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Kathryn Parker: Prior to joining ACCORD in February 2002, Kathryn was Executive Officer at the Northern Sydney Regional Development Organisation (NSRDO). NSRDO had a research and practical focus on projects to assist employment, business and industry growth, in northern Sydney. Previously she was the Economist with the Australian Business Group in North Sydney (formerly the Chamber of Manufacturers of NSW). From 1988-91, Kathryn was a tax and economics consultant with Coopers & Lybrand and Price Waterhouse. Kathryn has a Bachelor of Economics and Diploma of Education and is undertaking a Masters of Economics at Macquarie University.

Edward Oczkowski: Eddie is an Associate Professor in economics and quantitative methods in the School of Management at Charles Sturt University, Wagga Wagga. His expertise is applied econometrics and his previous research interests have included Australia's bilateral aid allocation and marketing. He has published numerous papers in journals such as the *Economic Record, Economic Letters, Journal of Agricultural Economics, Journal of Development Economics* and *Structural Equation Modeling*. Eddie gained a Ph.D from La Trobe University focusing on disequilibrium economics and econometrics.

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Abstract

This paper examines the potential impact of water reforms on agricultural water users. Within this context the role of co-operation and the use of the co-operative organisational structure is documented. The paper also examines the potential for further co-operation and the use of co-operatives in water markets and raises a series of policy issues.

There are approximately 15,000 farms in the Murray Darling Basin with irrigated crops and/or pastures, which represents 47% of all Australian farms with irrigation. The total value of agricultural production from New South Wales (NSW) irrigated valleys is $1.8 billion. Approximately 85% of irrigation employs furrow or flood methods and only 3% drip methods. In this environment water reforms have been implemented with the intent of encouraging sustainable water management practices. In NSW, this has led to the privatisation of irrigation infrastructure leading to the establishment of irrigator owned companies and co-operatives. The paper documents how the Council of Australian Governments (COAG) reforms have been undertaken in NSW, in particular under the NSW Water Management Act, 2000. The development of water sharing plans and water property rights have been key features of the water reforms. These have been applied with a mixture of economic and sustainability principles, in a policy environment trying to cater for the interests of environmentalists, agricultural producers and others with high water needs.

Various concerns have been raised about the reforms. Some irrigators express concerns about the prioritising of the environment to the detriment of production, employment and regional development. Some estimates of the costs of reforms point to the loss of 4,300 jobs and the production value of $324 million. As well, private irrigation companies now owning former government irrigation assets may have future problems raising capital or saving for future asset replacement, as well as maintaining and upgrading aging water distribution infrastructure. These organisations appear to be hampered by tax problems, high cost operating environments, and efforts to become more water efficient.

There exists significant co-operation and co-operative efforts throughout NSW's water allocation, distribution and usage network. There are approximately 700 authorised joint water supply licenses and a number of small privately owned irrigator schemes established as private irrigation districts. It appears that eight water related co-operatives exist in NSW. The largest co-operative is Coleambally Irrigation with over 350 shareholder members. Some other irrigation organisations are primarily member irrigator owned companies with co-operative structure characteristics. The water sharing plans in the water reform process represent the co-operative outcome of various stake-holders and an application of integrated catchment management techniques.

Examples of water co-operation in other countries are also outlined. Even though not unanimously supportive, the overseas evidence points to numerous cases were co-operation and the use of the co-operative structure in international water markets has resulted in improvements in the efficient use of resources and the attainment of common desirable goals.

There may be some benefits for individual irrigators from the use of the co-operative form. The benefits can be classified as return and risk management strategies. Possible benefits include: countervailing market power in the water trading market; reducing agency costs; and pursuing a 'savings bank' strategy to act as a buffer against water market fluctuations.

From a public policy perspective, the importance of co-operation and co-operative structures can be viewed as a response to market failure. The established and proposed water markets and associated property rights, have elements and characteristics of common property resources, externalities and high transaction costs. These characteristics question the standard economic efficiency arguments for an unregulated water market, and heighten the role of co-operation.

In different environments the co-operative structure has proven its ability to efficiently manage a common property resource. The costs and benefits of externalities such as salinity resulting from inefficient water practices may be shared by collective groups of irrigators to achieve a more collectively desirable outcome.

The likelihood of gaining increasing levels of investment in water infrastructure is higher with a co-operative structure than with a structure of individual irrigators. The pooling of various resources and the potential benefits resulting from economies of scale, make it more likely for irrigators to undertake investment in water saving technologies and hence reduce negative externalities.

The formation of co-operatives reduces the number of market participants in water trading and hence enables the market process to better capture the salinity effects of water use. Finally, the high transaction costs and information requirements associated with efficient water trading may be reduced by greater use of the co-operative structure. Effectively, a co-operative structure will be better able to harness information about different salinity and water efficiency aspects of use and distribution. Exchanges between and with co-operatives will better capture the full benefits of trade.

Contents

1. INTRODUCTION

This paper examines the impact of water reforms on agricultural water users in NSW with a view to examining the possibilities for greater co-operation and use of co-operative structures in water markets. There may be considerable benefits for large water users by applying co-operative principles in NSW's new water environment where economic and sustainable water practices and principles have become paramount.

The rural water reforms implemented by the NSW Government during the last three to four years are complex. They are complicated by current rural drought conditions, on-going policy changes and the development of more than 30 water catchment plans. They are causing considerable uncertainty and frustration for farmers, rural water suppliers and irrigators. Some of the issues of concern include developing water plans with committees that are often not representative of local community, economic and production interests. Other problems stem from prioritising the environment above all other objectives in plans and guaranteeing water allocations for irrigation and production purposes. There have also been considerable difficulties separating water and land property rights.

Another aspect of the reform process relates to the privatisation of NSW irrigation assets. During the mid to late 1990s the NSW Government transferred its six irrigation schemes and irrigation assets in the Murray and Murrumbidgee areas at nil cost to locally owned public companies. A major issue for these organisations has been how they structure their organisations to provide for future asset replacement, upgrades and investment, especially to provide for future water savings. As public companies, while they are able to raise capital from the public or customers, they pay huge amounts of income tax on savings for future investment. One of the former irrigation schemes, Coleambally Irrigation Company adopted a two-tiered co-operative structure that appears to offer some advantages for saving for future asset replacement. This two tiered structure enables one co-operative to be established solely for the purposes of saving for future capital asset replacement and the other co-

operative undertakes the general management of the organisation. However, there are still unresolved questions regarding the tax status of this structure.

The uncertainty surrounding the impact of the water reforms, in particular the development of water catchment management plans and water property rights, is causing frustration among producers. For instance, cotton and rice producers and other irrigators throughout NSW are concerned that the reforms will further impact negatively on production and employment. Issues also remain about the compensation to farmers for losses in production as a result of the water reforms. Even though there are some tax incentives on capital expenditure for water conservation, these could be strengthened to further encourage farmers to invest in new infrastructure and technology that will result in water savings.

Beyond these specific planning, privatisation and compensation issues, remains the general economic efficiency issue pertaining to the role of the market in the water usage and distribution process. It can be argued that 'water' has properties similar to those of a public good and therefore the entire issue of market failure and the need for government involvement or the search for additional institutional structures for water arise. The role of co-operation and the co-operative framework will also be discussed in this context.

The paper serves to raise the debate surrounding the impact of the NSW reforms on agricultural production, in particular irrigation and large water user needs. It also provides commentary on the mix of competing policy objectives in NSW (eg. privatisation of government assets, micro-economic objectives and COAG compensation issues), as well as the economic and environmental sustainability issues surrounding the reforms. The paper provides evidence of the need for further research (such as case studies, quantitative and qualitative research) to examine co-operative structures that can maximise co-operation, water efficiency, as well as agricultural production.

The rest of the paper is organised as follows. Section two summarises water usage and irrigation practices in NSW agriculture. Section three provides the policy background to NSW water reforms, looking at the COAG reforms and the NSW Water

Management Act. Section four examines the impact of the water reforms on existing structures and water users. Section five details examples of co-operation in the water reform process and outlines existing co-operative structures in NSW water usage and distribution. Section six examines possibilities and motivations for the emergence of greater co-operation and the increased use of the co-operative structure in water markets. Section seven concludes.

2. WATER USAGE AND AGRICULTURE

Water is a scarce commodity and key resource in Australia. The provision of clean water for domestic and commercial use has long been accepted as a community service and the responsibility of government in Australia.

In order to understand the rationale behind the Commonwealth and State Governments water reform policies, it is necessary to have an understanding of the patterns of natural and man-made water flows, storage and usage throughout Australia and NSW. However, as public attention has focused on water and the water industry, it has been realised that there is a paucity of data on total water resource usage, in particular the use of water by various industries, and the cost of water use and infrastructure both at State and National level. As a result, the Australian Bureau of Statistics (ABS) has recently began to produce more information on water usage by streams and groundwater for the environment. However, there is still very little data on the extent of water use by individual farms and establishments including the value of water infrastructure and assets. The following paragraphs attempt to illustrate the extent of water used by farmers with available data.

Water Usage Patterns

The ABS (2000) produced a research report that showed the agricultural sector is the largest net user of water (totalling 15,502 GL in 1996-97) and accounted for 70% of net water use in Australia. Of this amount, pasture, livestock, grains and other agriculture accounted for some 57% of total agricultural water consumption. Significant water users in this sector were cotton, sugar and rice industries. Agricultural activities depended heavily on both mains supplied (54% of water used) and self-extracted water resources (46%), (ABS, 2000).

This report also shows that 40% of total water supply for NSW was supplied by mains[1]. The NSW rice industry was the largest user of mains water, averaging 37% of

[1] It is assumed that mains water is the bulk water supplied by the NSW Government through State Water and also includes irrigation suppliers such as Murray Irrigation Limited and Murrumbidgee Irrigation limited.

total mains water use. The livestock, pasture, grains and other agriculture industry used approximately 25% of mains water and cotton 10%.

ABS (2000) also reported that in NSW the greatest levels of self-extraction of water (in contrast with mains water) were used for livestock, pasture, grains and other agriculture, cotton, fruit, grapevines and then vegetables. The study showed that between 1993-94 and 1996-97 the consumption of self-extracted surface water and ground water increased for each of the following industries livestock, pasture, grains and other agriculture, vegetables, sugar, fruit and cotton. Except for cotton, each of these industries experienced a decrease in water consumption in the 1995-96 financial year, this may have been a result of drought conditions.

Irrigation

Historically, irrigation has delivered substantial benefits to regional communities and the nation as a whole and allowed agricultural activities where they would not otherwise have occurred. According to the Australian Bureau of Statistics, irrigated production accounted for approximately 26% ($28,156 million) of the total gross value of production from agriculture in 1996-97, (ABS, 2002). The total value of irrigated agricultural production in NSW's major irrigated valleys is $1.8 billion (NSW Irrigators Council, 2002b) and while it uses just 1.5% of agricultural land in NSW, it accounts for nearly 35% of production.

Seventy-five per cent of total water extracted in Australia is for irrigation, with irrigation water use increasing by 76% between 1985 and 1996/97 (Jonas Ball *et. al*, 2001). In 1999-2000, 2.4 million hectares of land were irrigated with NSW accounting for 40% of this area. Most of the growth in irrigation occurred in NSW and Queensland with the area of irrigated land doubling in these states over the last twenty years.

In NSW the coastal areas are well watered by short streams with their sources in the highlands. The main irrigation areas are therefore situated inland along the Murray and its southern tributaries- the Murrumbidgee and Lachlan rivers. As well, to the North, irrigation extends along the Darling River to the Lachlan, Gwydir, and

Macquarie rivers and then eastwards to Bourke, Moree, Dubbo, Gunnedah and Narrabri.

Historically NSW's water resources have been seen as a factor of production to be harnessed in both agricultural and industrial contexts to provide a stimulus to regional economic development, (Crase, O'Reilly and Dollery, 2000). Water allocations were tied to social and strategic objectives associated with regional economic development such as closer settlement and soldier settlement. This view informed water resource policy until the 1980s. Until then only limited consideration was given to the true opportunity cost of water and the potentially deleterious effects of specific uses.

Large scale irrigation for rural production in NSW was first undertaken by the Government. Government administration of irrigation was originally allied to a policy of populating the interior of NSW. Fruit growing and rice growing on small holdings were part of the means of populating the interior. The establishment of irrigation schemes played an important role in the initiation of closer settlement policies to populate Australia and especially the inland.

Schemes established and run by the NSW Government have long been the dominant component of the NSW irrigation industry. Appendix One describes the history of the development of the Murrumbidgee, Murray and Colleambally irrigation schemes in the Murray-Darling Basin (MDB) in NSW.

The MDB river system that drains about one seventh of the Australian landmass is a prime food production region in NSW and Australia. The total area of crops and pastures irrigated in the MDB is 1,472,241 hectares. This represents 71.1 % of the total area of irrigated crops and pastures in Australia (2,069,344 hectares), 18.7% of the total area of crops, pastures and grasses, and 1.7 % of the total area in farms, MDBC (2002). There are 14,743 farms in the MDB with irrigated crops and/or pastures, which is 28.5 % of the total number of farms in the MDB, and 47.2 % of all Australian farms with irrigation, (MDBC, 2002).

According to an irrigation survey undertaken by the Australian Bureau of Agricultural and Research Economics (ABARE, 1998) in 1996-97, it is estimated that there are at

least 5,244 irrigators in NSW irrigating for a variety of agricultural purposes, including cotton, rice, pastures, general crops, rice and wheat, (ABARE, 1998). According to this research, the average value of irrigation plant capital was some $23,264 and the mean total for irrigation volumes were 1,323 megalitres and mean total area of crops irrigated was 109 hectares.

The NSW Irrigators Council (2002a) estimates that irrigated production in the following valleys is significant:

- Murrumbidgee Valley – total value of irrigated production crops of rice, fruit, grapes, vegetables and dairy is around $500 million and the farm-gate value of irrigated production is $300 million; while irrigated agriculture covers just 4% of the areas it contributes 41.6% of the total production;
- Murray-Lower Darling Valley – some 40.2% of total production of rice, crops, grapes, meat and livestock products is irrigated and is valued at $388.8 million and covers some 4% of the catchment area;
- Lachlan Valley - some 16.9% of total production of cotton, vegetables, fruit, meat and livestock products is irrigated and is valued at $165.3 million and covers some 1.6% of the catchment area;
- The Gwydir Valley - some 41.4% of total production of mainly cotton (80%) and other varied crops and livestock products is irrigated and is valued at $245.1 million and covers some 1.7% of the catchment area;
- The Macquarie Valley - some 22% of total production of grapes (80%), fruit (92.4%), vegetables (945), other crops and cotton (80%) is irrigated and is valued at $263.11 million and covers some 1.1% of the catchment area;
- The Namoi Valley - some 30.3% of total production of cotton (80%), other crops and fruit, vegetables (99.9%), grapes (80%) is irrigated and is valued at $292.2 million and covers some 1.5% of the catchment area;
- The Barwon- Darling Valley is an unregulated river with no major dams and some 36.7% of total production of cotton (80%), fruit (93%) and grapes (97) and vegetables (100%) is irrigated and is valued at $74.35 million; and
- The Border Rivers straddle the NSW/Queensland Border and some 32.9% of total production of vegetables (93%), fruit (97%), cotton (65%) and other

crops is irrigated and is valued at $271.3 million and covers some 0.7% of the area of the catchment.

Problems Arising from Irrigation Methods

The most intensively irrigated crops are rice, cotton and grapes with 97%, 96% and 81%, respectively, of their growing areas recorded as being irrigated, (ABS, 2001).

The method of irrigation used influences the efficiency of water use and the value of the harvested crop. However, a number of factors have affected the choice of irrigation method and these have varied from cost, available technology, soil type, type of crop, climate and geography. Nevertheless, the statistics show the prevalence of water inefficient irrigation techniques because furrow or flood irrigation methods are used for nearly 70% of all irrigated land in Australia and 85% of irrigation in NSW as reported by the ABS (2001). Flood irrigation is used on the majority of pastures and cereal crops because it is cheaper than other methods, (Smith, 1998). However, if not managed correctly, furrow and flood irrigation can be highly inefficient and have detrimental effects on the water tables and surrounding water bodies.

In recent years, technological innovations, such as laser leveling have improved water efficiency and helped decrease over-irrigation. In 1999-2000, the spray method was used on 22% of irrigated land throughout Australia and 11% of farms in NSW. While this has a higher installation cost and is used for the application of saline water (generally from groundwater sources), the spray method produces less waterlogging than the flooding method. The drip or micro-drip irrigation method is used on a much smaller scale, with only 8% of farmers in Australia and some 3% in NSW reported such methods.

The major problem of concern to policy makers apart from inefficient water usage, has been rising salinity as a result of irrigation. Of particular concern is the problem of salinity in the MDB brought about by extensive farming and changes in land cover. It is predicted that by 2100, many rivers in the MDB will have salinity levels exceeding the World Health Organisation minimum acceptable standards for drinking water, (MDBC, 1999).

Another factor contributing to salinity is the raising of water tables as a result of the accelerated recharge of underground water from irrigated land resulting in increased salt loads entering river systems. Reduced river flows as a result of the construction of dams, weirs and water diversions have compounded the problems as there are inadequate flows to dilute the saline groundwater inflows. Other problems with irrigation practices include the decline in soil structures in intensely irrigated areas, and a decline in water quality as a result of fertilisers used in conjunction with irrigation.

Continued awareness of these problems together with the need and ability to invest in water efficient technology and irrigation methods should help to improve some of these practices and reduce the decline in land and water assets. However, it is questioned whether farmers and irrigators have sufficient resources to invest in more efficient technology and infrastructure, especially as a result of the uncertainties produced by the new water environment in NSW. It also questioned whether the NSW Government can better assist farmers to invest in such water saving technologies, or alternative organisational structures discussed to maximise efficiency.

3. POLICY BACKGROUND TO THE NSW GOVERNMENT'S RURAL WATER REFORMS

The water reform agenda undertaken by the NSW Government owes much to the national initiatives and strategies established by the COAG in 1994 to encourage sustainable water management policies and prioritise the environment over production, economic and social objectives[2]. The major NSW reforms that have impacted on NSW farmers and irrigators have been the privatisation of government irrigation schemes in the MDB along the Murrumbidgee and Murray rivers and the introduction of the Water Management Act 2000. The impact of the reforms is uncertain, indeed various aspects of the reforms are still evolving and causing problems for government and water users alike.

COAG Reforms – the Carrot

The 1994 COAG Agreement included a commitment by all Governments to a package of measures to address the economic, environmental and social implications of future water reforms. These reforms included a move to full cost recovery in pricing water, the clarification of property rights to water, the trading arrangements, institutional reforms to separate service delivery and regulatory functions and better public consultation processes.

The 'carrot' in the reforms were significant financial incentives for States and Territories to implement these water and other National Competition Policy (NCP) reforms. Satisfactory progress against the NCP reforms entitles individual states and territories to a per capita share around $16 billion in transfers from the Commonwealth. The first round of payments was assessed in 1997 and excluded an evaluation of water. The second round of payments required effective implementation of a broad framework for water reform and the third tranche commencing in 2001-2 were conditional on the States having given full effect and continuing to fully observe all COAG agreements on water.

[2] The driving force behind COAG reforms appears to be a mixture of micro-economic reform and sustainable development ideals – which often sit uncomfortably with each other. Economic principles have been applied to privatise government assets, to limit water use because of scarcity, and to trade water with similar legal property rights as land. The mixture of these principles and paradigms has been confusing. They can be contrasted further with common pool resources and public good characteristics of water discussed in later sections of the report.

The National Competition Council (NCC) released its report in 2002 assessing whether the States have implemented their COAG water reform agreements, NCC (2002). While most States have begun implementing rural water reforms, the States differ markedly in their progress and approaches to institutional reforms, privatising government assets, water pricing and trading policies.

NSW Reforms - Institutional Separation

One of the first national competition reform initiatives of the NSW government was the institutional separation of its water delivery and regulatory functions from the Department of Land and Water Conservation. The rationale underlying these reforms was the improved accountability, productivity and efficiency of separate water delivery and regulatory functions.

In the mid-1980s, metropolitan service providers were separated from the government as state owned corporations and these included the four major NSW metropolitan service providers of Sydney Water Corporation, Hunter Water Corporation, Gosford City Council and Wyong Shire Council.

State Water was also ring-fenced, not separated, within the Department of Land and Water Conservation. There are no current plans to separate or privatise its assets, although the recent National Competition Assessment, the Independent Pricing and Regulatory Tribunal and the NSW Irrigators have questioned whether the existing separation is sufficient, (NCC, 2001).

State Water continues to provide bulk rural water to irrigators, local governments and industrial customers and is responsible for managing infrastructure assets including 18 major dams including the Blowering, Burrendong, Copeton, Glenbawn, Keepit and Windamere throughout NSW, (NCC, 2001). These dams were valued in 2001 as worth $1.9 billion and their 264 weirs and 404 related structures were valued at some $278.7 million[3]. In addition to these dams, State Water is also responsible for the operation and maintenance of 14 small dams across the State, most are no longer used

[3] NSW DLWC (2001) lists these assets using the Modern Engineering Equivalent Replacement Asset (MEERA) valuation.

for water supply and have not been valued. State Water also provides river operations, and metering and billing services.

Privatisation of Irrigation

In the late 1990s, NSW also privatised six former government irrigation schemes located in the southern part of the Murray Darling Basin under the following NCP rationale that led to "constituents being given a greater degree of responsibility in the management of irrigation areas (clause 6g)"(NCC, 1999). In June 2001, the NCC concluded that the NSW Government had met its requirements under the NCP and that all NSW irrigation areas are now privately operated and controlled by farmers and irrigators.

Murray Irrigation Ltd, Western Murray Irrigation Ltd and Jemalong Irrigation Ltd were created in February 1995 as Australian Public Companies limited by shares. Two others irrigation areas were privatised under the Private Irrigation Districts Act 1973, these were the Gumly Gumly Private Irrigation District early in 1995 and the Hay Private Irrigation District in 1996.

The Murrumbidgee and Coleambally Irrigation Districts were separated from the NSW Department of Land and Water Conservation in the mid-1990s as state owned corporations. They were both allowed to become private companies after parliamentary pressure from irrigators. Murrumbidgee Irrigation Ltd became a public company limited by shares in February 1999.

In November 1999, Coleambally Irrigation moved closer to local ownership as the Irrigation Corporations Amendment Bill passed through State Parliament and enabled 30 or so water users outsider the area who were customers to become shareholders in a new locally owned scheme. By June 2000, Coleambally Irrigation was transferred to local ownership and then chose to become a co-operative. It was the last of the States irrigation schemes to be converted to local ownership.

NSW Water for the Environment – The 'Stick'

The culmination of the NSW Government's water reform program was the introduction of the Water Management Act ("the Act") in December 2000. This has

revolutionised the way water is managed in NSW because it is based on the concept of ecological sustainable development that will not threaten the ability of future generations to meet their needs and gives the Government the ability to prioritise the environment above all other economic, social and community goals, NSW DLWC (2002). As recent NSW Government actions indicate, the Act has given the Government the ability to simply 'turn the water off' in certain areas of NSW which are having serious consequences for irrigation and production.

The purpose of the Act is to provide for the protection, conservation and ecological sustainable development of water. It protects rivers and groundwater systems, integrates water management with other natural resources, shares water responsibilities between government and the community, and considers environmental, social, cultural, heritage and economic in all water management and planning decisions, (NSW DLWC, 2002).

It has the following implications, (NSW DLWC, 2002):

- It is a priority for water to be specifically provided for environmental needs.
- There are various environmental protection approvals processes that need to be followed when activities impact on water, and this concept is included in regional environmental plans.
- Existing water licences are to continue until they expire and after that replaced by water access licences, water use approvals and water supply work approvals which will be for longer terms than currently available.
- Licences are to be linked to local water management plans which specify how water is to be shared between users and the environment; as well, a public register will be established for all licences and approvals; and compensation may be claimed if changes are made during the term of a plan resulting in reduced water allocations (this compensation clause has yet to be finalised and tested in NSW).
- Water management plans are to be legal documents developed by local representative committees to direct how water is to be allocated, used, managed and protected.

- The membership of water catchment management committees is specified in the Act and is encompassing to ensure broad representation. Committees attempt to reach consensus on issues.

The Act foreshadows the separation of current water licences into water access licences (with a share of the resource component and an extraction component) and water use licences which are specific to an area of land. This separation of water access entitlements from title to land is a major component of the COAG agreement and a key step in facilitating water trading.

Existing water licences have been converted to volumetric licences so that all water licences in NSW are more standardised. The Government has stated that for the time being licences and approvals that existed under the old 1912 Water Act will continue and had foreshowed that new licensing provisions will not commence until late 2002, (NSW DLWC, 2002). The reason for the delay in implementing these arrangements is the need to establish systems and process to verify all 130,000 existing licences.

Progress to Date

Although farmers and irrigators have supported the new water, sustainability and environmental objectives of the Act, there has been outrage at the lack of certainty in the Government's decision, implementation and planning processes for the Act[4]. The NSW Farmers points to considerable delays and uncertainties with investment and agricultural production. The NSW Irrigators Council have provided estimates of significant employment and production losses that will occur as a result of the reforms.

As well, water management plans are currently being finalised by some 38 community-based river management committees in NSW. These plans are to have a tenure of ten years, with a major review after five years. These plans will establish the amount of water available for extractive uses and any change within the tenure of a plan that damages the values of a water user's entitlement will trigger compensation.

[4] There has been significant attention by the media (rural, such as the Land, Sydney Morning Herald and the Financial Review) during the last 12 months on the problems, reports and comments by NSW farmers, cotton growers and irrigators on the impact of the reforms.

The NSW Government initially proposed loopholes that avoided compensation, however conditions were tightened when the legislation progressed through Parliament.

A significant issue affecting the future of irrigation and farming as a result of these reforms is the uncertainty surrounding water property rights. The main reason that there has been increased insecurity for holders of water entitlements is that substantial changes incorporated in the Act have not yet been implemented. The National Competition Council 2002 report notes that the Council will assess progress against the property rights action plan, including development of the interim register, in June 2002.

4. IMPACT OF REFORMS ON THE NSW IRRIGATION INDUSTRY

In NSW farmers and irrigators have been vociferous in their criticism of the NSW Water Management Act, including its introduction, planning processes, consultations and impact on NSW agricultural production. While, the farmers and irrigators have acknowledged the need for better environmental management of existing natural streams, groundwater and river valleys, the reform process has been flawed.

Major problems

The major problems with the NSW reforms according to the irrigators and farmers appear to be prioritising the environment to the detriment of production, employment and regional development.

Farmers also believe that the process of consultation through the water catchment committees has been flawed. Farmers make up only a few of the committee members, some members are not from the local community and members have had to often commit to plans that do not result in their best or future production interests.

As well, many of these plans have only just been developed, some two years after the Water Management Act was introduced. The NSW Government has also been changeable in its policies on water allocations. There has also been considerable uncertainty over the separation of water rights from land and the effect of this on property values. Another issue has been water trading rights and the system of licensing bulk water users and the ability to trade permanent rights. This could cause problems for some of the larger irrigators with their commitment to large unsaleable assets, future investment and maintaining water customers.

Production Losses

The NSW Irrigators Council together with Cotton Australia and the Ricegrowers Association estimate the following impacts as a result of the NSW water reforms on the major irrigation valleys with Draft Water Sharing Plans (Murrumbidgee, Namoi, Gwydir, Lachlan, Macquarie and Murray):

- Total potential megalitres lost to irrigation in the NSW Water Sharing Plans is estimated as 752,994 megalitres;
- The total lost gross agricultural production value as $347.6 million, (NSW Irrigators Council, 2002b);
- In particular, the cotton industry which is valued at some $572.9 million is projected to loose some $208 million and the rice industry valued at some $292 million is estimated to loose $14 million;
- An estimated 4,519 jobs lost as a direct result of the Draft NSW Water Sharing plans and 2,086 of these in the agricultural sector; and
- The total lost off farm output and income is $1.738 million.

The NSW Irrigators estimate the following losses in each of the major irrigation valleys in NSW, (NSW Irrigators Council, 2002b):

- Murray – loss of 58,000 megalitres will loose $18 million in production and some 239 jobs;
- Gwydir - loss of 61,700 megalitres will loose $34 million in production and some 444 jobs;
- Macquarie – loss of 96,530 megalitres will loose $51.9 million in production and some 674 jobs;
- Namoi – loss of 271,723 megalitres will loose $695 million in production and some 1807 jobs;
- Lachlan – loss of 83,744 megalitres will loose $30 million in production and some 396 jobs; and
- Murrumbidgee – the loss of 181,297 megalitres will loose $368.7 million in production and some 959 jobs.

According to the NSW Irrigators' Council, Cotton Australia and the Ricegrowers Association, the NSW Government has failed to address the social and financial impacts of the reforms, in particular the impact on rural and regional industries in NSW, (NSW Irrigators' Council, 2002d). It is estimated that some 14% of the cotton industry may be wiped out by the plans especially in the Gwydir, Namoi and Lachlan valleys where cotton growers make up large proportions of the agricultural industry. The Ricegrowers Association estimates that the rice industry stands to lose about $14

million of production, translating to some four percent of total NSW production, (NSW Irrigators' Council, 2002b). The NSW Farmers have released similar figures and estimate that the water reforms will cost 4,300 jobs and a loss of farm production of $324 million, (NSW Farmers Association, 2002).

In September 2002, the NSW Government released another commissioned study to measure the impact of the reforms and water sharing plans for NSW, (ACIL Consulting, 2002). According to this research, the impact of the reforms should be much less in production and employment losses than that anticipated by the irrigation industry. Despite considerable media attention and doubts about the veracity of both irrigators and independent research methods, the conclusions of both are that the reforms impact negatively in terms of jobs and production losses.

There are still numerous problems with the new water operating environment for irrigators and farmers and the NSW Government has not really provided any real incentives for farmers to invest in new water saving technology and infrastructure. Indeed, the impact of the reforms has made the future sustainability of farming questionable and banks have joined forces with farmers to echo investment uncertainties. In this uncertain production environment, it is hardly feasible for the Government to expect that farmers will be able or encouraged to invest in water saving technology or infrastructure to irrigate or continue production.

Privatisation

It is argued that so far there has been very little benefit or new opportunities for co-operatives, irrigation corporations, and farmers as a result of the implementation of the new water operating environment arising from the privatisation of NSW's irrigation assets. Indeed the future for being in business in high water usage industries such as rice and cotton looks increasing bleak.

In considering the benefits for irrigation co-operatives and farmers as a result of the NSW Government's privatisation of its six irrigation schemes and rural water assets in the mid to late 1990s, it is argued that co-operatives and farmers have not benefited to any great extent from owning these assets. The privatised irrigation assets were acquired at nil cost by public companies that will need to raise capital from the

general public to fund future investment, infrastructure and the aging assets. These organisations appear hampered by tax problems and high cost operating environments. These problems may cause them in the future to loose customers and/or members who may be able to source water from other areas through temporary or permanent transfers in water licences. This may leave them with what has been called 'stranded assets', that is high cost irrigation assets that have no marketable value, (Goesch, 2001).

The benefits of privatisation of the assets according to the companies are that they can control and maintain water supplies to their crops with no government involvement. The track record of the irrigation entities that were privatised has been good according to Hansard reports of the late 1990s[5] recording that works progress has been good, and there have been little staffing problems and linkages with Government agencies at the regional level has been effective. Interviews with three of the privatised companies also reveal that corporatisation and the process of converting to local ownership has been beneficial for local communities.

It is unclear whether the irrigation companies as public companies will be able to raise future capital needed to replace, upgrade and invest in high cost, new plant and equipment from the general public or their local communities. As well, there may be current or annual tax liabilities that prevent them as public companies from attempting to save or invest for future unknown, but large-scale (billions) capital works and improvements. Such high cost and large-scale capital works may be beyond the abilities of local community or public fund raisings, and not seen as conducive to current community and public irrigation and water needs. Further research needs to be undertaken to examine these issues and implications in greater detail.

Another disadvantage of the privatisation process is that there has been no formal NSW government investigation or assessment of the strengths and weaknesses arising from the privatisation of irrigation infrastructure, and how these public and private companies will be able to meet huge future capital investment needs and whether the government has any responsibility for future irrigation investment in these areas.

The major advantages of the corporate structures are their ability to raise capital for future asset replacement or upgrades from the public. However, the main disadvantages of the corporate structure are its tax difficulties and ability to save for future high cost 'public' irrigation assets. As well, the public company structure does not sit well with assets which were once public goods and need to be maintained and upgraded for the benefit of the community and public generally.

[5] Extract from NSW Legislative Council Hansard, 12 November 1998 regarding discussion on the Irrigation Corporations Amendment Bill.

5. CO-OPERATION AND CO-OPERATIVES IN THE NSW WATER REFORM PROCESS AND OVERSEAS WATER MARKETS

There may be some benefits to be considered from pooling or working co-operatively in the new water environment. To this end some NSW irrigators have worked co-operatively to achieve common goals. The Department of Land and Water Conservation estimates that there are about 700 authorised joint water supply licences or arrangements operating throughout NSW. It is also understood that throughout NSW, there are a number of small private irrigation schemes that are owned jointly by irrigators to achieve economies of scale in irrigated production. Examples of jointly owned private irrigator schemes include: the Hunter Wine Country Private Irrigation District serving over 300 vineyards in the Pokolbin district; and the West Corurgan Private Irrigation District comprises of 300 members in the Southern Riverina. ACCORD plans to conduct a comprehensive case study of the operation and performance of the Hunter Wine Country Private Irrigation District.

As a result of the water reform process and the privatisation of irrigation assets in NSW only one co-operative has been established, namely Coleambally Irrigation Co-operative Limited (CICL). It represents 375 shareholders and 437 farms. It has established a separate entity known as Coleambally Irrigation Mutual Co-operative Limited for the purpose of investing asset funds for future replacement of the irrigation infrastructure. The two entities operate with separate boards and via service agreement, the operating entity undertakes services for the mutual entity. This structure enables the creation of a non-trading entity responsible for the investment of funds and infrastructure replacement and is separate from the operating entity responsible for day-to-day operations.

The advantages of the two-tiered co-operative structure can be seen in terms of the co-operative's ability to defer income tax to its members, which means that it has the ability to create funds (sinking funds) to build up a reserve for future capital expenditure and then price its water cheaply with relatively lower infrastructure costs. While, the two tiered co-operative structure at the moment appears to provide advantages in terms of the company's tax assessment, the Coleambally Irrigation

Mutual Co-operative Limited faces uncertainty in terms of its future tax assessment. There may also be other problems if members want to trade their individual member entitlements for water and are constrained by the bulk company licence membership for water access.

In addition to the two-tiered Coleambally Irrigation Co-operative, seven other agricultural water related co-operatives exist in New South Wales. The size of these co-operatives is relatively small ranging from 14 to 67 members. The purpose of these co-operatives varies, but mainly relates to providing water to members, (NSW DFT, 2002).

Integrated Catchment Management

It could be argued that the Water Management Act in NSW is an example of the implementation of an integrated catchment management framework to a natural resource. Integrated Catchment Management (ICM) represents an institutional structure designed to reduce the economic inefficiency problems associated with ill-defined property rights, high transaction costs and externalities. In general, ICM involves the co-ordination between resource managers and users to achieve superior community outcomes for natural resource use. Marshall, Wall and Jones (1996) point to the significant advantages of ICM, including improved information flows and reduced bargaining costs by reducing the number of eligible bargaining participants. It is also argued that ICM improves the quality of the natural resource by increasing peer pressure on land holders to act with the collective interest of their community, (Marshall, Wall and Jones, 1996).

Community based management committees have been established and water management plans are being developed. The plans represent outcomes of 'a co-operative model' between all users of water including the environment. Some economists have lauded the NSW approach as a good model for dealing with the inadequacies of an unregulated property rights approach. Quiggin (2001, p89) recognises the NSW system as addressing the common property aspects of the water system.

Water Co-operation in Other Countries

The experience of co-operation in international water markets can be documented. This experience will shed light on the feasibility, benefits and likely success of co-operation in the Australian market. The following section discusses some of the experiences and discussion of co-operation in water markets overseas.

Loehman and Dinar (1994) report on a case study relating to the externalities due to drainage from irrigated agriculture for the San Joaquin Valley in California, U.S. They demonstrate that co-operative action would result in improved outcomes for all parties. Co-operation relates to managing water on a regional basis, treating water to remove pollutants and sharing joints costs of a water treatment. Benefits of co-operation come from economies of scale in drainage collection and treatment. Coordination and information problems can be addressed by appointing a water district manager. The role of the manager is to produce a voluntary co-operative agreement.

Holden and Thobani (1996) in a *World Bank* policy report, advocate the use of water associations to help alleviate the transaction costs associated with water markets. A two-step process is advocated. First, water rights can be assigned to associations based on past usage. Second, individual users receive entitlements according to guidelines issued by a Water Council. The advantages of this procedure include: water associations have better information on past use than governments and block titling reduces costs and helps resolve conflicts.

Dinar, Rosegrant and Meinzen (1997) advocate the use of water user allocation systems over regulatory systems. User allocation is more flexible, it allows water delivery to adopt more easily to local needs. More information is available at a local level about water use. Other advantages of water user allocations include: administrative feasibility and sustainability, and political acceptability.

Challen (2002) describes the institutional structure for water use in Sukhothai Province, Thailand. The water users consist of co-operative groups of irrigators with a common-property right to water. The co-operative groups form common water plans which define private property rights for individual water entitlements.

Herath (2002) documents the consequences co-operation and non-co-operation in water use for many developing countries. In India, private ownership of groundwater use for irrigation has replaced collective action and this has resulted in substantial degradation of natural resources. In Sri Lanka, there are documented cases where collective arrangements have out-performed agency-based water allocation systems. In the Philippines, farmers in irrigators groups achieved higher rice yield, contributed to infrastructure maintenance and were more likely to have their irrigation design suggestions incorporated, than farmers operating in isolation. In Kenya, co-operation in water management is brought about by the uncertainty of resources.

Gandhi and Namboodiri (2002) examined the experience in India and suggests that co-operation between farmers in water use has increased and this lead to the resolution of many water-related conflicts.

Wang, et al. (2002) analysed water usage in China and compared the performance of collective versus non-collective water users. Their research suggests that improvements in technical efficiency result from non-collective and market-oriented mechanisms for irrigation. Wang et al (2002) conclude by suggesting there should be an expansion of private and shareholding irrigation in China and this should be integrated into government irrigation investment programs.

In summary, even though not unanimously supportive, this evidence points to numerous cases were co-operation and the use of the co-operative structure in international water markets has resulted in improvements in the efficient use of resources and the attainment of commonly desirable goals. This evidence points to the possibility of successful beneficial co-operation in Australian water markets.

6. INCREASING CO-OPERATION AND CO-OPERATIVE OPPORTUNITIES IN WATER MARKETS

This section discusses the prospect of increasing co-operation and the use of co-operative form for water markets from two different perspectives. First, the benefits which may potentially accrue to individual irrigators from the use of the co-operative form will be outlined. Second, the role of co-operation from a public policy perspective will be examined. Here the concept of market failure and its consequences for the water market are discussed.

Benefits of a Co-operative Structure

The arguments for forming a co-operative for servicing agriculturally based activities are well developed and potentially offer opportunities for the use of the co-operative structure for irrigators. Potential benefits can be labelled under two broad categories: 1) return strategies and 2) risk management strategies, see for example, Peterson and Anderson (1996). Return strategies include: countering market power, improving cost efficiencies and serving missing markets, (Peterson and Anderson, 1996). The risk management strategies maybe direct, such as: pooling, savings bank and maintain the market; or indirect, such as conservative investment, diversification and selective vertical integration, (Peterson and Anderson, 1996).

For NSW irrigators, compared to operating in isolation or working with a corporation, the following specific possible benefits from forming a co-operative may exist. In terms of return strategies, as the water market develops over time potentially large traders may emerge who may gain significant market power in the water market. The ability of large traders to manipulate market outcomes can be countervailed through the formation of a co-operative who maybe yield greater bargaining power in the market place than might any individual small irrigator. In terms of improving cost efficiencies, lower agency costs may exist with a co-operative structure compared to a corporation. Co-operatives generally have lower pay structures for senior management than corporations. In contrast to shareholders in corporations, co-operative members have additional information about the managerial processes in their organisations. This reduces managerial monitoring costs and possibly reduces losses from inept major managerial decisions.

In terms of risk management strategies for water trading, a co-operative structure has the potential to pursue a 'savings bank' strategy. The co-operative can use generated surpluses to act as a buffer against water market fluctuations. Retained co-operative surpluses can rise in times of low prices and fall in terms of high prices, to maintain relatively constant water prices for members, shielding them from market fluctuations. Relatedly, a co-operative structure is more likely than might a corporation, to maintain-the-market for an individual irrigator who faces hardship. That is, because co-operatives often seek to maximise member returns they are also more likely to consider the effects on a members' farm assets of abandoning an irrigator facing unique difficulties.

Market Failure

A common motivation for establishing or maintaining a co-operative organisational structure is to overcome problems related to market failure, (Cook, 1995). Simply put market failure implies that markets result in inefficient transactions, in the sense that the marginal benefits to society do not equate with the marginal costs, (Mrozek, 1999). It is postulated that three of the typically quoted reasons for market failure: 1) common property resources, 2) externalities and 3) transaction costs and incomplete information (see for example, Gravelle and Rees, 1992, ch 18) apply to the concept of a water market. It is around these themes that the role of co-operatives in water markets is further discussed.

Common Property Resources

A common property resource (CPR) is an asset used either in production or consumption which is not owned by one individual. It could be argued that the river systems are collectively owned by society and used in various ways by its members. The water in rivers and dams are used not only for irrigation but for household consumption, recreational purposes and by the wider environment and natural habit. It is well known (Ostrom, 1990) that unrestricted access to a common pool resource results in over-use and exploitation of the resource and hence unregulated markets fail.

In many countries (for example Spain, Japan and Switzerland) and for many centuries, the use of a common pool resource has been sustained by collective local

appropriators through self designed management and monitoring systems, (Ostrom and Gardner, 1993). This empirical observation is consistent with the theoretical result that in terms of maximising total group net-returns to users, a co-operative solution to using a common pool resource is superior to a non-co-operative solution. That is, prisoner dilemma game theoretic notions can be employed to illustrate the superiority of a joint maximisation co-operative solution, to the appropriation of a CPR, over the individual maximisation Nash non-co-operative solution, (McCarthy, Sadoulet and de Janvry, 2001). The introduction of costs of negotiation, supervision and enforcement within the co-operative, alters the level of extraction but still predicts the superiority of the co-operative solution, see Seabright (1993) and McCarthy, Sadoulet and de Janvry (2001).

An important issue motivated by the CPR literature is the consequence of the free-rider provision of maintaining infrastructure for water distribution. As Freeman (1990) suggests, if all but one irrigator maintains and improves water channels and pipes, then the irrigator who does not participate in infrastructure maintenance stands to benefit at no cost. If all irrigators individually behave in this way then infrastructure is not maintained and becomes depleted. Effectively the absence of co-operation leads to water distribution inefficiency. The current depreciated state of irrigation infrastructure in Australia makes this an issue of significant importance, (Brennan and Scoccimarro, 1999).

Externalities

It is well known that the existence of externalities in the production or consumption of a resource results in a difference between the privately and socially optimal usage level, see Gravelle and Rees (1992, ch 18). In water markets at least two types of externalities have been identified, salinity and improvements in irrigation efficiency. In terms of salinity, return water flows from upstream irrigators have a major influence on the salinity level of water used by downstream users, (Heaney and Beare, 2001). Effectively, an upstream irrigator imposes a negative externality on a downstream user by contributing to the salt level of the river. On the other hand, if upstream users improve irrigation efficiency then this imposes a positive externality on downstream users, see Heaney, Beare and Bell (2001). Improvements in irrigation efficiency implies that individual users use less water, resulting in increased water

flows for other users and the environment and also reduces the amount of saline groundwater seeping into the water system. Thus improvements in irrigation efficiency results in positive externalities for other users.

Traditionally economists have advocated the use of two alternative responses for dealing with externalities: internalising the externality through negotiated property rights (Coase) and the introduction of taxes or subsidies (Pigou), see Gravelle and Rees (1992, ch 18). The Coasian solution is only feasible if property rights are well defined and transaction costs are low, see Eyal and Hochman (1996). Moreover, even if property rights are well defined, unequal political power results in a sub-optimal outcome, (Eyal and Hochman, 1996). We will cite literature below which points to significant problems with defining property rights for water and high levels of transaction costs. This recognition questions the efficacy of negotiated property rights for water trading.

The research of Heaney and Beare (2001) and Heaney, Beare and Bell (2001), suggests that the effects of salinity and improvements in water efficiency are non-exclusive, highly site specific and variable in nature. As a consequence it is not feasible to internalise these externalities through instruments such as salinity credits. Heaney and Beare (2001) suggest that a set of taxes and subsidies on water trade may be necessary to handle these externalities and to facilitate the investment needed to improve irrigation efficiency.

As an alternative and consistent with the CPR literature, a co-operative solution maybe another response to addressing these externalities. Co-operation through the pooling of financial, capital and human resources may make feasible the use and procurement of improved water distribution processes. In isolation there is little incentive for an individual irrigator to improve irrigation practices. The establishment of a group of irrigators who collectively purchase improved piping and distribution systems may result in outcomes consistent with less water usage and improved salinity levels. Clearly, an irrigator is likely to gain more from, and commit resources to, improving irrigation efficiency if other irrigators also pursue similar strategies. Effectively, the costs and benefits of externalities may be shared by collective groups of irrigators to achieve a more collectively desirable outcome.

Transaction Costs and Incomplete Information

In designing and operationalising an institutional structure for water trading, issues relating to transaction costs are important. Transaction costs are costs needed to efficiently carry out exchanges between market participants. Challen, Linder and McLeod (1996) refer to the following transaction costs for water trading: 1) costs associated with obtaining information on prices, market participants and processes of exchange; 2) costs associated with negotiating and concluding contracts; 3) costs associated with the divergent interests of markets participants and consequent market externalities; and 4) costs associated with the requirements for contract enforcement and conflict resolution. Challen (2002) argues that the best institutional structure to support property rights is that which minimises these transaction costs. A co-operative structure for irrigators maybe one option which reduces these transaction costs. By definition, if co-operatives are formed then fewer market transactions need take place and therefore lower market transaction costs occur. On the other hand, the costs associated with distribution and enforcement within the co-operative must be recognised.

Some of the issues which determine the size of transaction costs for the water market include, the uncertainty of property rights and the information requirements needed to facilitate efficient water trading. In general, water property rights in Australia represent an entitlement to take a proportional share of available water within a defined security class, (MacDonald and Young, 2001). The absolute entitlement is variable given changing rainfall patterns and therefore the actual uptake of water is uncertain. Moreover, policy settings are changing constantly, further adding to the uncertainty of rights. The consequences of ill-defined rights can be significant for the efficient operation of the market. Beare and Bell (1998) point to ill-defined rights leading to weak incentives for irrigators to pursue water saving technologies and investments. Crase, O'Reilly and Dollery (2000) cite ill-defined property rights as a serious impedient to a vibrant water market for permanent entitlements. The lack of an active trading market for permanent entitlements is likely to be accompanied by under-investment in highly valued agricultural endeavours.

To help alleviate these detrimental consequences of ill-defined property rights, (i.e., the lack of incentives to invest in infrastructure and water saving technologies) a co-

operative structure might be advocated. As previously argued, the likelihood of gaining increasing levels of investment in water infrastructure is higher with a co-operative structure than with a structure of individual irrigators. The pooling of various resources and the potential resulting benefits from economies of scale, make it more likely for irrigators to undertake investment in water saving technologies.

The specific consequences of the externalities associated with salinity and improvements in irrigation efficiency are difficult to measure. The effects depend on the time of season, long-term rainfall intensity and are site specific, (Beare and Bell, 1998). The costs of acquiring this information to facilitate the operation of a successful trading market are substantial, see Bell (2002). For example, eventhough a downstream user may have some notion about the salinity impact of their water use, they would have very little information about the quite different salinity impact of water used by an upstream user. Given the recognition of externalities, Bell makes the case that this lack of information about the magnitudes of these external effects will mean that a free atomistic competitive market in water entitlements will not be optimal. An institutional structure which improves the information flow about these externalities is needed to produce a more socially desirable outcome.

Essentially, the problem with atomistic markets and incomplete information arises because each agent individually acts upon their own incomplete and different information about the externality and as such it is difficult for them to fully capture the full benefits of trade. Bell (2002) shows however, that as the number of agents in the market decreases the information flow improves and trades which capture the external effects are more likely. Bell advocates the use of a single trading house to facilitate this information flow to capture all the benefits from trading. In particular, Bell (2002, p360) argues 'a trading house structure enables price experimentation and thereby can generate information on the salinity benefits and costs of a redistribution in water entitlements.

As an alternative for improving information flows co-operatives maybe formed between individual irrigators. The incomplete information problem occurs because of the atomistic nature of a free market. Bell's (2002) simulations show that reducing the number of traders improves this information and results in more socially desirable

outcomes. The formation of co-operatives reduces the number of market participants and hence enables the market process to better capture the salinity effects of water use. Effectively, a co-operative structure representing many individual water users will better be able to harness information about different salinity and water efficiency aspects of use and distribution. Exchanges between and with co-operatives will better capture the full benefits of trade.

7. CONCLUSIONS

The NSW water reforms are going to radically change the way water is managed in NSW production and farming. The major problem that farmers have is whether they are going to have sufficient water to farm and continue production in the future. Indeed, the future of cotton and rice production in NSW looks uncertain and cuts in water allocations arising from the reforms look set to flow negatively into huge production, employment and income losses. In this environment, it is doubtful that many farmers will survive, let alone have sufficient resources to borrow further to invest in technology or infrastructure that produces water savings.

While, the prioritising of the environment and the emphasis on sustainable development embodied in the NSW water reforms is important given NSW water, groundwater and salinity usage patterns and problems, the reform process will create many production and investment casualties. There is a clear need for the NSW Government to better manage the reform process, including guarantees for critical production uses and delivering compensation to those farmers which are facing production and investment uncertainties.

The privatisation of NSW Government irrigation and rural water assets has meant that rural communities have benefited in terms of owning and controlling their own irrigation assets and equipment. However, the cost of replacing and maintaining these assets now and in the future may prove prohibitive for local farmers and their representative companies. The problems that may emerge in the future may include being left with high cost irrigation assets that are too expensive to be upgraded, replaced and have few customers willing to pay for them or customers that prefer to access water cheaper in other areas. These issues surround the unprofitable nature of owning irrigation assets and schemes.

Compounded with these problems is that neither public companies, private companies nor co-operatives provide the best organisational vehicles for savings for future infrastructure and replacement needs. Public and private companies appear constrained by taxation that robs them of the ability to save for future investments

needs. While, co-operatives structured as dual tiered organisations with one entity established for the sole purpose of saving for future investments have been allowed tax benefits, these benefits may in the future be eroded by the Australian Taxation Office.

There may be benefits from the NSW water reforms if the policy environment investigates more co-operative forms of encouraging farmers and irrigators to work together to invest in water saving technology and infrastructure. Better deals and assistance from government should be provided to farmers and irrigators to ensure that they can afford to maintain, replace and invest in new plant and equipment. This may require special taxation considerations for irrigation companies and co-operatives and partnerships with government to assist members and/or public capital provision in the future.

Some of the benefits from co-operation and forming a water co-operative have been expounded in this paper. To further investigate the feasibility and benefits to be gained from co-operation in water distribution and usage, ACCORD will undertake a comprehensive case study of the Hunter Wine Country Private Irrigation District, which serves over 300 vineyards in the Pokolbin district of NSW.

APPENDIX ONE: HISTORICAL DEVELOPMENT OF IRRIGATION IN NSW[6]

Murrumbidgee Irrigation Schemes

Along the Murrumbidgee River, initial investigations into irrigation were undertaken in the 1890s and they were further stimulated by the devastating drought that extended over a number of years around the turn of the century. In 1906, NSW State Government legislation made possible the acquisition of land for farms and the establishment of associated towns, the construction of the Berembed Weir on the Murrumbidgee River and the main and subsidiary supply channels, and the construction of the Burrinjuck Dam. Berembed Weir and 130 kilometres of the Main Canal were completed in 1911. Burrinjuck Dam was completed in 1929 (modifications were carried out between 1939 and 1956 as well as in 1995-96). There were 677 farms in the MIA by 1914. The Main Canal, 160 kilometres long, was completed in 1924.

The Murrumbidgee Irrigation Area and Districts (MIA&D) consist of two irrigation areas, Yanco around Leeton, and Mirrool, around Griffith, and the Districts of Benerembah, Tabbita and Wah Wah. Rice, horticultural crops, cattle, poultry and eggs are the main commodities produced. It is estimated that up to 80 per cent of the MIA is affected by shallow watertables, with up to 5 per cent of the area having gone out of production because of waterlogging and salinity.

The completion of the Blowering Dam in 1968, as part of the Snowy Mountains Hydro-Electric Scheme, made possible a significant increase in irrigation in the Murrumbidgee Valley, including the Coleambally Irrigation Area (CIA), which was established to the south of the MIA between 1956 and 1969, water being diverted from the Murrumbidgee at the Gogeldrie Weir (completed 1959). Rice and fat lambs are the main commodities produced.

The MIA&D are now operated by Murrumbidgee Irrigation and the CIA by Coleambally Irrigation.

[6] This information is sourced from MDBC (2002).

Murray Irrigation

The Berriquin, Deniboota, Denimein and Wakool Irrigation Districts formerly owned and operated by the NSW Government, were privatised in 1995. Irrigation water and drainage services are now provided by Murray Irrigation Limited, a private company in which each of the region's irrigators is a shareholder, shares being allocated on the basis of water entitlements. Serving a total area of 950,000 hectares with 2,200 irrigation farm holdings, it is the largest privately owned irrigation and drainage company in Australia. The region produces half of the Basin's rice crop and a wide range of other agricultural commodities.

Individual Operations

Apart from the group schemes, there are large numbers of farmers throughout the MDB who pump their own water directly from rivers, other waterways and underground sources. Many of the operations are relatively small, but some are very large, especially those associated with cotton growing, with on-farm storages as large as many reservoirs. While, the NSW Government has retained ownership of the major dams and weirs in the region through State Water, individual operators own the irrigation equipment and assets on their own properties.

This is particularly true of the more recent irrigation developments in the northern part of the Basin around the Namoi, Gwydir and Macquarie Rivers. As well, there are individual irrigators pumping from almost all of the Basin's rivers, such as the Kiewa, Lachlan and Upper Darling. They are also found along the Murray. Since the 1995 cap on water imposed by the MDBC, it is estimated that many of these irrigators have acquired ground water licences and have led to serious depletion of some reserves, especially in the Namoi River system.

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