assume that technology on its own can achieve more than marginal gains overall in relation to present applications.

Total Catchment Management

The principles of TCM, first proposed in 1885 (Royal Commission on Water Supply 1885) for the management of rural lands on a holistic basis, have provided a platform for improved land use and planning at an appropriate level. The particular benefit is the co-operative interaction between state departments and local government, also incorporating input from the community for addressing broad, catchment-wide issues (Auster & Epps 1993). TCM committees have engendered some antagonism because they have nominated rather than elected community representation; this is claimed to be indicative of further government intrusion into the direction of land use (Martin et al. 1992). Another weakness of TCM is its lack of significant regulatory and punitive powers. However, the catchment committees fulfil a role which is basically integrative and advisory and they are in a position to recommend policy changes. Such functions give some promise of enhanced sustainability of our catchment systems.

Whilst TCM tends to address policy, the Landcare program, launched by the Hawke Government in 1989, is aimed at 'best practice' and involves agriculturalists and the broader community. Its target is to see that land is used in an economically and ecologically sustainable manner (see, for example, Meechan 1991). In terms of raising the profile of land care throughout the agricultural population, the program has been particularly successful with awareness reaching 90 per cent amongst broadacre farmers in Australia. By March 1994, 28 per cent of farms had a member or representative who was a Landcare member (Mues et al. 1994). Interestingly, the aspect of Landcare most valued by the members was information exchange at meetings (34 per cent) and field days (20 per cent) in preference to new management skills (8 per cent), catchment/regional planning (9 per cent) and monitoring degradation (6 per cent). Whilst there was no indication from the farm survey (Mues et al. 1994) as to the exact nature of the information exchanged, it appears highly probable that social ties as well as the land are likely to be sustained as a consequence of the meetings.

DOES THIS MEAN A STEADY IMPROVEMENT?

Whilst acknowledging the potential benefits of these developments, it is imperative to view them in the global context. Then many key issues become increasingly significant, including:

- the likely consequences of increasingly widespread access to information;
- the distinct possibility that, under persistent global marketing difficulties, profitable opportunities will be explored around the world by most nations;
- the strong likelihood that, given time, resources and government support, other producers in better agricultural environments can out-compete many traditional and new commodities from Australia;
- the logic that, in order to protect industries in other countries, tariffs and trade barriers, overt or camouflaged, will persist;
- the impact of conflict and national security on trade and tariffs;
- the need, in order to keep avenues of trade open, to direct considerable care towards maintaining clean produce and anticipate potential trade espionage;
- the considerable potential increases in global production due to the agricultural restructuring within parts of the former Soviet bloc (ABARE 1993b);
- the need to moderate unrealistic expectations of the benefits of information, technology and the outcome of the Uruguay Round of trade talks;
- the need to remain at the forefront of research and development of agricultural production and, where appropriate, further processing or value-adding; and
- the need to gain maximum market leverage by virtue of Australia's geography.

In view of these points, there is a distinct lack of reason in assuming that information, tariff reduction, technology and sound land management will bring about the considerable improvement neces-

sary to economically sustain Australian agriculture. In the global context of achieving this objective, the implications of three of the above issues, research into new enterprises, the need for quality control, and the need for greater attention to be paid to geography, will be briefly considered. In addition, four further issues, all largely related to local factors, are raised. These include the task of combating drought; the growing importance of water; the benefits of syndicates or co-operative action; and, particularly important in securing the nation's agricultural resources in the longer term, assessing the most effective role of Landcare.

Research and innovation

With the increasing flow of information around the globe and the likelihood that other suitable conditions exist elsewhere, Australia cannot expect to have monopolies over profitable enterprises. Essentially, it must be presumed that, given an appropriate lead time, most Australian produce will eventually be competing with that from other countries which have more reliable climates, more fertile soils, often cheaper labour, and probably matching efficiency. However, Australia can achieve a degree of prosperity through the dividends of entrepreneurialism. The strategy capitalises on Australia's ability to research and develop innovative agricultural enterprises, be they new breeds of livestock, crop varieties, or niche markets such as emu, marron and other indigenous foods. However, with a limited profitable lifespan always a likelihood as other countries develop competition, this process needs to be continually evolving.

Product contamination

Recent alarms raised due to the contamination of food exports, allegations of corrupt activities involving meat inspections, and the death of one child and the illness of many more due to *E. coli* contamination of processed meat, emphasise the need for further research into the screening of food products in Australia. Although some bacterial tests may pose challenges, there is a distinct need to develop monitoring that can screen food products before they leave the processing/packaging point. Ideally, in order to cut the logistics of tracking the food post-scanning/sampling, the ultimate objective would be to develop tests that would monitor all throughput instantaneously. Perhaps new technology will eventually achieve this. Such an approach would minimise Australia's exposure to rejection of consignments, damaging publicity and loss of market share.

Geographic advantage

Australian markets have been well established in Asia for some time (ABARE 1994a) and, with increasing affluence in the region, it is attracting the attention of agricultural exporters from around the globe. Whilst Australia is relatively close to many Asian markets, this in itself represents only part of its geographical advantage. Its hemispheric difference places it in a favourable position to supply fresh foods, particularly those which are perishable or have a short shelf life, out of season to the northern markets. Whilst New Zealand, South Africa and South America are also in this position, Australia possesses several advantages including:

- its geographical proximity to South, South-East and East Asia;
- well-established trade and transport links;
- relative freedom from pests and diseases, reducing the quarantine problem;
- produce generally low in chemical residues;
- a capable and responsive research capability;
- considerable and growing ethnic links with much of the region;
- relatively stable political and economic structures; and
- a large variety of land and climatic resources that can produce most foodstuffs.
  (Epps 1993, p.143)

The process of developing openings in these markets is a complex issue and one that has been receiving increasing attention in recent times. In general terms, matters that need further attention include:

- establishing a toehold in the complex Asian market networks with their traditions and favours;
- assessing market needs (varieties, presentation, packaging, price fluctuations);
- assessing freight and handling appropriateness (reliability, price, climate control);
- determining the most suitable locations for producing the crops (soil, climate, water supply, infrastructure); and
- evaluating the technical, financial and human resources required for production.

Typical of the progress in this context is the work of CSIRO in developing a preservative membrane for the packaging of fresh produce and the farming of tuna in South Australia to meet market requirements in Japan.

Geographic advantage in the supply of Australian agricultural commodities is predominantly seen in the context of exports as approximately three-quarters of the production is exported. Additionally, the possibility of developing farmed fibre, such as hemp, for environmentally acceptable local paper and packaging manufacture has plenty of scope as imports of paper and wood pulp total $1.4 billion annually (ABARE 1994a).

Combating the economic impact of drought

With the development of more effective climatic monitoring at a global level, there is an increasing appreciation of the functions of atmospheric systems that govern Australia's weather in the short to medium term. In a climate where extremes and uncertainty appear the norm, it has always been particularly difficult to manage agricultural activities optimally. If further research could build on the knowledge obtained from models such as the Southern Oscillation Index based on the El Niño effect, and incorporate factors relating to the Indian and Southern Oceans, there may well be the possibility of eventually providing a meaningful estimate of weather possibly several months in advance. Such information would permit, for example, soundly based decisions on the sowing of crops, the joining of livestock and the conservation of fodder. It would be of particular benefit to all rainfed agricultural systems and could also enable the managers of irrigation supplies to optimise their water allocations.

Attention to water resources

The way in which the water resources of this nation have been abused is exceedingly unfortunate. Algal blooms in the Darling River in the early 1990s were indicative of resource exploitation where inappropriate allocation and over-extraction have caused the natural system to collapse. Regulatory measures to guarantee environmental flows have been introduced, but there is still a gross undervaluing of the water resource itself. Whilst the flood irrigation systems, with the land manicured by laser levels, may be the most effective in the world, the system itself is far from the most efficient. Trickle or drip irrigation, whilst involving higher reticulation costs, may water twice the area for a given quantity of water with the added bonus of claims of higher crop yields (Birch 1984).

Increasing water charges to the point of full cost recovery is a most unsavoury task in a political sense and is generally sidestepped with only token increases imposed. However, in instances such as the Coal River Scheme in eastern Tasmania, water charges were set initially at a level to cover all current maintenance costs as well as the estimated replacement cost of the system in the future. Whilst there still remains some concern about the pricing arrangements, the high cost of the water has focused irrigators' attention on the returns from their crops. Having researched their options, they have moved towards high-value crops which yield a high return per unit of water, and have produced some high value per unit weight products which are widely exported. Increasing water charges also has the benefit of encouraging users to trade a portion of their nominal entitlement, part of which may be acquired for river management, thereby both increasing the environmental flow in the river systems and the likelihood of enlarging the total irrigated crop returns.

Corporate models

Farmers have viewed agribusiness activities with some concern, particularly when struggling families have their properties purchased by large overseas corporations. If, in fact, these firms are successful, they should serve as a model for other local agriculturalists, especially if they could act together as a co-operative and emulate the scope of expertise in agribusiness. The proportion of tertiary-trained people is increasing in rural Australia (Lewis 1990) and many farm groups would include a spectrum of generally under-utilised skills amongst their families. Whilst acknowledging the difficulties in overcoming the staunch individualism of many farmers and graziers, the benefits of co-operative action in developing new enterprises, from production to marketing, may be significant. In addition, these new enterprises may provide opportunities for many of the young people who left the land to acquire an education and found employment elsewhere. With the typical family farm consisting of two adults in their fifties with no children at home (ABARE 1992), any activity that can attract educated young people to rural areas must be invaluable for the long-term sustainability of rural society.

Landcare

If the results achieved to date are any indication, Landcare has stimulated interest in sustainable farm management amongst its members. However, there is a high level of non-participation in group activities. Landcare is, metaphorically, the cart before the horse, as a mechanism to fully place responsibility for the condition of the land in the hands of the landholder is a necessary precondition. The true condition of the land must be reflected in the asset value of the land. Sophisticated, cost-effective appraisal systems are being developed which could provide an inventory of land condition at the time of sale (Epps & Crittenden 1992a; 1992b). With an appropriate policy accomplishing this in place, Landcare would provide the mechanism for all landholders to ensure that their land is a valuable asset, and not simply an input into a production system.

CONCLUSION

It is unlikely that agriculture can be sustained in its present form in Australia without periodic, substantial financial support from government. Economic recessions and the impact of drought can no longer be weathered simply by withdrawing, tortoise-like, into a shell. The level of essential farm overheads, including interest, is sufficiently high to ensure that indebtedness will rapidly

increase in times of negative income. Certainly, improvements in long-range forecasting would enhance farm management and also reduce the degree of degradation due to drought, but less can be achieved in response to global influences unless there is a considerable reorientation within the industry. The growing affluence in the Asian markets offers opportunities for new enterprises for many exporters of agricultural produce. Australia's particular geographic advantage in this regard has not been exploited. The greatest potential for growth lies in horticultural enterprises, many of which require reliable sources of irrigation water or prime frost-free, rainfed agricultural land. Both are under pressure, the former through over-commitment and environmental problems, the second through inappropriate land allocation.

Whilst sustainable agriculture in the broad sense may be an unrealistic objective, moves in that direction may bring about many welcome improvements. Further technological development in broadacre enterprises may result in marginal improvements which would be appreciated, but only if they yield a net monetary gain and are ecologically desirable. Much of the present dryland farming and grazing areas has limited scope for diversification and, should the present trends be maintained, will achieve little unless further economies of scale or co-operative structures are adopted. Amalgamation of agricultural holdings may sustain some in the community, but will be balanced by further population loss. Co-operative structures have some attraction if used solely for rationalisation of labour and resources, but hold considerably more potential if new ventures are being contemplated.

Only if there are significant achievements in improving the economic performance of agriculture will the possibility of improved standards of living and employment prospects in the industry eventuate. These will, in turn, attract younger, qualified people to careers in agriculture on the basis of rewarding opportunities, rather than divert their attention to non-rural occupations. It may well be that the new opportunities will not be found in the traditional extensive agricultural enterprises and management structures that have been Australia's hallmarks of the past, but, in time, this should be of little concern. Regardless, a more robust agricultural economy will ease the pressure on ecologically unsustainable production, although attention will need to be focused on the condition of those lands not capable of supporting viable enterprises.

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Resource Equity Through Rural Regional Development?

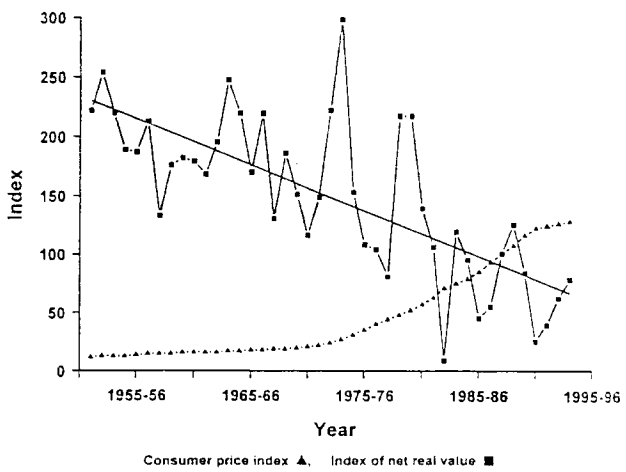
Roger Epps
Department of Geography and Planning
University of New England, Armidale, 2351
email wepps@metz.une.edu.au

In the short history of post colonial rural Australia, there has been a continuum of structural change and adjustment both in terms of economic and social activity. Unfortunately, with a high level of exports characteristic of most major rural enterprises and a low level of protection for domestic markets, the fortunes of much of rural Australia is highly dependent upon global commodity markets.

In addition, the costs to the government and the penalties of inefficiency arising from subsidies to industry have limited financial support in rural areas, apart from periodic drought assistance and manipulation of sugar markets. In the era of economic rationalism, there is a prevailing ethos of 'user-pays' and an absence of a safety net to protect industries and those reliant upon them. In areas predominantly dependent upon agriculture, these circumstances have, in part, led to a decline in the populations of rural service centres. There is little alternative employment not in some way linked to the profitability of the farm sector and out-migration is inevitable.

Some trends are cyclical and, within the farm sector, some enterprises fare better than others from time to time. Despite this, when one considers the long term trend in the overall index of agricultural prosperity, it is obvious that Australian agriculture is in a serious and worsening predicament (Figure 1) Admittedly, we may hear much about the possible benefits from GATT and the future under the direction of its executive the WTO. I believe, however, that many of these gains are more imagined than real, exaggerated by both the political parties involved and the media (see Epps. 1995).

Figure 1: Trends since 1951 in the Consumer Price Index and Index of Net Real Value (ABARE, 1994a)



It is only in the last few decades that Australia has been confronted with the realisation that the exploitative approach to its supposedly renewable resources is leading to the inevitable scaling down of production in several sectors. For example, past levels of forest production, particularly in terms of type, quality and quantity have not been maintained (Rawlinson and Penna, 1982; Dargavel, 1995). One consequence of this is the action of the NSW government which is funding the major proportion ($120 million) of the restructuring of the State's forest industry (SMH, 17/9/96).

Another sector causing concern is Australia's fishing industry where the long term viability of several species of fish, crustaceans and shell fish is under threat. Departments responsible for the management of these natural resources have drawn significant criticism both from the industry itself on one side and the community on the other. The populations of new fishing grounds, particularly in the Southern Ocean are being carefully assessed by the Australian Fisheries Management Authority to ensure that subsequent commercial development is on a sustainable basis.

The productivity of Australia's agricultural lands has also been weakened through land degradation with estimates of the full cost to society ranging from $600 million to $2 billion per annum (Eckersley, 1989). It is too soon yet to effectively gauge the impact of Landcare in reversing this deterioration of this significant national asset. However, until the market place fully reflects the condition of crop and grazing land, it is unlikely that there will be a long lasting impact on land husbandry (Epps and Crittenden, 1992).

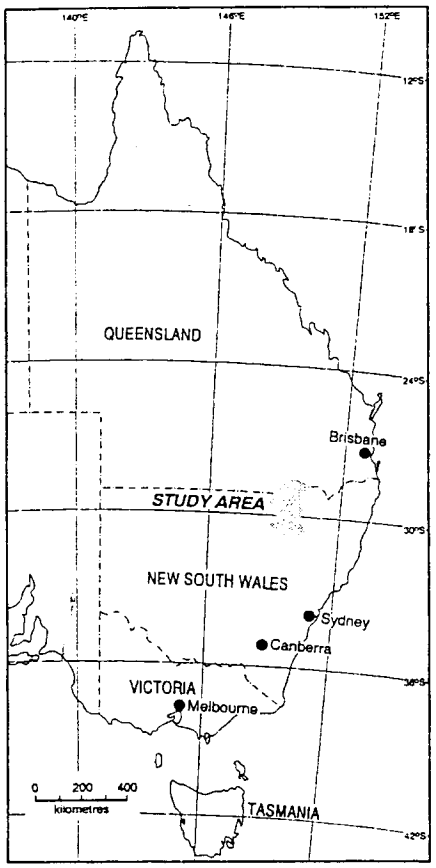
In all these industries, there is an element of resource exploitation, a culture that has descended from colonial times when, for example, the populations of Mt. Pitt birds on Norfolk Island and the fur seals of Bass Strait were hunted till their numbers were exhausted. In addition, virtually all accessible cedar trees were logged; the only concern of the authorities being that royalties payable to

the crown were lost through illegal logging. Land, too, was a commodity being used until, its fertility drained, it was abandoned for virgin soil further afield (Collins, 1798).

Water resources

So, also, have our rivers been exploited, both directly and indirectly as we have become increasingly aware. The construction of dams for the regulation of water flow and subsequent extraction for irrigation has left a legacy of unproductive

Figure 2: Location of Study Area



saline soils, seriously affected river ecosystems and the periodic indictment of river management, algal blooms extending up to 1100 km.

By definition, resources must meet a need. However, in the process of furnishing needs to resource users, we would expect a dividend to society. If resource value is actually diminished, as in the case of non-renewable resources such as minerals, we would expect not just a dividend but a transfer of natural capital to either downstream processing and value-adding industries, including manufacturing, or to other positive enhancements such as research capacity. The extent to which such a transfer has occurred is debatable.

The policy of the establishment of infrastructure for irrigation development, funded from government borrowings (essentially the public purse), is a good example where the argument has been that the resultant industry will broadly benefit society. The economic activity stimulated is the dividend from the public investment in the dams and distributary systems. Research has indicated that there is the potential for irrigated crops to lead to significant multiplier effects (Powell, 1985). The leverage of the natural resource (in this case, irrigation water) on local economic activity will depend on the value added to the input, the degree to which inputs are drawn from local sources, and the extent of further processing that can profitably be carried out in the general zone of production.

$$\text{Multiplier}_{(\text{nat res})} = [VA_{(\text{water})} \times LS_a + VA_{(\text{product})} \times LS_b]\text{Services etc.}$$

VA = value added
LS = local sourcing

However, this principle of the potential maximisation of local economic development is probably forgotten, by all bar the cynics, the moment the campaigning politicians step down from their election platforms. Dams are constructed and, to ensure that the water consequently impounded is fully utilised, entitlements/water rights are liberally dispersed. Nominal charges are set for water, not even covering the distribution and maintenance cost, let alone offsetting the considerable infrastructure investment. Once these low charges are established, a considerable amount of political courage is necessary to raise them even marginally. Despite initiating investigation by the Prices Tribunal (1995), the recently elected NSW Labor government, perhaps increasingly concerned about alienation from the rural sector, also procrastinated on this important issue in 1996.

From the irrigators' point of view, water comes with a low price tag and full discretion (within constraints relating to supply) as to how that water should be used. The extent to which productive activity stimulates the local economy is largely arbitrary. It has been more economical, for example, for large scale farm operators to import machinery from overseas suppliers directly, undertaking self servicing of equipment rather than depend upon local dealer warranties and parts supplies. There is no obligation, quite probably

rightly so, explicit or implicit, for irrigators to pass on business to the local community unless it should be profitable for them to do so.

Cotton growing in NW NSW

One area that has witnessed considerable irrigation industry growth is the north west of NSW (see *Figure* 2) with the predominant crop being cotton. Expansion since the bounty driven 1960s has been impressive and, if it had not been severely constrained by the drought of the early 1990s, the industry would have shown steady growth in recent years (Figure 3). Despite the growth in the cotton industry, the number of agricultural workers and the populations of the two local government areas have been falling, although only marginally for Moree Plains (Table 1)

Exacerbating these circumstances are local environmental issues with serious concerns about pesticide contamination in both the riverine and terrestrial ecosystems and threats to the health of humans in the region. A central issue is spray drift resulting from the aerial application of pesticides in the cotton industry. Whilst this has been an issue for several decades, it is only recently that monitoring techniques have been developed that have identified the extent of the diffusion and interactions of chemicals that may be causing chronic health problems.

Table 1 Shire	1981	1986	1991
Moree Plains	17 237	17 017	16 915
Narrabri	15 630	15 532	14 653
Source IRDB, 1994.			

Thus, the predicament confronting this region that is highly dependent upon the crucial natural resource of water is one where:

- despite irrigation there are serious periodic disruptions to water supply;
- there is a downward trend in population, despite the growth in the cotton industry;
- the environment and the riverine ecosystem, in particular, are under threat due to both over-extraction of water and pesticide contamination; and
- the potential equity in resource utilisation is not being realised by society.

One response to this predicament may be that population decline is inevitable as structural adjustment proceeds. However, there is no justification in permitting environmental degradation to continue in parallel. It is also untenable to suggest that anything other than short term support for the local economy be permitted for fear of a reliance on a *de facto* market support (Young 1992). The final component of this paper reviews the key role of the water resource and identifies the possible avenues whereby the issues listed above may, to a significant extent, be addressed, particularly in the context of returning resource equity to the non-farm population. The discourse can be presented most effectively by viewing a series of models that charts the progression of irrigation development.

Scenario 1 Low level extraction from natural river systems (Figure 4)

Limited irrigation from an unregulated river provides some opportunities for irrigation, but is constrained by seasonal flow patterns. Due to the small scale of the operations, impact on the environment is minimal, provided there remains some river flow to meet riparian needs.

Scenario 2 Government funded irrigation development (Figure 5)

This model is typical of most 20th century irrigation developments in Australia. In an effort to stimulate agriculture and thence the broader regional economy, governments fully funded the construction of dams and distributary systems. Water licences, even within the last two decades, have been distributed free of charge to potential users, in order to stimulate irrigation development and hence provide some justification for the projects. Additionally, water charges have generally been well below the cost of supply, and rarely has there been any attempt, through pricing, to offset the depreciation of the publicly funded infrastructure. As referred to above, it has generally been considered politically inopportune to address water pricing, and recent attempts have failed to reduce the subsidies.

The rationale for subsidisation of water has consistently been that the government should recoup the capital and maintenance costs through increased economic activity and, where relevant,

increased exports.

Fig. 3: Limited water extraction from natural river systems

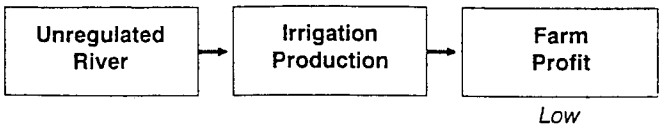


Fig. 4: Privately funded irrigation development

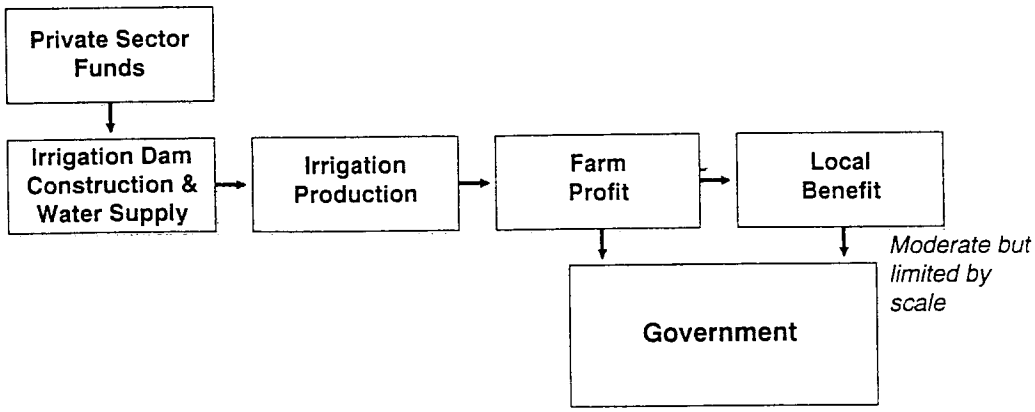


Fig. 5: Government funded irrigation development

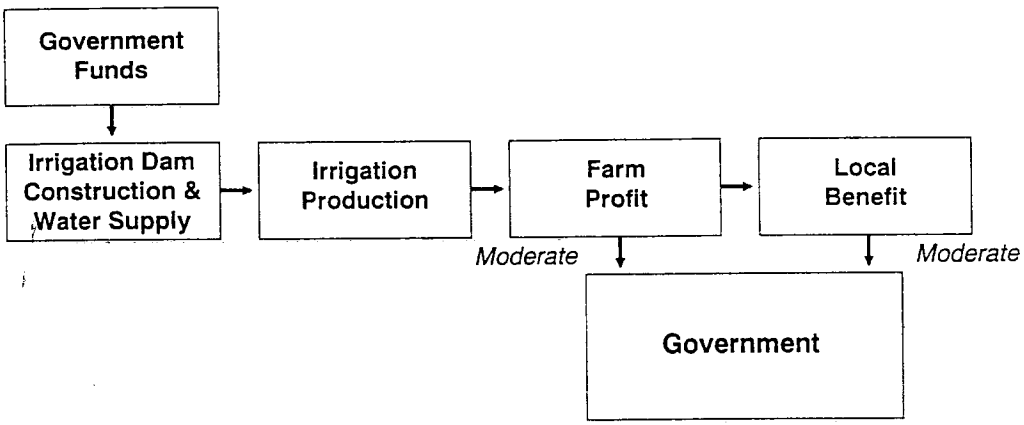


Fig. 6: The impact of technology and declining terms of trade

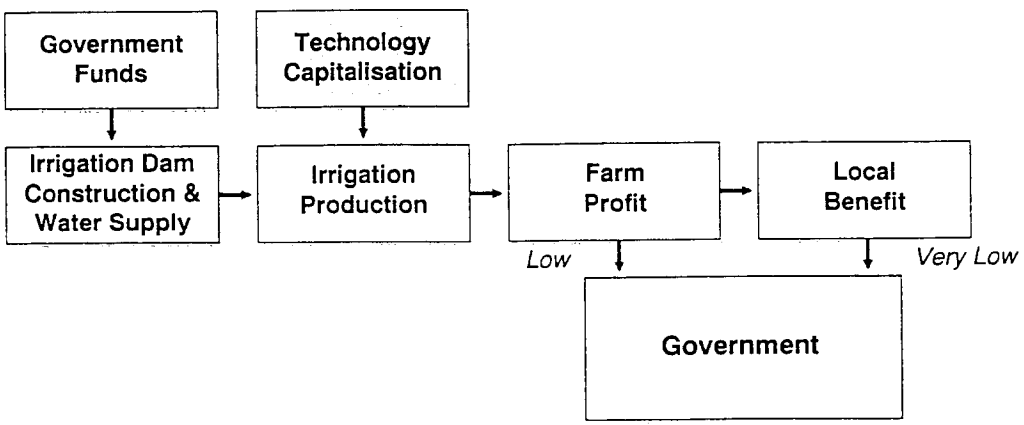


Fig. 7: Recognition of environmental cost

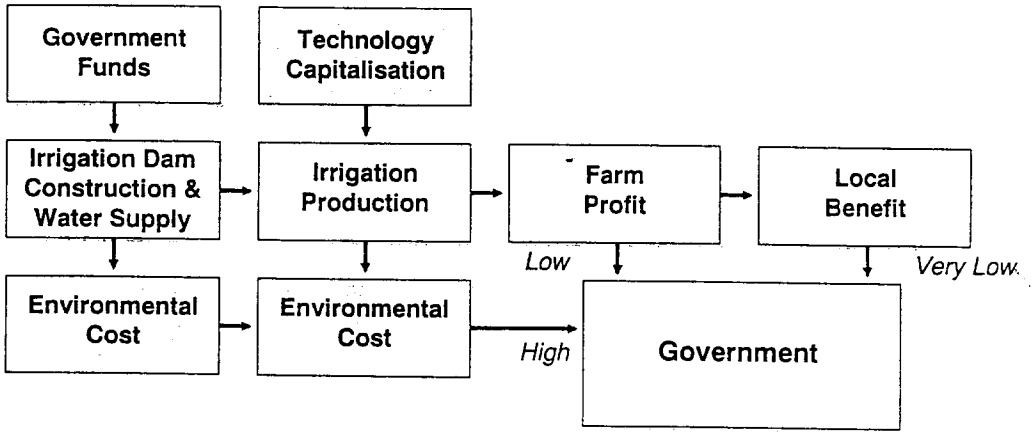
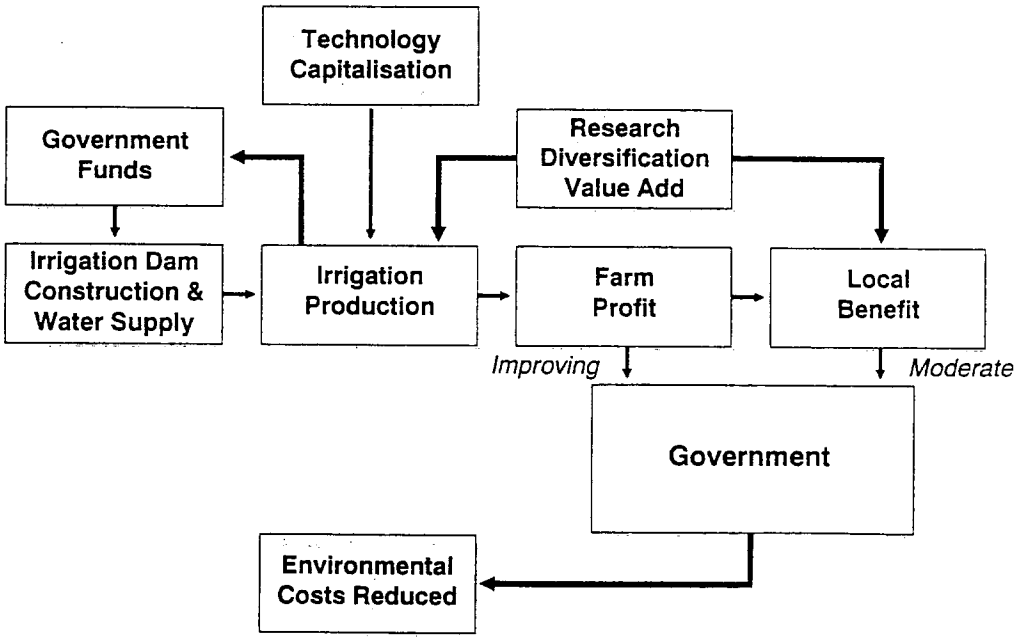


Fig. 8: Towards a holistic, equitable model



Change and adjustment in the agricultural sector

Increasing global competition and deteriorating terms of trade have driven agriculturalists to both adopt cost cutting measures and increase production. We can view the impact of this on Scenario 2.

Scenario 3 The impact of technology and declining terms of trade (Figure 6)

Utilisation of technology to enhance production efficiency and a substitution of capital for labour has had a major impact on employment in the study area. In the 1981-1991 period, the total agricultural workforce dropped from 4,217 to 3,594 at a time when the primary enterprise in the area, cotton, was doubling its production (IRDB, 1994). Whilst it is true that there has been some employment increases in related sectors, they have not compensated sufficiently to maintain overall population.

Scenario 4 Recognition of environmental costs (Figure 7)

Including the environmental cost into the model highlights a major liability of irrigation in a situation where the scale of water extraction in relation to the typical river flows is particularly high, as is the case in the study area. Whilst the full environmental costs of both the dams and reduced flows will probably remain incommensurable, the extent of the physical impact was evident in the algal bloom that extended downstream for 1100 km in 1991. Further environmental damage has occurred due to the extensive use of pesticides in cotton production.

Scenario 5 Towards holistic equitable models (Fig 8)

In order to meet the current predicament of the cotton industry as stated earlier, several policy changes are required. Firstly the real price of water needs to be determined and charged to all users (refer Young, 1992). This will have three major consequences:

- increased attention to water use efficiency;
- focus attention on value adding to water; and
- reduce, in the short term, the value of water entitlements.

To preserve the profitability of irrigators, research, funded jointly by the private and public sectors, into both crop diversification and efficient water use is justified. Trickle irrigation of cotton, whilst admittedly involving considerable additional capital outlay, has the potential to reduce water use by 30 - 40%, improve fertiliser efficiency, increase yields by up to 15% (Constable and Hodgson, 1990) and provide environmentally acceptable application of pesticides at a reduced cost (Epps, 1995). Gains in water efficiency would be associated with a progressive reduction in the allocation, thereby providing the opportunity to restore environmental flows to a more satisfactory level. Increased government revenue could also partly be directed to the purchase of some licences should that be necessary to free water for alternative uses or environmental flow. In addition, reduced demands on irrigation supplies will significantly suppress the impact of major droughts such as that experienced in the years of 1993 and 1994 where the seasonal allocations were, of necessity, severely curtailed.

There has been some crop diversification in the study area with the limited statistical data suggesting that potatoes and onions yielded respectively two and three times the crop value of cotton per hectare in 1993 (IRDB, 1994). Data from Dragun *et al* (1986) suggest that many horticultural crops require significantly less water than cotton. Thus, a realistic price for water will foster crop diversification. It is also probable that, with further research, two crops per annum will be produced and, with trickle irrigation where appropriate, the value added per unit of water will be further increased. More significantly, the diversification will trend towards the provision of fresh horticultural produce for which there are growing markets in Asia. There is, of course, the added geographical bonus of contrary seasonal production for these markets in addition to many other advantages (Epps, 1993). This is in contrast to the less than optimistic prognosis for cotton in the medium term (ABARE, 1996).

A key issue in the success of a scenario as depicted above is the need for conjunctive research between industry and government to achieve the objectives of:

- effective research into water use efficiency (and thereby increasing the environmental flow in rivers);
- research focused on increasing the efficacy of pesticide usage and associated reduction in environmental contamination;
- appraising appropriate markets and products with a view to value-adding to the central resource; and
- assessing the potential for further, cost-effective processing of the irrigation produce.

Due to the uniqueness of production areas such as

the irrigation industry in the NE of NSW, the scale of the research must be primarily regional. If the strategy described above can maintain a reasonable level of profitability for agriculturists, in terms of resource equity it should halt the undervaluing of society's natural asset, irrigation water, and provide a return on the public equity in the natural resource.

Conclusion

To achieve the more robust model depicted in the last scenario, there is an additional crucial role for government. It must balance the move towards realistic pricing of water with support for research into efficiency and diversification which will ensure that irrigators incomes will, within reason, be maintained. This will be matched by a progressive reduction in allocations to ensure the sustainability of the riverine ecosystem. Government has the ultimate responsibility of ensuring that the price imposed on the environment is not beyond the bounds of sustainability.

Finally, there is the distinct possibility that a holistic regional approach to resource and environmental management provides the opportunity for improved quality of life, both in terms of the physical surroundings and improved employment prospects.

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