

SOCIO-ECONOMIC RESEARCH AND DEVELOPMENT FOR IRRIGATION COMMUNITIES

**A report on the socio-economic research needs of
irrigation communities in making structural changes
in the next thirty years**

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Onko Kingma
Noel Beynon

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EXECUTIVE SUMMARY

The case for maintenance of a healthy environment that supports sustainable economic activity and offers economic, social and environmental benefits has been well argued. All stakeholders, whether farmers, governments, non-government organisations or industry in all its forms, have a crucial role in this process, as decisions and actions of stakeholders at all levels greatly affect outcomes from use of water and other natural resources.

In many catchments, new approaches to the use and management of water and other natural resources will be required, if we are to achieve personal and national economic, environmental and social goals. The issues are complex and will not be able to be handled in isolation. A sharper consumer focus on environmental performance in production and on food quality and safety is now evident. The linkages within and between natural systems and the inter play of economic, social and biophysical factors that influence natural resource decision making, will require a more coordinated and integrated approach to the issues.

These are all socio-economic issues – how the structure of, and linkages between, economic and social enterprise, and ways in which individuals and groups consult, communicate and interact in the conduct of economic and social activity, impact upon our water and other natural resources.

Presently, our knowledge about these socio-economic issues lags well behind our technical knowledge. Yet net benefits from changes in economic and social structures and relationships are possibly as great as those from technical breakthroughs.

A program of socio-economic research for irrigation communities will, therefore, equip us with the insights and tools to shift towards more sustainable production systems and water use and management regimes.

IDENTIFICATION OF SOCIO-ECONOMIC RESEARCH TOPICS

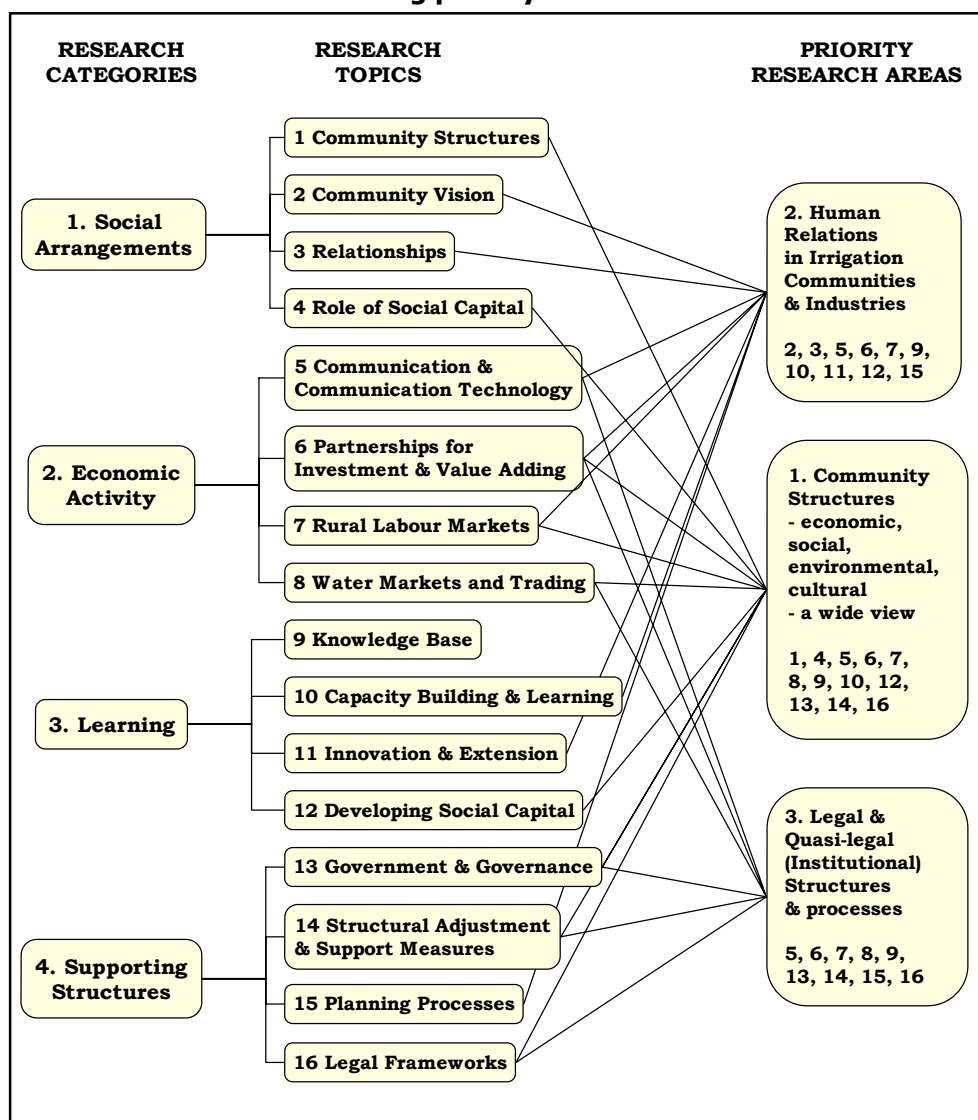
This report has identified 16 inter-related 'research topic areas' for socio-economic research, development and extension (R, D&E), for consideration by the National Program for Irrigation Research and Development (NPIRD) of Land & Water Australia. The topics are summarised in Figure 1. The priorities among the topics, shown in Figure 1, are discussed later in this summary. Note that 15 of the research topic areas are linked to the three priority research areas but as development of a sound and updated knowledge base underpins all of the socio-economic research areas no lines of linkage have been shown between research topic 6 (knowledge base) and the priority research areas.

Research topics range across a number of disciplines, given the need for more holistic approaches to the present problems and issues in irrigation areas. Research results will be required in these areas if communities are to make the successful transition to more sustainable irrigation communities under the revised water and human landscapes for 2030, discussed in Section 4.2 of the Report.

A research program of this nature is complicated by the different technical, informational, structural adjustment and innovation needs of different producer, industry and community groups. Irrigation communities are not easily defined. Thus blanket recommendations and broad strategies for change across these various groups may fail to attract the appropriate community responses. Part of the charter of a socio-economic research program should therefore be to

uncover the factors and complexities that facilitate motivation and learning in complex and diverse communities, such as we have in irrigation areas.

Figure 1: Framework for establishing priority research areas



THE SIXTEEN RESEARCH TOPIC AREAS

The topic areas where socio-economic research projects are likely to have a high pay-off are outlined below. The focus is essentially on irrigation communities. However, it is recognised these communities operate within a wider regional, national and international community framework and that this wider framework and linkages must also be considered in socio-economic analysis. Sixteen research topics for a socio-economic research program for irrigation communities are suggested below and prioritised. Research topics have been structured into the following four categories.

- **Social arrangements** – covering values, institutions and the debate on the structure of irrigation communities.

- **Economic activity** – covering the issues relating to farming enterprises, business structures, development of markets for inputs and products, and the scale and scope of industries supporting agriculture.
- **Learning** – covering issues relating to innovation, capacity building and the development and uptake of knowledge.
- **Supporting structures** – covering issues relating to governance, structural adjustment, planning processes, operational arrangements, and support measures.

Research is already available in many of the 16 topic areas below and this research should be recognised. Any projects taken from these topics should therefore, take the approach of reviewing relevant research in the area and using available research results in developing models and analyses.

Research category 1 - Social arrangements

This area is about the socio-economic structure of and linkages in, local and regional communities in our irrigation areas. Sound information is central to good decision making and risk management. Knowledge about these communities, and the characteristics of stakeholders, industries and other groups, provides a powerful means of changing the ways in which we use and manage our water and other natural resources. Socio-economic research into the structure of irrigation communities is therefore likely to have a high payoff. This also requires research into community values, the structure of relationships, the role of social conventions in shaping attitudes and the factors determining change and decision making.

Topic area 1 - Community structures

Research into the structure of industries and local and regional economies, from the viewpoint of environmental, economic, social and cultural sustainability.

Understanding of the dynamics of the institutional, economic, social and cultural environment within which irrigation communities operate should underpin plans and policy development. Information on the structure of the environment we live in and the processes of and mechanisms for change, is essential for visioning and decision making. We have little knowledge of how structural change may help or hinder regional growth prospects and help to resolve equity issues. Practical strategies are required to enable communities and regions to attain their economic and social potential, based on detailed analysis of current performance and prospects. New work will be required to analyse the dynamics of change, the data requirements for wider analysis of community structures and steps communities should take better to understand their own localities.

Topic area 2 - Community vision

Research to identify the needs and aspirations of communities, gain community participation in change and develop improved models for consultation

There is presently the possibility of a fundamental re-think of values and innovative approaches to policy development, to bring into play new institutions and ways to re-enfranchise irrigation areas. Communities are beginning to seek ways to grapple with the challenges facing them. In many cases this requires that they take charge of their own destiny, develop visions for their future and implement local solutions. Research is required in this area and particularly, into the visions and aspirations of irrigation communities and regions, and ways in which different cultures can come closer together.

Topic area 3 - Relationships

Research into the structure of relationships, pathways and networks best suited to effective community processes, working in teams and groups, and 'getting to agreement'.

A key factor influencing behaviour, attitudes and the ability to resolve and avoid conflict in the use and management of natural resources, is the relationships and inter-relationships which stakeholders have with each other and the wider community.

An increase in focus is required on the human element, skills and relationships as a basis for the partnerships for investment and natural resource management. Habits and identity are tied up in traditional behaviours and it is the perceptions and conventions involved, which must be addressed if adoption rates for irrigation practices are to be altered. Of relevance are the essential characteristics or make up of participants and the factors at the farm, catchment, industry and regional levels, which influence these.

A central focus is to find ways to help farmers, extension workers and other participants think beyond the boundaries of individual properties and interface with other farmers and those who have responsibilities for water resources. This is also important for those who influence behaviour, such as catchment authorities, local government, input suppliers, purchasing companies, state governments, and so on. The willingness and ability of various stakeholder groups to respond within this wider social setting is an important area for research and policy development.

Topic area 4 - The role of social capital

Research into the role of social capital in facilitating (or hampering) community progress.

The role of communities is increasing in importance in the management of water and other natural resources. Communities are held together by social capital, which is the networks, norms, trust and bonding, bridging and linking ties involved in working together. Social capital is embedded in the relationships between people and created by families, communities and regions and the nation as a whole for the benefit of all members. The capacity to motivate and activate our knowledge, and physical and human resources is dependent upon the stock of positive social capital. Little is known about what influences the growth of positive or negative social capital, as a determinant of the capacity of communities to manage their resource base and the structural changes which accompany growth.

Research into social capital should take account of the diverse nature of stakeholder groups in irrigation communities and, in particular, the factors which draw response from and motivate different producer, industry and community groups. This is an important challenge for socio-economic research.

Research category 2 - Economic activity

The structure of economic activity and the technological and management processes we use to produce goods and services, whether through the public or private sector, have a marked influence on our water and other natural resources. This area is, therefore, about the commercial and market operations involved in the use of water and other natural resources, and the impact of the associated technical, financial, managerial and risk management practices in both public and private enterprise, on the sustainability of this socio-economic activity.

Topic area 5 - Communication and communication technology

Research into improved models for communication with stakeholders including appropriate information and communication technology.

Issues of consultation and communication with and between stakeholders are presently among the most urgent and unresolved issues in rural policy in Australia. Issues are the availability of quality information, effective communications technology and the ability to use the information and associated technology. Administrative structures and information management systems should facilitate synthesis of information and knowledge, management of risk and uncertainty, adoption of learning processes and effective decision making. In many instances these are poorly developed or in their infancy.

Associated with this is the development and use of decision support systems and information technologies for not only data management and analysis but also as tools to assist communication, negotiation and decision making. Addressing the issues will require new ways of engaging individuals and groups, of communicating between stakeholders and of skilling of people and groups for effective uptake and use of information and information technology.

To date rural and regional Australia has been disadvantaged in terms of access to quality telecommunications infrastructure, particularly, the capacity to access effective internet services, such as , text, images, sound, software and video. Bandwidth at minimum standards for speed and quality are not available in many rural areas and there is presently a growing divide between urban and some rural areas. It is expected that, by 2005, all areas in Australia will have access to bandwidth of a minimum standard. This will be commercially delivered, heightening the problems of affordability, relative disadvantage between some regions and whether service industries, such as banks, stock broking firms, agribusiness and supply chain ventures find it profitable to invest in irrigation areas.

All these issues in communications and access to associated technology are important topics for socio-economic research.

Topic area 6 - Partnerships for investment and value adding

Research into the types of partnership, consortia and affiliation arrangements and networks required to achieve joint community, industry and government investment in irrigation communities.

High levels of risk and uncertainty in local investment are largely due to increasing complexity of the investment environment, the scale of investment required, externality issues associated with the uses of natural resources, and the structure and scale of industry and business. In many irrigation areas and regions, the quality and level of services, whether public or private, is continuing to decline.

Economic imperatives and issues of 'critical mass' determine amalgamation of services and in many cases closures. Often business closures stem from 'the tyranny of small decisions' where decisions by individuals operating in isolation lead to closures which could have been avoided with strong community leadership and networks.

Communities will want to develop businesses and services, which are local and different from the traditional models. However, despite efforts by some communities to make changes, there are still significant barriers to implementation of effective models. The only way forward, in many cases, is for irrigation communities to work in partnership to establish the conditions required to encourage strong local industries which value add their produce, and to facilitate formation of strong business linkages into their communities via relevant export industries and the agribusiness sector. This requires analysis of options and a sound research base.

A major driver for irrigation communities is accommodation of growth in the large scale input supply industries, service companies and other areas of agribusiness. Irrigation communities will

have to keep pace with these developments. The impact of these developments on communities is not well researched. Investment in these areas will involve all levels of government and associated agencies in partnership with industry and the community.

These issues will require extensive research to identify best practice, appropriate partnership arrangements and feasible models for investment, to meet the needs of different producer, industry and community groups.

Topic area 7 - Rural labour markets

Research into rural and regional labour markets and identification of policies to overcome employment problems particular to rural and remote communities.

Issues in rural labour markets are associated with availability of a skilled, flexible work force, employment prospects and provision of physical and social infrastructure to facilitate development of a learning culture. Farming communities are clearly coming under increasing pressures to upgrade or formalise skills to ensure best practice and long term business viability, and to have recognised qualifications to satisfy business needs. There is increased awareness of the benefits of and need for investment in training, in part, driven by business management imperatives and new income and business taxation policies.

Indications are that agriculture, particularly businesses associated with irrigated agriculture, has sound prospects and there is a strong demand for skilled, high quality and flexible labour. However, there is a need for marketing and promotion of these issues and of education, training and learning opportunities.

There are significant barriers to the uptake of education and training, and skills shortages and gaps (eg. management, business planning, technology uptake, labour market shortages etc) which should be addressed in policy and service provision terms, and from the viewpoint of the client base. These are important research areas. Statistics continue to point to rural disadvantage in education and training and employment generally. Labour markets in agriculture are segmented (owners, workers, age, gender, etc), and there is significant variation between, and overlapping skill and labour difficulties across, sectors and industries. Some rural areas are locked into a 'low skills – low quality cycle', paying insufficient attention to the need for high-level intermediate skills in export-exposed sectors of industry. Age and skill profiles indicate a looming skills shortage and an ongoing need for positive policies for replacement and improvement of the skills base and succession planning.

These are all, clearly, significant issues for socio-economic research.

Topic Area 8 - Markets and trading

Research into measures and models for appropriate functioning of markets and trading arrangements for water, and environmental services associated with water and other, associated natural resources.

Economic instruments such as markets have the potential to transfer information, allow decentralised decision making, contribute to efficient allocation of resources and minimise administrative costs. However, these instruments can also have limitations in terms of identifying and valuing environmental and wider benefits and costs of water and other resource use. Implications are that water and other natural resources may be used in excess or not utilised effectively, with repercussions for communities. Second and third round effects of changes in the use of water and trading may also have repercussions for irrigation communities.

Research should aim to develop, in partnership with appropriate agencies and community groups, efficient technical and economic market arrangements for the trading and allocation of water, and environmental services for associated natural resources, where appropriate. This will involve attitudinal, behavioural, equity and duty of care issues, which require socio-economic research. Where such markets are not appropriate, new governance processes will have to be set in place for the allocation and use of environmental resources, and for resolution of resource conflicts. The social and distributive effects of the introduction of markets and their rules and operations require new research attention

Research category 3 – Learning

Communities thrive where individuals, groups, organisations and community groups have the capacity to learn and innovate in the light of experience. A learning culture, in turn, relies upon sound social relationships and communications, and institutions, which foster participation and facilitate change. These institutions will encourage growth and sharing of knowledge, capacity building and the development of networks and pathways to maximise opportunities and wealth.

Topic area 9 - Knowledge base

Research to determine the requirements of a knowledge base appropriate to meet the irrigation community challenges and aspirations.

Underlying community stakeholder processes is a requirement for better understanding of the economic, environmental and social and cultural forces, processes and systems in regional communities and at all levels from local to national. The use of sound information and analysis by all stakeholders for awareness, vision building, planning, investment decision making and benchmarking, increases understanding of these issues.

Much has been done to development of more detailed and sophisticated environmental, economic and social data and information systems, which, combined with information technology, has already increased the capacity of communities and industry to understand and better manage their impacts on the natural resource base.

Despite this, it is well recognised there is a need to improve the regional and local statistical collection. Current statistics offer too narrow a vision for changes occurring in regional communities and for solution of many contemporary problems. Small area data become increasingly important with emphasis on distribution, equity and disparity in regions. Similarly, small area data can affect business investment decisions to locate industry and new enterprises. Governments could help resource data collection and analysis of Australia's regions, conduct research on knowledge bases, develop and demonstrate innovative strategies for sustainable regional development and play a part in provision of information and knowledge to stakeholders at all levels. More socio-economic research is required in these areas.

Topic area 10 - Capacity building and learning

Research into approaches to and frameworks and applied models for capacity building and lifelong education and training in irrigation and regional communities.

Achieving behaviour change in farming and business has become complex, requiring knowledge of the many factors and forces influencing business managers. In addition to adoption of new production technologies, farmers must now give more attention to investment in: human skills and education; the uptake, analysis and use of information; the management of risk; the production, quality and marketing of their products; the financial and personal management skills of the management team; and the institutional organisation and structure of their industry. This will require shifts in the attitudes and perceptions of many farmers and their support

workers and organisations and a new willingness to enter into cooperative dialogue and networking with their communities and groups of common interest.

Achieving a balance between all these areas will be important, requiring continuing access to or willingness to participate in, education and training. These systems must meet the special needs of different groups of farmers, people in industry and community groups, including indigenous communities, with respect to isolation, face-to-face delivery, communication, case management, planning, lifelong learning and career development. This requires new approaches to the adoption of new technologies and management systems, skilling and re-skilling, and ways in which relationships are managed.

Socio-economic research is required into not only farm level factors but also wider off-farm economic and social factors, bonds and ties to wider circles of individuals and groups, influencing behaviour to improve natural resource management and create a learning culture.

Topic area 11 - Innovation and extension

Research into new approaches to innovation, extension, and the uptake and use of technologies, management systems and knowledge, to create a culture of learning organisations, industries and communities.

Research shows that for innovation, and adoption of new and adapted technologies, regional businesses and communities must become learning businesses and communities based on knowledge intensive firms operating through continuous improvement and regeneration of organisational structures, networks and linkages. Commercial activity should be supported by networked, informed, and skilled local communities. There should be enabling leadership within the community as a basis for structuring partnerships and resolving conflict.

Facilitating the uptake of technology and new management systems is an integral part of this. Successful industries have strong linkages, such as to buyers, suppliers, customers, technology and networks, and these linkages work best where industries are geographically concentrated or clustered. Firms and industries are best able to achieve external economies through participation and partnership at all levels.

The degree to which business enterprises can become embedded within regions, however, is related to the scale of enterprise and size of firms. The dilemma is that as firms capture economies and become larger they also become less effective in helping to build social cohesion and unity. Regions need to attract skilled workers and high technology firms and have the mechanisms in place to retain them and encourage learning in the local economy. In turn, regional communities must be able to provide the environment not only to attract knowledge but also to retain and embed this into local economies. Factors such as these contribute to more effective and efficient business structures, and private sector investment, innovation and risk sharing. Requirements for innovation and extension will vary across producer groups, farming structures (eg small farm versus corporate farming), industries and community groups.

The innovation system is also important. Aside from the public R&D and extension effort, there has been relatively limited R&D. Public R,D&E has invariably been technically oriented, to the detriment of organisational and managerial innovation and R&D into information technology, supply chains and value adding. The interface between technical R&D and the uptake of technical R&D results has received relatively little attention.

New innovation systems should be designed to produce a diversity of evolutionary and revolutionary innovations, remove constraints and respond to the innovation and extension

needs of the range of farmer, industry and community groups. This R, D&E should be supported by pooled resources from all these groups. Mechanisms for this are not well developed.

Socio-economic research into ways to influence all these factors at the community level will have a high commercial and social payoff.

Topic area 12 - Developing social capital

Research into the development of models and mechanisms to encourage and the growth of positive social capital in irrigation communities.

Communities can best develop and enhance their capacity to determine their own futures through strategies for empowerment, community planning, innovation and leadership. Research shows empowered, learning organisations and communities, which build on their social capital, will be most effective in achieving successful change. Social capital is not only an important means for bringing about required change but it is also the product of such change. Growth of social capital is dependent upon institutional and policy settings. It is institutional settings within which markets work, which give expression to economic and social behaviour and within which communities develop their social structures. Issues such as these have been identified in other research and, in particular, the need for local leadership development, community capacity building and review of the roles of government, business and the community in achieving growth. However, further socio-economic research is required to develop the models and mechanisms to achieve on-ground results.

Research category 4 - Supporting structures

The mechanisms and processes to ensure the successful outcomes from economic and social activity are as important as the activities themselves. They concern governance, ways in which power is used, planning, communication, stakeholder processes and the various incentives and penalties to improve performance. These are all socioeconomic issues and concerned with **implementation** of the concepts and policies outlined in the first topic area, 'Social Arrangements'.

Topic area 13 - Government and governance

Research into the role of governments at all levels in helping to achieve sustainability, and more broadly, appropriate forms of governance and devolution of power, and models for achieving responsibility and duty of care for irrigation communities.

Governance is the structure of institutions within which groups operate including issues of autonomy, representation and ownership, and the nature of pathways of decision making. Issues of who has and uses power, meaning the authority and authoritative structures surrounding the 'rules of business', designated responsibilities, rights and privileges, legislative systems and other institutions, are also a part of governance. Many of these issues are not resolved and will require socio-economic research into models for participative governance, equitable representation, and for achieving voice and power in business, social and environmental affairs in local communities.

The three levels of government have an important role in developing these structures. Ways should be found for working in partnership with local communities to help overcome barriers to change, provide leadership for innovation, deliver equitable and efficient services and share risk and responsibility in new business and infrastructure investment. Irrigation communities will have to develop a range of new regional structures and governance organisations and review their roles and responsibilities in and ownership of those structures and organisations. Further socio-economic research can help to achieve this.

Topic area 14 - Structural adjustment and support measures

Research into structural adjustment policies and support measures to help individuals, firms and industries to move away from obsolete investments and unsustainable production processes.

Irrigation areas will have to undergo structural adjustment in order to survive the forces impacting upon them. Both governments and the community can legitimately play a role in facilitating this adjustment and to help people and communities tackle and cope with change.

There is a case for positive measures to support businesses and communities create and recreate competitive advantage – this involves development of models of and measures for capacity building, leadership, risk sharing and new partnerships. There is also a case for ameliorating the effects of change by helping people, businesses and communities leave their present unviable occupations and enterprises and re-skill and/or re-invest in different ventures.

Socio-economic research is required into new approaches to encouraging structural change in irrigation areas. Without specific attention to structural change, potentially viable regional communities may fall by the wayside, locking resources in unproductive uses and placing an increased burden on welfare systems. There now appears to be a growing need for a proactive approach to structural adjustment in irrigation areas. Research is required in this area.

Topic area 15 - Planning processes

Research into models and processes for more integrated planning for resources management, land use, water resource conservation and allocation, catchment management and farm business sustainability.

Effective planning processes have a major role in helping communities and stakeholders generally, to reach agreement and cooperate. This enables communities to move beyond development of regional structural and corporate plans to the implementation of investment strategies for sustainability. Planning processes are important as a tool to aid and support stakeholder negotiations, and facilitate conflict resolution, decision making and the reaching of agreement. Such processes rely on accurate and timely data, research and analysis.

Planning is dependent upon capacity building within all sectors and at all levels and creation of a learning culture supported by state of the art information technology and expertise. Participative processes, in which feedback loops ensure constant renewal of approaches to issues and revision of management strategies, are necessary.

Sound procedures for review, accountability and commitment to change at all levels are also required. This is particularly so at the bureaucratic and political levels, given many changes required are structural and institutional. There is a need to encourage greater community involvement and commitment to these planning and political processes. This will require further research and extensive consultation to achieve acceptance of the necessary changes.

Topic area 16 - Legal frameworks

Research to explore appropriate legal, statutory and regulatory frameworks to encourage continuous improvement in the use and management of water and other natural resources, and assess the conventions and perceived rights, which are not necessarily grounded in statutes, but which influence behaviour and attitudes towards resources management.

'Institutions' are the legal and quasi-legal frameworks and structures, rules and conventions that govern our actions, relationships, ways of doing things and ways in which individuals and groups interact to achieve ends. These frameworks are given expression through law, statutes and

regulations. They are reflected in, for example, legal and perceived entitlements, property rights and regulatory arrangements. By giving access to income streams and power to particular individuals and groups, institutions largely who benefits and loses from policies we implement and conventions we support.

Change is required in the policy agenda into appropriate legal and quasi-legal frameworks if we are to address emerging resource use issues and the socio-economic effects these are having. This will require new ideas on market arrangements, new, smarter ways to use regulatory measures and clearer policies on responsibilities and duty of care. There is lack of clarity about how to weigh up ideas in law against the wider socio-economic issues in irrigation communities, and the value of other mechanisms, such as accreditation of natural resources management activities and planning. There is also limited information on how legal and regulatory measures, and market power, might be misused by participants, giving rise to ecological, economic and social impacts.

A more holistic approach is necessary in the development of these ideas and measures, to take account of the impact they may have on the economic, social and cultural environment. For example, there is little information on the second and third round effects of water trading. Yet water trading, particularly where this is between regions and on a more permanent basis, can lead to the disintegration of communities. There is a lack of information on the characteristics of participants, who gains and loses from institutional change, the magnitude and location of socio-economic impacts, and timing of changes in rights. There are also issues in the communication of institutional arrangements to stakeholders, the administration and enforceability of laws and regulations and the adequacy of monitoring and feedback processes. Improved participatory processes are required to debate the uncertainties and develop effective institutions. There is a dearth of data and analysis on which to base these activities.

PRIORITIES FOR SOCIO-ECONOMIC RESEARCH

The 16 research topics identified above range across a number of disciplines, given the need for more holistic approaches to the present problems and issues in irrigation areas. Clearly NPIRD will be unable to fund all the R, D&E within these topics and the communication and extension effort that should accompany research. Thus priorities should be established to focus the work but still give insight across the 16 topics. Three priority areas for R, D&E have been identified in Figure 1. These are R,D&E into:

- community structures with linkages to several other topics, namely, social capital, capacity building, community structures, communications, partnerships, innovation, labour, water and other natural resources market and trading issues, governance, structural adjustment and legal framework
- people or human relationships issues and communication in irrigation communities, with linkages to topics such as, community vision, relationships, partnerships, capacity, learning, innovation and community and regional planning structures
- legal and quasi-legal frameworks and structures, with linkages to topics such as, communications, partnerships for investment, labour, water and other natural resources market and trading issues, structural adjustment and planning.

There is an urgent need for more information on the structure of irrigation communities and the linkages and motivational factors that will facilitate innovation and a learning culture. Knowledge about the efficacy and effects of legal and quasi-legal frameworks and structures within which we operate, is vital as these frameworks and structures determine responses from stakeholders, the capacity to adjust and take advantage of opportunities. Underlying all activity is the extent

to which individuals and groups have the capacity and ability to learn, interact and innovate to respond to the changing agenda for continuous improvement.

Socio-economic R, D&E projects in these three areas are urgent and should be ongoing in irrigation communities, funded from pooled resources contributed through innovative partnerships between producers, industries, government and the community.

SOCIO-ECONOMIC RESEARCH AND DEVELOPMENT FOR IRRIGATION COMMUNITIES

Purpose

This study is concerned with the socio-economic impacts of change in irrigation communities in Australia, over the next 30 years. From enquiry into key factors that might transform irrigation communities and questions about what irrigation communities might look like by 2030, it should be possible to identify areas of socio-economic research that could be undertaken now to anticipate and work with change.

This report covers the following:

- a discussion of the consultancy brief and methodology
- outcomes of consultations with stakeholders
- a discussion of community views in the context of challenges and the resource and community futures discussed with participants
- identification of areas for socio-economic research for irrigation communities.

Methodology

The study was commissioned by the National Program for Irrigation R&D (NPIRD) as part of its R&D program into the use and management of irrigation water resources in Australia. The task was to scope the range of social and economic issues for irrigated agriculture and determine how R&D into these issues might help or smooth the way for the transformations likely to be required in irrigation communities. Insights from such work will help inform participants, policy makers, administrators and those involved in new irrigation developments, in their planning and decision making. Such work can also help raise awareness, improve relationships and create a culture for environmentally sustainable development of irrigation regions and industries in the longer term.

The consultancy brief envisaged this work as a short, scoping study (3 months) with two stages, namely, identification of: (i) likely challenges facing irrigation communities, based on drivers of change, characteristics of communities, a review of relevant literature and outcomes of consultations with community representatives; and (ii) priority areas for socio-economic R&D and activity based on the outcomes of Stage (i).

A Discussion Paper was produced (see Attachment A) as part of Stage (i), following examination of recent literature (see Attachment B) and this Paper was circulated to key researchers, and industry, government, community and non-government organisation representatives, for comment. The Discussion Paper provided the mechanism for focusing discussions. The intention here is not to redraft the Discussion Paper. In the comments below, points in the Discussion Paper are drawn upon in the context of reporting on stakeholder consultations and identifying areas for R&D.

The reference material used (Attachment B) covers a range of fields such as: cultural issues; supply chain management and agribusiness; regional development; water resources, land use and natural resource development issues affecting irrigated agriculture; natural resources management policy; structural adjustment; motivation, learning, social capital and managing change; elements of public policy and planning; scenario building and foresighting; issues in rural labour markets; stakeholder processes; and technical change and adoption of technologies.

The consultancy brief required contact with some 30-35 representatives, given limited time. In the event, over 60 participants received the Discussion Paper and were personally interviewed, either face-to-face or by telephone. Two fact finding visits were made to rural areas, one to central NSW (the Lachlan/Murrumbidgee irrigation areas) and one to regions in southern NSW and Northern Victoria. To select the participants, advice was sought from State government agencies, and farm, industry and community organisations associated with irrigated agriculture. Participants were selected from individuals suggested through this process, with broad coverage in all States, including areas across Northern Australia. The 60 participants reflected views from farmers, government and private utilities servicing irrigation areas, government agencies, interest groups such as rural women, community groups such as catchment management associations, and special interest groups. Their views are discussed below.

Rationale for the R&D

The case for maintenance of a healthy environment that supports sustainable economic activity and offers economic, social and environmental benefits at all levels in society has been well argued. All stakeholders, whether farmers, governments, non-government organisations or industry in all its forms, have a crucial role in this process, as decisions and actions of stakeholders at all levels (Landcare, local government, regional, and national) greatly affect outcomes from use of irrigation resources and the natural resource base generally.

Growing awareness of the need for sound and sustainable management of the natural resource base is central to achievement of personal and national economic, environmental and social goals. This concept has been reinforced through numerous government policy documents espousing concepts of stewardship, Landcare and community participation in management and decision making.

Despite growing awareness and management efforts, degradation of our water and other natural resources persists throughout Australia. The extent of recent degradation, loss of biodiversity, ecosystem health and salinity has been documented. Invariably, conclusions are that '... *the scientific evidence suggests ... degradation problems will probably become more serious ... we know that the decline in the condition of our natural resources in some areas is outstripping our efforts to counteract it using current approaches. The community, including most landholders, now has a higher expectation that the natural resource base will be better managed. There is a sharper consumer focus on environmental performance in production and on food safety, and international forums are now making connections between natural resource management and trade.*' (AFFA 1999, pp.4-5).

Research indicates that in many catchments, new approaches to the use and management of water and other natural resources will be required. Significant changes in water and land management practices, farming systems and other economic and social activity, are seen to be central to achieving continuous improvement towards more sustainable systems. The issues are complex and will not be able to be handled in isolation. "*We need to look beyond individual problems ... and take account of the links within and between natural systems and the inter play of economic, social and biophysical factors that influence natural resource decision making. An integrated approach is needed.*" (AFFA 1999, p.7).

These are all socio-economic issues – how the structure of, and linkages between, economic and social enterprise, and ways in which individuals and groups consult, communicate and interact in the conduct of economic and social activity, impact upon our water and other natural resources, The related question is how can changes in economic and social structures and relationships help in our efforts to improve the use and management of our natural resources.

Unfortunately, our knowledge about these socio-economic issues lags well behind our technical knowledge. It is therefore, timely for NPIRD to embark on a program of socio-economic research, which will equip us with the insights and tools to shift towards more sustainable production and management systems. The work in this project is aimed at developing such a program for irrigated agriculture.

For this report, irrigated agriculture is any agricultural activity where water is added to production systems to supplement naturally available water, or where a water rich environment has been created in the absence of naturally available water.

Discussions with participants

The Discussion Paper listed a number of key questions asked of participants, namely:

- Is there general agreement about the propositions, assumptions and challenges facing irrigation communities, as outlined in the Discussion Paper?
- Will these forces and influences, when brought together, result in the short and long term futures for irrigation communities outlined in the Paper?
- Are the socio-economic R&D areas outlined in the Paper relevant and will they provide useful building blocks for irrigation communities to change and grow?
- Are there other issues or R&D areas which are of equally high priority and which might forestall irrigation communities achieving sustainability?

In each interview there was broad discussion around these questions but also in terms of the various premises and propositions put forward in the Paper. The following provides a generalised summary of responses and conclusions from the literature without trying to repeat many of the earlier arguments and bearing in mind the purpose, which is to identify areas for socio-economic R&D. More detailed responses are provided in Section 5.

General building blocks

Some general observations can be made from the responses, as a basis for identifying scenarios for change. Broadly, participants would agree these are as noted below.

Vision and foresighting are essential

The Discussion Paper outlined several building blocks or 'propositions' which might underpin irrigation communities of the future. Together they outlined a scenario for 2030. A number of the propositions were regarded by some as 'idealistic' or 'optimistic'. However, the general view was that, unless these propositions are strived for and embraced, then many irrigation communities will cease to be viable. The alternative in some areas would be traumatic structural adjustment leading to the demise of many communities. Little is known about the values, aspirations and vision of communities and how to harness these for growth.

Significant change to date should be acknowledged by all

It should be acknowledged that irrigated agriculture has made a significant contribution to Australia's wealth. Agriculture, horticulture and forests are continuing to expand and the productivity of these enterprises is continually increasing. There is no doubt our environmental and natural resources policies have undergone significant and rapid recent change as conditions have changed and as knowledge has grown. There has been growth in awareness of the issues and the need for action, even if exactly what that action is, has not always been clear. There

has also been a sea-change in the involvement of the community in planning and increasingly in decision making, which commenced with the landcare movement less than 15 years ago.

Despite this, in some areas radical shifts will be required to move towards land uses that are more compatible with Australia's ecological systems. With a finite water supply and issues of water quality as a result of intensification of production systems, the sustainability of the irrigation industries in some areas will have to be addressed, as must the question of whether the contribution of the irrigation industries to the nation outweighs environmental considerations.

Profitability is of over-riding importance

Participants stressed the importance of profitability in production systems and wider economic activities. Without profitability of farm enterprises and personal motivation in terms of successful business ventures, little action is likely to take place, particularly in areas such as landcare, conservation of biodiversity and other activities to achieve environmental goals (see for example, Barr and Cary 2000; Cary and Webb 2000; Cary and Wilkinson 1997). Farmers made the well known comment, 'it's hard to be green when you're in the red'. An urgent agenda is to define the characteristics and requirements of profitable, ecologically sustainable farming systems.

Environmental needs are acknowledged by producers

Degradation of Australia's natural resources and environment is a national issue with profound economic, social and ecological impacts across communities. A major shift in the attitudes of irrigation water users is now occurring, concerning recognition of the need for attention to the environment and for appropriate environmental flows of water. Environmental needs are now acknowledged with participants arguing there is urgency in setting the parameters for this which then allows farmers and other irrigation water users to adapt and develop new management approaches. Irrigators require more knowledge about the magnitude of environmental flows and associated socio-economic repercussions.

New cultures are required to solve present problems

Developments in the use of irrigation water and the responses of stakeholders to changes in water availability mark a shift towards a new paradigm for addressing the management of water and other natural resources. Irrigators and most associated communities are keen to understand the essence of new approaches so they can effect the continuous improvement processes in their businesses. This will require new knowledge about new cultures and the associated adjustment processes.

This paradigm is increasingly also about holistic approaches and solutions for regional communities. Traditional measures of economic growth will, therefore, have to be supplemented by indicators of community health, quality of life and social dimensions such as the desires and values of communities.

Shifts in the roles of communities and individuals will require governments to continue their efforts to reform institutional and related arrangements for water and other resources. Over the next decade the processes of water reform should be nearing completion resulting in different arrangements for water property rights, pricing and trading.

Partnerships and alliances are one important way forward

It is increasingly recognised that formation of partnerships, alliances and consortia are the best ways to undertake the needed structural reforms. This will require team efforts on the part of businesses and communities, and stakeholder processes that are inclusive and effective in resolving conflict and achieving agreement. This will necessitate flexibility, responsiveness and

involvement on the part of governments, and adaptability, resourcefulness and innovation on the part of communities. In general, irrigators and associated communities are willing to make the attitudinal changes necessary for these new approaches work.

The 'irrigation community' is difficult to define

Participants argued references to 'irrigation communities' should be qualified. Aspirations and issues for irrigation farmers may not necessarily be the same for local communities. Communities are largely formed around issues of common concern. Therefore, local or regional communities may not, for example, respond to the agenda for water use efficiency since, in many cases, water use issues do not affect them directly. Therefore, in bringing about change, care should be taken to spell out the attributes of different stakeholder groups, their needs and the different approaches required to engage them. This will require research into the structure of stakeholder groups and how to target these to meet their interests. Blanket recommendations and solutions are not likely to work.

Another dimension to this is that, within farming, different groups of farmers will have different needs and will respond differently to business and sustainability issues. For example, for those with smaller farms, an important issue is likely to be the need to gain size economies through cooperative arrangements and to build strong linkages to other supporting businesses. For larger corporate businesses where economies of size can be captured as a part of their business operations, this may not be an issue. This raises issues about why and how we should seek the participation of different farming groups. Factors motivating large corporate enterprises may, for example, be the need to be good corporate citizens, environmental goals, labour force issues, the need to achieve environmentally friendly investments as a result of pressure from shareholders, and marketing and consumer product demand issues. The key point is that farming systems are highly heterogeneous, and strategies for growth will differ between groups.

This caveat about diversity and the need for flexibility in formulation of business and community strategies is important in relation to recognition of diversity in farming and communities, and also in relation to comments made in this section and other parts of this report, about partnerships and community processes.

Community based processes will have to be made to work

There is general consensus that landscape (re)design is best achieved where the landscape reflects community aspirations. Attempts to develop more sustainable land uses often fail, or under-achieve, because this principle is ignored. Appropriate community consultation processes in which stakeholder groups have meaningful input, and with outcomes that motivate and allow stakeholders to take responsibility for their actions, are the only way forward.

Conflicts associated with resource use are likely to be a major impediment to the development of more sustainable resource use and management systems. Processes for conflict resolution and avoidance, through mechanisms such as dialogue and consultation, improved information flows and education, will, therefore, be important. These will only work where relevant community groups are involved.

This does not mean communities should have absolute control of all decision making. There must be a balance between top-down and bottom-up processes. There will be issues where leadership and decision making by authorities and government is in the best interests of the community. On major issues, there should be clear lines of responsibility agreed in advance by all parties. 'Rules of business' will have to be clearly understood, and adhered to, by all players. Tradeoffs and transparency will be necessary. These 'rules' are the broad range of social norms and institutional arrangements (legal and organisational) which must reflect those social norms. They must be tailored to local conditions and be adaptive to changing needs. Institutions must

also be inclusive and not oblivious to the aspirations of wider stakeholder groups (e.g. tourism, urban, industry, recreational and cultural users of natural resources).

These are major challenges for governments and those bodies or corporations with administrative control or power. At minimum, these organisations may need to be more sensitive to community views and to implementation of processes to modify institutional arrangements to better suit community situations. There is limited knowledge in these areas.

Change will, in many cases, be driven by forces beyond community control

It was generally agreed the drivers of change affecting prosperity in irrigation and regional communities are as noted in the Discussion Paper and relate to resource use pressures, arguments about globalisation of economic activity, technological advances and demographic and lifestyle factors. Other areas stressed by participants as important were changes in energy sources and technology, bio-technology, agribusiness and the scale of corporate enterprise. All these drivers will engender extensive and rapid reform in the operating environment of irrigators, requiring behavioural and attitudinal change and modification of management approaches and styles. Despite the fact that many of these drivers are beyond the control of individual communities, they raise opportunities and the possibility of turning uncertainties into positive directions for growth. Research will be important in these areas.

Scenarios for change

In general, participants agreed with the broad scenario for 2030 put forward in the Discussion Paper. There were differences in perception about the likely future of some communities. For example, some argued the paper focused too much on a perspective for declining communities, such as in some southern areas, and did not adequately take into account prospects in new development areas, such as parts of Northern Australia, Western Victoria and refurbished areas, such as Loxton in South Australia. There are areas in all regions, where developments are taking place and forces of structural adjustment are leading to the closing down of unviable enterprises. Thus scenarios should accommodate both growth and decline.

Bringing the various arguments together, in general, participants believed the following might be the most likely scenario for irrigation communities, by 2030. The areas noted suggest important topics for socio-economic R&D.

The water resources landscape

In terms of irrigation water, participants agreed major transformation in the use and management of water would be the norm, whether in developing areas, such as Northern Australia or in the south irrigation districts. Key elements of a scenario for 2030 for irrigation areas are likely to be:

- safe minimum standards for water for the environment and purposes other than commercial enterprise, will be in place;
- there will be significantly less diversions and water available from other sources, such as groundwater, available for irrigated agriculture, horticulture and plantation forests;
- For some areas, particularly parts of Northern Australia, availability of water may be less of an issue. However, even in these areas, availability may still be constrained by the lack of infrastructure in water delivery systems and the need to rely upon natural rivers for delivery. In these circumstances, environmental and quality assurance issues may still limit water availability;

- irrigation will occupy a smaller proportion of the landscape by area, but a larger proportion of the value added in agriculture, horticulture and plantation forests – productivity will increase markedly in all areas and there will be a strong demand for high quality, 'clean and green' products from irrigated areas – the restructured irrigation sector will be highly profitable;
- there will be significant new investment in irrigation infrastructure and much current infrastructure will be either removed or refurbished, under new, innovative arrangements for partnership and consortium investment;
- the water use efficiency requirements of new infrastructure investments will have forced out lesser efficient producers such that some present irrigation landscapes will no longer contain irrigation enterprises and, by the same token, significant new irrigation developments will take place in other areas – the location of irrigated agriculture will shift with major structural change in associated communities;
- the requirements for quality assurance and compliance in irrigated agriculture, horticulture and plantation forests will be extensive, requiring third party formal entitlement to use of natural resources subject to compliance, and accreditation of produce from irrigated areas;
- management and planning frameworks for water and land use will be in place, based on whole of catchment/region principles and representative and transparent stakeholder processes.

Participants argued the above scenario would require attention to a range of important problems in water availability, allocation, use and conservation, if irrigation communities are to make the transition towards a more sustainable future.

The availability of water

Issues here are concerned with monitoring of the 'water account', assessment and of the resource base and planning to ensure water use is within the capacity of the natural resource base.

Many of the issues require extensive new skills on the part of managers, cooperative action in industries and communities, and new knowledge for decision making, all areas dominated by socio-economic issues. Examples are:

- the management of changes in land use, requiring coordination between land use planning and water agencies;
- water use efficiency as this relates to recognition of appropriate assessment of surface and groundwater resources and translation of these assessments into decisions on availability of water for users, including the environment; handling of drought and other risks;
- determination and management of 'caps' on water extractions;
- valuation of water and other resources, different land uses, and benchmarking of these changes; and
- the treatment of water savings, involving judgments about who should capture the benefits of efficiency savings of water.

The allocation of water

Issues in this area range as widely as:

- replacement or refurbishment of irrigation supply and drainage infrastructure;
- development of water legislation and policy;
- tackling external impacts of land use change;
- modifying entitlements to water in the face of new priorities;
- developing codes of practice for environmental management systems; and
- the operations and inter-relationships between agencies and jurisdictions.

Associated socio-economic issues involve the making of policy and its implementation, and hence, also the interface between governments and the community, and are concerned with handling:

- community involvement in implementing better arrangements for entitlements and property rights to water and other natural resources and changes in these;
- associated stakeholder processes for change;
- conflict resolution and avoidance; and
- revision of regulations and legislation.

The use of water

Socio-economic issues in the use of irrigation water are concerned with achieving water use efficiency gains, economic and environmental sustainability of farming systems and business structures, the operation of markets and water trading arrangements, capacity building and structural adjustment. Associated issues include:

- the uptake of new technologies from production to processing and distribution;
- supply chain management and development of linkages with agribusiness;
- modification of inefficient management and cultural practices;
- action to overcome constraints of small farm size and rising unit costs of production;
- strategies to cope with new management demands, such as the increase in reporting requirements of taxation and banking, market requirements, environmental standards and accounting arrangements; and
- management in a business sense, of competitive crops and water requirements for agriculture, horticulture, plantation forests and vegetation generally.

The conservation of water

Issues here are concerned with the integrity of environmental resources, the impacts of water use and land use change on the resource base, and assessment of the costs to the environment of commercial activities; responsibilities and duty of care, water re-use, drainage and quality issues; and water storage. This area also includes issues in:

- aquifer and catchment management;
- development of markets and other measures for environmental services;
- development of a conservation ethic including protection of wetlands and awareness about the need for environmental flows;
- development of policies to cope with environmental pressures brought about by high productivity industries, such as increased fertiliser use, salinity, high stocking rates, greater supplementary feeding, nutrient and veterinary products, etc;
- issues in catchment and river health, and water quality; and
- development of policies for use of energy conservation, greenhouse abatement and managing for climate variability.

The human landscape

Drawing on comments provided by participants, the above scenario for water resources to 2030 suggests a number of socio-economic issues in the human landscape which irrigation communities will have to grapple with, and which point to potential areas for R&D. Examples of some of the issues raised are outlined below.

- Irrigation communities will require a high degree of knowledge of the environmental, economic and social structures in their living environment. Much of this information will

have to be shared, requiring good group relationships and a culture of cooperation. Reaching agreement on stakeholder responsibility and duty of care for the environment will be important issues.

- Stakeholders will have to reach agreement that natural resources are only used within the limits of long term capacity, preservation of future options and the reasonable requirements of current and future users. This would require that development and decision making processes across all resources and potential uses be coordinated and be based upon sound scientific and economic information about the resource base and impacts on the associated physical and human systems. There will have to be strong recognition of cultural values and rights and responsibilities of all Australians.
- Irrigation communities will have to become world leaders in sustainable food production and demonstration of holistic land, water and vegetation systems – this will require a transformation in attitudes and improved knowledge systems. Partnerships will be essential to generate the environment for innovation, development of sophisticated and discriminating home markets and export ideas. In this context, there will need to be a better understanding of the structure, size, concentration and location of local and regional communities and industry, and commitment to developing a highly skilled local and regional workforce, world-class R&D, profitable supporting industries and accreditation arrangements.
- Bearing in mind the caveats noted in Section 4.1 about diversity and scale in farming systems and communities, linkages to regional and corporate industry and agribusiness will have to be strengthened, requiring stronger local and regional organisations and governance. Successful operation of these structures will be vital for negotiation on tradeoffs for resource use, administration and planning, and brokering of joint investment ventures. Relationships, networks, pathways of communication and community processes for change will be central to these functions. Organisations charged with community governance, together with the different levels of government, and irrigation and other industries, would form partnerships or consortia for investment in infrastructure and services, and in the marketing and distribution of produce.

Issues raised for socio-economic R&D

Socio-economic analysis is an important component of a research agenda to foster continuous improvement within irrigation communities. Such research must be wide ranging in order to capture the dynamics of the development process in communities.

Participants provided insights into a range of more specific issues, which are summarised below. Following analysis and given the points made in the previous section, it was clear issues fell within the following four categories, which provide a basis for structuring a socio-economic R&D program.

- **Social arrangements** – covering values, institutions and the debate on the structure of irrigation communities.
- **Economic activity** – covering the issues relating to farming enterprises, business structures, development of markets for inputs and products, and the scale and scope of industries supporting agriculture.
- **Learning** – covering issues relating to innovation, capacity building, information systems and the development and uptake of knowledge, and
- **Supporting structures** – covering issues relating to governance, structural adjustment, planning processes, operational arrangements, and support measures.

Key issues raised in these four areas are discussed below. Areas where projects are likely to have a high pay-off in each of these four areas are discussed in the next section, "Issues in each of the research topic areas", and in detail in Attachment D. There will necessarily be some overlap between the above categories. However, they are useful for classifying responses. Issues relating to the technical R&D that must underpin the socio-economic research were not within the charter of this report. It is assumed the necessary technical research will be funded and available (and ongoing) well before 2030, to facilitate decision making. However, issues relating to the interface between technical R&D, the uptake of technical research results and the socio-economic impacts of this R&D, are relevant to this study (see Topic 11 below).

Finally, while the discussion is essentially about irrigation communities, it is recognised these communities operate within a wider regional, national and international community framework and that this wider framework and linkages must be considered in socio-economic analysis.

Social arrangements

This area is about the legal and quasi-legal frameworks, conventions and ways in which we do things, in our society (see also "Supporting structures", p. 12). These 'rules' dictate our attitudes about what is permissible and ways in which we behave. A culture which recognises not only the need for profits from business activity but also the importance the environment, heritage, culture and biodiversity, will behave differently compared with a society driven purely by markets for private, commercial gain. Participants raised important issues in this regard, all of which provide legitimate areas for socioeconomic enquiry. Some key issues are outlined below.

- While some of the propositions in the Discussion Paper are idealistic (see "General building blocks", p. 3), we have little information on the consequences if we fail to match up to these.
- How do we define 'an irrigation community' (see p.5), given there are problems in identifying the values, beliefs and drivers for different groups within these communities, and given that different stakeholder groups have different goals, beliefs and passions?
- How do we bring together and identify strategies for change for the various highly diverse and unique groups of farmers, and diverse community stakeholder groups in irrigation communities?
- What is the meaning of 'sustainability' (see p. 4) given this is more a process in continuous improvement?
- What are the criteria for representation by different stakeholders in planning processes and decision making?
- Who receives the benefits of water reform and who bears the costs of change and what are the criteria for public debate on these issues?
- Whose preferences are to be taken into account in public decision making since preferences of different groups in the community often do not coincide?
- What processes are most appropriate for consultation and decision making?
- What are the issues which are dependent upon cooperative action and how do we achieve cooperation, given the diversity and scattered location of irrigation enterprises?
- What are the requirements for duty of care and determining the responsibilities of individuals and different groups of stakeholders?
- What are the benefits and costs of and policy measures for, different structural adjustment options?
- How do we conduct an inclusive debate on the environment, land use change and the future of irrigation communities?
- How do we generate positive social capital as the basis for business viability and continuous improvement?

- How do we change the institutions and cultures governing behaviour in bureaucracies, corporate enterprise and smaller private business and groups?
- How do we take into account different cultures and values and whose rights and values prevail?
- How do we overcome the social traps, impediments and inertia in the use of natural resources, resulting from external benefits and costs and incomplete information?

Economic activity

This area is about the commercial and market operations involved in the use of water and other natural resources and the associated managerial, financial, technical and risk management issues. Participants were particularly concerned to stress that irrigated agriculture does have a bright future that we are currently in a process of transition to a new institutional and regulatory environment for business, and that in this transition period, support on a number of fronts is essential to survival. Some issues raised by participants, all worthy of socioeconomic enquiry, are outlined below.

- While there is agreement that the main drivers are as noted in "General building blocks", p. 3, there is little guidance on their impact and development of strategies for survival and growth.
- Little is known about the regional/local economic and social structures, business linkages and factors determining growth and decline in irrigation areas.
- There are significant issues in rural labour markets which affect business strategies in irrigation areas.
- What are the second and third round impacts and spillover effects in irrigation areas as a result of the trading of water and changes in land and natural resource use?
- What is the impact of scale in organisations and corporate business structures in irrigation communities?
- What are the best farm structures, risk management strategies and planning strategies in irrigated agriculture?
- Who should fund R&D, what should be the R&D agenda and who makes these decisions?
- Who should participate and make decisions on the location of economic activity, irrigation infrastructure and agribusiness?
- How can partnerships, consortia and initiatives such as economic zones be encouraged?
- What are the skills and leadership issues in fostering business activity?
- How will the debate and decision making on commercial opportunities in areas such as biotechnology and alternative sources of energy, be conducted and decided?
- How can information and information services be improved in a range of areas such as value adding, market power, alternative enterprises, business opportunities and the development of new investment ventures?
- How will effective market mechanisms and associated institutions such as property rights, entitlements and trading arrangements be developed?

Learning

The development of a learning culture in which individuals, groups, organisations and communities have the capacity to learn and innovate in the light of experience, is probably one of the most important factors in ensuring survival and growth in a highly uncertain environment. A learning culture relies upon a good stock of positive social capital and institutions which foster participation and facilitate change. Participants believed that with the escalation in the demands on managers at this time, the rapidity of structural change and the increasing complexity of the decision making environment, research into ways of encouraging life long learning is crucial. Some specific issues raised are noted below.

- What is the knowledge base for decision making, who makes decisions, and funds and maintains this?
- How is information made available in useable form, to individuals and communities for appropriate decision making, where there are external benefits and costs to others?
- Leadership, burn-out, representation and networking in the community are major issues.
- How do we raise the capacity and capability of individuals and groups to work in multi stakeholder processes to resolve resource use and management issues?
- How can the serious supply and demand issues in rural labour markets be addressed in order to achieve better collective outcomes and fulfil the needs of business at all levels?
- How can attitudes and behaviour be changed to give better understanding of the issues and encourage duty of care?
- What are the requirements for improved adoption or take-up of new technologies and management systems?
- What mechanisms and processes contribute to the capacity to learn and create positive social capital, and what is the role of cultural activities, such as the arts, in these processes?
- How do health issues in rural and remote communities contribute to success or failure in irrigated agriculture?
- What conflict resolution and avoidance mechanisms are best in overcoming present water and other natural resource use issues?
- What factors and mechanisms can help in modifying the culture in large corporations and bureaucracies associated with water resources?

Supporting structures

Issues in this area are about the mechanisms and processes to ensure the successful outcomes from economic and social activity. They concern governance, ways in which power is used, planning, communication, stakeholder processes and the various incentives and penalties to improve performance. These are all socioeconomic issues and concerned with **implementation** of the concepts and policies outlined in the first area, 'social arrangements'. Participants suggested a range of issues, key ones of which are noted below.

- What are the appropriate local and regional stakeholder consultative and participatory processes to generate optimal social and economic outcomes, and how should these be resourced?
- What should be the structure and content of planning arrangements at all levels, how do these plans come together for greatest integrity and how is information transmitted and used?
- Who are the appropriate stakeholders for involvement in water resource issues, how should they be targeted and how can their capacity be enhanced?
- What is the role and responsibility of governments at all levels and their agencies, and should these bodies work in particular ways (e.g. top down or bottom up) to effect change?
- How can effective and practical policy measures be developed in a wide range of areas such as development of: improved water and other natural resource entitlements and property rights arrangements; a trading environment; economic or prime development zones; partnerships and alliances for investment; new investment ventures; communications and better understanding?
- What are the mechanisms and support measures to facilitate structural adjustment?
- How can infrastructure renewal be introduced and under what shared responsibility arrangements between governments, industry and communities?
- What are innovative ways of introducing new technologies, management processes and services (e.g. alternative energy sources and crops, different combinations of crops etc)?

- What are new and innovative models and mechanisms for delivering services to irrigation communities, in areas such as health and education, and how can we ensure these can attract viable support industries?
- How can attitudes and processes be modified within and across agencies to improve coordination and administrative structures, and tackle important issues impacting on water resources, such as environmental flows, use of water efficiency savings, over allocation of water in some catchments and land use change?

Issues in each of the research topic areas

This section presents an outline of 16 research topic areas, which begin to cover issues raised in discussions with participants in this project. This section provides an overview of some of the issues in each of the topic areas. There are unavoidable overlaps and linkages between these topics. Note that with limited time the following can only be a scan of some of the issues in this wide range of research areas. The reference material across this wide range of topics can only be indicative.

The four *research categories* (see p.9) are proposed here as a basis for structuring a possible socio-economic R&D program. These categories are: social arrangements, economic activity, learning and supporting structures. The four research categories have each been divided into a further four *research topic areas* (discussed in this Section) and *priority research areas* shown in Figure 1. Note that 15 of the research topic areas are linked to the three priority research areas but as development of a sound and updated knowledge base underpins all of the socio-economic research areas no lines of linkage have been shown between research topic 6 (knowledge base) and the priority research areas.

Topic Area 1: Community structures

Research into the structure of industries and local and regional economies, from the viewpoint of environmental, economic, social and cultural sustainability.

Information on the structure of the environment we live in and the processes of and mechanisms for change, is essential for visioning and decision making. Practical strategies are required to enable communities and regions to attain their economic and social potential, based on detailed analysis of current performance and prospects.

Understanding of the dynamics of the institutional, economic, social and cultural environment within which irrigation communities operate should underpin plans and the development of policies. We have little knowledge of how structural change may help or hinder regional growth prospects and help to resolve equity issues.

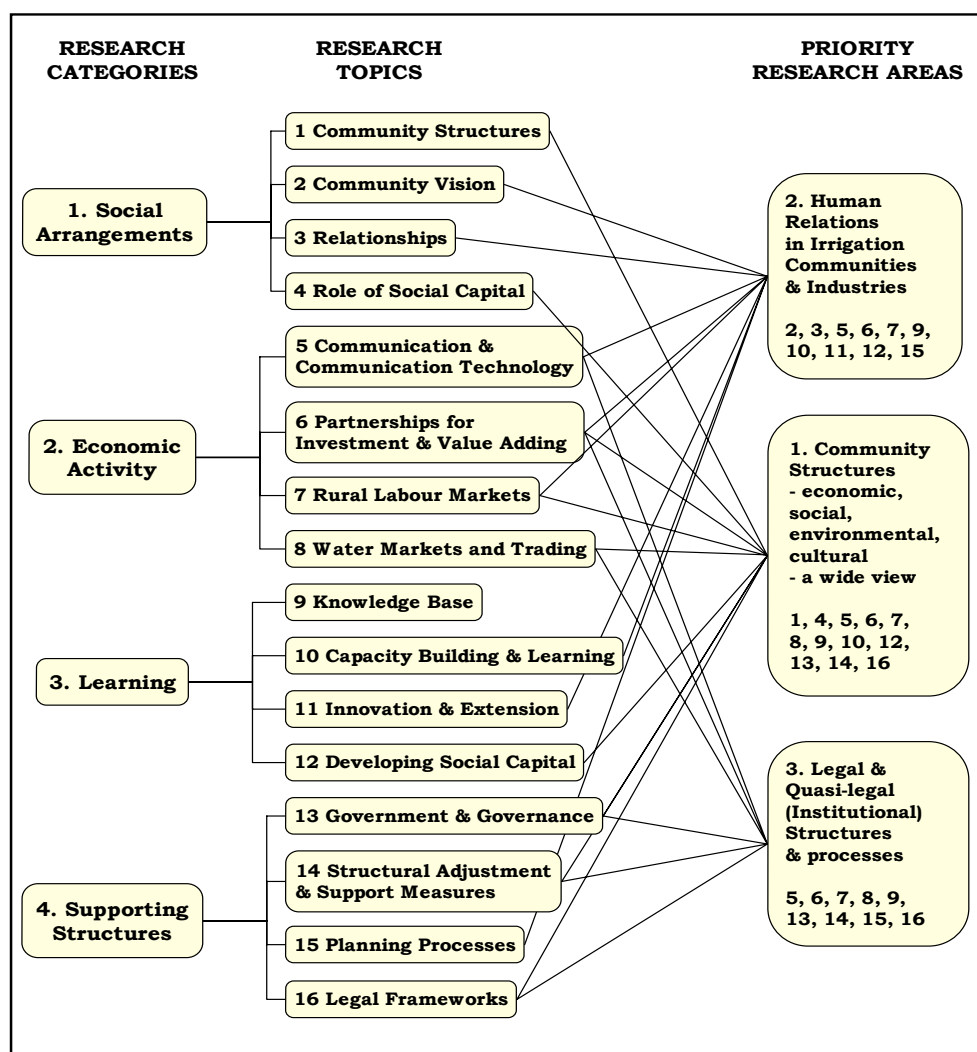
A number of studies, albeit relatively scattered and independent, have been undertaken to understand community structures. There is work, for example, on analysis of structures such as ministerial councils, regional forest agreements, landcare groups, catchment management boards and authorities, and (statutory) R&D bodies. There is a literature on regional development bodies and examples of initiatives taken by several communities. There is also currently discussion about roles and functions of governing bodies, such as, for example local government and the interaction of organisations responsible for regional water, land and vegetation management. However, there is little work of a more holistic nature on the dynamics of communities and processes leading to growth and decline, and the strategies communities can adopt to equip themselves with the necessary information to determine their future.

At the local level, what is required is knowledge about the resource base available to irrigation communities, including information about the stock of skills and different forms of capital as well as an understanding of the physical and socio-economic processes which generate change, growth and social capital. What constitutes more sustainable farming systems is also important. The building of knowledge and its use will require ongoing attention and is linked closely to innovation, adoption of new technologies and systems and the capacity of individuals and groups to change (see Topics 10, 11).

Research should draw on earlier work to develop ideas and designs for effective local and regional development (see also Topics 2, 13-15). Each community is unique and it is just not possible to fund processes for each community, such as carried out within the Green Triangle. Work already completed can provide case study material for analysis and from which lessons can be learned and toolkits developed. In addition to this, new work will be required to analyse the dynamics of change, the data requirements for wider analysis of community structures and steps communities should take better to understand their own localities.

Some useful references are: ATSIC (1999); BRS (2000); Cape York Regional Advisory Group (1997); Dunlop et al (2001); Falk (2001); Green Triangle Regional Association (2000); Johnson et al (1999); OECD (2000a,b); Quiggan (2000); Schofield (2000); Sorenson (2000); Taylor (1995).

Figure 1. Framework for establishing priority research areas



Topic area 2: Community vision

Research to identify the needs and aspirations of communities, gain community participation in change and develop improved models for consultation

In recent years there have been substantial advances in our understanding of the likely requirements for more sustainable natural resources management in Australia. There is now increasing awareness of, and responsiveness to, the issues involved. Communities are beginning to seek ways to grapple with the challenges. In many cases this requires that they take charge of their own destiny, develop visions for their future and implement local solutions. This trend should continue and strengthen as communities seek to create the outcomes they want, become more vision oriented and develop a greater commitment to the principles that enhance ecological sustainability, social capital and sustainable industries.

The shift towards more sustainable irrigation communities in which people are empowered and participate through the development of common goals can only happen where there is vision that includes individual as well as institutional and organisational aspirations and values. Research is required in this area and particularly, the vision and aspirations of irrigation communities and regions, and closer integration of different cultures.

There is presently the possibility of a fundamental re-think of values and an innovative policy development process to bring into play new institutions and ways to re-enfranchise irrigation areas. We first want to know the outcomes we want and only then should we turn attention to the best ways to achieve these ends (see also Topics 4, 15, 16). There are major new policy issues for research here, both at the local and national levels.

Some useful references are: ACF-NFF (2000); Blackmore (1999); Bradberry et al (2001); CYRAG (1997); CIE (2000); C of A (1992); C of A and ALGA (1999); Cox (1995); CDN (2001); DTRS (2000); Flora et al (1996); Holmes (1996); Kingma and Falk (2000); Meyer (1999); NISN (2001); Siewort (1998); SCARM (1998, 1999).

Topic area 3: Relationships

Research into the structure of relationships, pathways and networks best suited to effective community processes, working in teams and groups, and 'getting to agreement'.

A key factor influencing behaviour, attitudes and the ability to resolve and avoid conflict in the use and management of natural resources is relationships and inter-relationships which stakeholders have with each other and the wider community. This is particularly so given the external impacts associated with natural resource use which inevitably require collective solution and sound relationships among stakeholders. When relationships fail, progress in resolving water and other resource use issues becomes difficult, at times leading to disintegration of communities.

A central focus is to find ways to help farmers, extension workers and other participants think beyond the boundaries of individual properties and interface with other farmers and those who have responsibilities for water resources. This is also important for those who influence behaviour, such as catchment authorities, local government, input suppliers, purchasing companies, state governments, and so on. Farmers' willingness to respond within this wider social setting is an important area for policy. A further key point for policy is that many of the environmentally responsible actions required of farmers will not be in their own best financial interests. Externalities in the use and management of natural resources mean that often, farmers cannot fully recoup the benefits of their investment in, for example, efforts to increase water use efficiency.

Habits and identity are tied up in traditional behaviours and it is these perceptions and institutions which must be addressed if adoption rates for irrigation practices are to be altered. Of relevance are the essential characteristics or make up of participants and the factors at the farm, catchment and regional levels, which influence these. Key areas are:

- the nature of, awareness about and ability to re-assess values and beliefs, and the conventions which embody these;
- effectiveness of farm operations and actions, ways of doing things and management;
- decision making at all levels including public versus personal decision making, and close linkages between the family, the farm and the business; and
- participation in group activity at all levels and communication within and between groups.

Increased emphasis on relationships is supported in the recent mid-term (administrative) review of the Natural Heritage Trust. The mid-term review emphasised the need to overcome fragmentation and administrative duplication in the NHT programs. Many recommendations were aimed at the need to give expression to the investment nature of the Trust (see Topic 6). Findings indicate a major increased focus is required on the human element, skills and relationships as a basis for the partnerships and investment contracts required to generate regional investment strategies and achieve more integrated approach to water and other natural resource use and management.

This area is linked to communications (Topic 5), learning and capacity building discussed under Topic 10, the formation of investment partnerships under Topic 6, rural labour markets (Topic 7) and issues in development of social capital under Topics 4 and 12.

Some useful references are: Alston (2000); Cooke (2002); Gunningham and Sinclair (2002); Kingma and Beynon (2000); Kilpatrick (1997); MDBC (2000); MDBC (2001b); SCARM (1998); Barr (1994, 2000); Cary and Webb (2000); Curtis and de Lacy (1996).

Topic area 4: The role of social capital

Research into the role of social capital in facilitating (or hampering) community progress.

The role of communities is increasing in importance in water resources management and in the management of natural resources generally. This trend is strengthening as governments at all levels seek to develop more effective systems to deal with water use issues, particularly where there are large spatial dimensions and where the basis of action lies mainly with private landholders.

The term 'social capital' is closely linked to the term 'institutions' (see Topic 16). Social capital is the networks, norms, trust and bonding, bridging and linking ties involved in working together. Its hallmarks are reciprocal activities such as cooperation, participation and sharing. Social capital only has meaning in the context of human relationships - it is the glue of relationships and facilitates economic and social activity. Social capital is embedded in the relationships between people and created by families, communities and regions and the nation as a whole for the benefit of all members. The capacity to motivate and activate our knowledge, physical and human resources is dependent upon the stock of positive social capital.

Little is known about what influences the growth of positive or negative social capital. For example, elements of a 'productive cycle' (building of social capital) in group processes have been shown to be the building of trust, cooperation, networking, reciprocity, and the positive interrelationships between these (see also Topic 12). On the other hand, where groups are not performing a 'vicious cycle' appears as mistrust, isolation, exploitation, defection and the downward interaction between these. Such cycles have been shown to be part of the processes

of building and erosion of social capital in communities. However, more conceptual research is required in this area.

Issues in the area of social capital will differ in importance, depending upon the particular farmer groups, industries or community stakeholder groups are involved. These issues were discussed in Section 4.1. Diversity of farming and irrigation industries and communities should be considered in formulating strategies for change. This adds complexity to socio-economic research.

Some useful references are: Allen (1998); Binning and Young (1997); Chapman (2000); Cox and Caldwell (2000); Falk (2001); Falk and Kilpatrick (2000); Rifkin (1999); Smith (1999).

Topic area 5: Communication and communication technology

Research into improved models for communication with stakeholders including appropriate information and communication technology.

Issues of consultation and communication with and between stakeholders are presently among the most urgent and unresolved issues in rural policy in Australia. In many areas the stresses of coping in a fast changing environment have been such as to cause people to 'shut down'. Communication on policies and programs to ensure successful uptake and wide knowledge of policy objectives and programs, has become difficult. New approaches to communication in rural areas will be required to overcome these and wider problems. Addressing the problems will require new ways of engaging individuals and groups, of communicating between stakeholders and of skilling of people and groups for effective uptake and use of information.

These factors are to do with four major policy areas, namely, the disposition and social development of individuals, how groups work and interact, consultation processes; and communications. Associated issues are the availability of quality information, effective communications technology and the ability to use the information and associated technology. Administrative structures and information management systems should facilitate synthesis of information and knowledge, management of risk and uncertainty, adoption of learning processes and effective decision making. In many instances these are poorly developed or in their infancy.

A complicating factor is that communication needs will differ with different farmer, industry and community groups. These are complex issues, which should be taken into account in socio-economic research.

The development and use of decision support systems and information technologies for not only data management and analysis but also as tools to assist communication, negotiation and decision making, is an important new issue. Information technology is an increasingly powerful tool that can be used for a wide range of tasks such as:

- generating technical, economic and social data and knowledge;
- creating development plans and options;
- developing consultation and communication strategies and associated activities;
- providing support for learning and the development of capabilities;
- monitoring and assessment of technical and group processes and outcomes; and
- as an aid to development of inclusive negotiating environment.

To date, rural and regional Australia has been disadvantaged in terms of access to quality telecommunications infrastructure. This is not so much in telephony but in the capacity to access effective internet services, such as text, images, sound, software and video. Transfer of such data through copper wire is a lengthy process yielding poor quality results. Capacity means

bandwidth of the network as this determines the speed and quality of data flow through the system. Minimum bandwidth standards for speed and quality are not available in many rural areas. On this issue there is presently a widening gap between urban and rural areas. It is expected that, by 2005, all areas of Australia will have access to bandwidth of a minimum standard. However, this will be commercially delivered, heightening the problems of affordability, relative disadvantage between regions and the whether service industries, such as banks, stock broking firms, agribusiness and supply chain ventures find it profitable to invest in irrigation areas. These are all important topics for socio-economic research.

Many of the above activities and particularly those involved with structuring, collecting and utilising regional data, have a significant public good component justifying government funding. There is an urgent need to develop and implement funding models and partnerships between governments, communities and the business sector, to ensure current data sets are maintained as time series and enhanced where appropriate for optimal use in the future (see topics 6, 9).

Some useful references are: ALGA (2000); ANTA (2001); Gunningham and Sinclair (2002); Webster et al (2001); C of A (1997); Cooke (2002); Kilpatrick (1997); Share (1995); Kingma and Beynon (2000); WRI (2000); Barr and Brown (1994); RIWG (2001).

Topic area 6: Partnerships for investment and value adding

Research into the types of partnership, consortia and affiliation arrangements and networks required to achieve joint community, industry and government investment in irrigation communities.

The issues in this area are concerned with development of cooperative and partnership effort to undertake investments in areas such as public infrastructure and services, agribusiness ventures, new industries and value adding. Issues are:

- the increasing complexity of the investment environment, which makes development of partnerships difficult and increases risk and uncertainty;
- the scale of investment required, making it difficult for small, individual investors to bring the resources together for investment ventures;
- the externality issues associated with the uses of natural resources, making it difficult for investors to capture the benefits of their actions; and
- the structure and scale of industry and business, with dominance of large scale corporate enterprise and development of large scale supply and demand chains.

The issues will differ with different farming, industry and community. Groups, as discussed in "General building blocks", p. 3).

The quality and level of services in many irrigation areas and regions, particularly in smaller towns, is continuing to decline. Many of these areas are now characterised by declining populations, an ageing populations and poor age care facilities, service decline, poor infrastructure, escalating social problems, poor education, fewer and less secure jobs, and poor quality of life. Service areas most affected are schools and education generally, health and welfare services, information services, banking, telecommunications, and services associated with infrastructure such as roads and other forms of transport, energy and water resources.

The situation is the same for services provided by the private sector, such as in banking, health services, pharmacies, newsagencies and so on. For services such as these, economic imperatives and issues of 'critical mass' determine amalgamation of services and in many cases closures. Often business closures stem from 'the tyranny of small decisions' where decisions by individuals operating in isolation lead to closures which could have been avoided with strong

community leadership and networks. Attempts to restore these services within the traditional institutional 'ways of doing business' are increasingly failing.

The decline in service levels and quality, whether public or private, is in part due to forces of globalisation and the dominance of market forces and associated microeconomic reforms. It is recognised not all regional communities can be viable within this environment and that, for some the only solution is structural adjustment and relocation of resources. However, the pace of change has, at times been such that some potentially viable communities have not been able to take stock and develop new, local solutions, even though such a strategy would generate socially justified economic growth. These communities must be nurtured. In these circumstances, there should be special recognition of the importance of infrastructure, the need for social capital development and presence of a viable service base with public and private involvement, as important ingredients in returning communities to viability.

Communities will want to develop service delivery arrangements, which are local and different from the traditional models of government provision and subsidisation. However, despite major and in many cases successful efforts on the part of some communities to make changes, there are still significant barriers to implementation of these different service delivery models. Research is required in this area.

These barriers are cultural, attitudinal, structural, organisational and personal. In many circumstances the barriers are similar to those for infrastructure development. They are particularly insurmountable where goods and services have a public good component and where local stakeholder processes have not yet crystallised sufficiently to handle partnerships and community based models for self help. Where the public good component is high it is unrealistic to expect the private sector or the community to undertake the necessary investment. As in the case of infrastructure, public/private partnerships for risk sharing and investment will be the only approach.

There will continue to be a debate on how to fund the renewal of infrastructure, such as irrigation storage and distribution systems, and the environmental works of communities and local government. Levels of frustration have built in many regional communities in the quest to maintain such soft and hard infrastructure development. Reasons invariably relate to resourcing of initial proposals, packaging, identification of the true benefits and costs of projects, inadequate institutional arrangements, insufficient information and analysis of alternative models to share risk, poor consultation and communication among stakeholders, and inadequate pathways to lead through commercial, official and political processes.

The only way forward, in many cases, is for irrigation communities to work in partnership to establish the conditions required to encourage strong local industries which value add their produce, and to facilitate formation of strong business linkages into their communities via relevant export industries and the agribusiness sector. This requires analysis of options and a sound research base.

Consumers of the future will demand quality and sophisticated goods and services. A 'bulk commodity' approach to agricultural and horticultural production will be unacceptable and will have to be superseded by activities which add value to basic products. Value adding industries provide a range of services to the communities they operate in. They provide significant employment opportunities, new prospects for local farm produce, markets for a range of input supplies and services and opportunities to re-invest funds locally. Agribusiness will continue to be important in achieving value adding. Value adding activities can strengthen linkages between the local level and larger scale agribusiness, bringing a sense of place and identity. This will require further research and communication.

A major driver for irrigation communities is accommodation of growth in the large scale input supply industries, service companies and other areas of agribusiness. These sectors are highly competitive on world markets, and have developed sophisticated supply/demand chain linkages, competencies and resource sharing arrangements. Companies involved manage functions within chains, share gains and costs and have embarked on cross-disciplinary innovation and participation to enhance their competitive position. Irrigation communities will have to keep pace with these developments. The impact of these developments on communities is not well researched.

Irrigation and regional communities will have to set in place regional and local arrangements for the development of business and community infrastructure, services and networks. Investment in these areas will involve all levels of government and associated agencies in partnership with industry and the community. This will require extensive research to identify best practice and feasible models for investment, and take account of the diverse needs of producers, industries and communities (see Section 4.1).

Some useful references are: AFFA (1999, 2000); Cooke (2002); C of A (1998); ALGA (2001); CSBO & DTRS (1997); Gunningham and Sinclair (2002); ICA (2000); MDBC (2001b); WRI (2000).

Topic area 7: Rural labour markets

Research into rural and regional labour markets and identification of policies to overcome employment problems particular to rural and remote communities.

Issues in labour markets in rural areas are associated with availability of a skilled, flexible work force, employment prospects and provision of physical and social infrastructure to facilitate development of a learning culture. These issues impact heavily on irrigation areas and require further socio-economic research.

Labour markets have changed markedly in recent years. Farming communities are coming under increasing pressures to upgrade or formalise skills to ensure best practice and long term business viability, and to have recognised qualifications to satisfy business needs. There is now acceptance of national policies on vocational education and training. Competency based national training and assessment now allows many rural practitioners to gain formal credentials by having existing skills and experience assessed and recognised. Further initiatives have come from the rural R&D Corporations and the State and Territory governments. There is increased awareness of the benefits of and need for investment in training, in part, driven by business management imperatives and new income and business taxation policies.

Smaller regional training organisations and consultancies have entered the training market in competition with established providers. These are offering tailored on the job training, assessments, business support and brokering services for employment. Grower organisations are still key players in providing access to information and (non-formal) training to members. Collaboration between agencies and service groups is increasing. Agricultural training is highly contextualised and seasonal, requiring flexible delivery, and combinations of classroom/workshop delivery and site visits.

Agriculture is being reshaped as a professional career with a credential pathway. Indications are that agriculture, particularly businesses associated with irrigated agriculture, have sound prospects and there is a strong demand for skilled, high quality and flexible labour. Employment rates and equality of opportunity vary across regions. The need for learning and capacity building in rural areas is greater than ever (see also topics 3, 10, 11).

Despite this progress, statistics continue to point to rural disadvantage in education and training and employment generally. The recent Rural Industries Working Group Report (RIWG 2001) concludes there is 'a strong rural disadvantage' for school and post-school education and hence job prospects.

Evidence indicates young people from rural and remote areas are still less likely than those in capital cities, to complete Year 12 or to go to university following completion of Year 12. Indigenous Australians rate well below urban Australians on Year 12 completion. Rural and remote students have lower rates of achievement and completion in school and post-school studies. A lower proportion of the rural workforce has degrees compared with other areas. These conclusions are accentuated for the agricultural workforce. Rural and remote students are disadvantaged in terms of distance to vocational education and training providers, imposing extra costs of learning.

The RIWG Report argues *"Australia is locked into a 'low skills – low quality cycle', paying insufficient attention to the need for high-level intermediate skills in export-exposed sectors of industry. This assessment is particularly relevant to Australia's rural industries and emphasises the need for upgrading of skills"* (RIWG 2001 p.25). Some key issues are:

- there is insufficient emphasis on training for greater adoption of innovative business practices, new technology, productivity growth, value adding and marketing (see Topic 11). There is 'poor uptake of proven technology';
- labour markets in agriculture are segmented (owners, workers, age, gender, etc), and there is significant variation between, and overlapping skill and labour difficulties across, sectors and industries. This may require a different approach to education and training;
- age and skill profiles indicate 'a looming skills shortage' and an ongoing need for positive policies for replacement and improvement of the skills base and succession planning;
- special measures are required to resolve disadvantage in language, literacy and numeracy, and to boost financial, management and marketing skills for the existing workforce;
- location-specific and flexible training is required with better recognition of past experience;
- an increased emphasis is required on cross-sectoral and industry vocational training, definition of career paths and measures to improve the career appeal of rural industries;
- communication and understanding are issues; and
- there are still problems with the Agricultural Training Package.

There are special problems in the provision of information about training and linking of this to information about and prospects for employment. Among providers there is no clear picture of information flows on courses, operation of state and national data bases and website course listings.

While there is growing awareness in rural areas of the need for and benefits from education and training, there is a need for marketing and promotion of these issues and of education, training and learning opportunities generally. There are significant barriers to the uptake of education and training, and skills shortages and gaps (e.g. management, business planning, technology uptake, labour market shortages etc) which should be addressed in policy and service provision terms, and from the viewpoint of the client base. These are important research areas.

Some useful references are: Chudleigh (1998); CSBO & DTRS (1997); CRLRA (2000); Garnaut et al (2001); Garnett and Lewis (1999); RIWG (2001); BRS (2000); Garnaut et al (2001); Kilpatrick (1997); Kilpatrick and Bell (1998a); RIRDC (1998).

Topic area 8: Markets and trading

Research into measures and models for appropriate functioning of markets and trading arrangements for water, and environmental services associated with water and other, associated natural resources.

Economic instruments such as markets, where the conditions are met for their effective operation, have the potential to transfer information, allow decentralised decision making, contribute to efficient allocation of resources and minimise administrative costs. However, these instruments can have limitations in terms of identifying and valuing environmental and wider benefits and costs of water and other resource use. There can also be difficulties in rewarding individuals for the external benefits they confer on others as part of their use of natural resources, and in making individuals fully accountable for the full costs of their actions. The implications are that water and other natural resources may be used in excess or not used effectively, with repercussions for communities. Second and third round effects of changes in the use of water may also have repercussions for irrigation communities.

Many irrigation areas are presently characterised by different types of water allocations, with some specified in volumetric terms and others by area. Policies for water rights, rules for water quality protection and trading arrangements, are not integrated, have developed incrementally and have competing objectives. Markets for water are 'thin' and while trading arrangements are in place, these are not optimally used. Further development of water resources is, in part, predicated upon the development of water trading arrangements. A 'mature' market for water trading including limited trading between different river systems should be in place well before 2030. Such trading will have significant implications for irrigation communities, as water is transferred between areas and regions, and as associated changes in economic activity cause communities to grow and decline. This will require research and assessment of the socio-economic implications of trade in water and other natural resources.

Research should aim to develop, in partnership with appropriate agencies and community groups, efficient technical and economic market arrangements for the trading and allocation of water, and environmental services for associated natural resources, where appropriate. This will involve attitudinal, behavioural, equity and duty of care issues, which require socio-economic research. Where such markets are not appropriate, governance processes will have to be set in place for the allocation and use of environmental resources, and for resolution of resource conflicts. The social and distributive effects of the introduction of markets and their rules and operations have received little research attention (see also topics 13, 16). Extensive research is required in this area.

Some useful references are: Bjornlund and McKay (1998, 2000a, 2001a); Heaney et al (2000); HLSG (2001); Kingma and Musgrave (2001); Lyster (2000); McKay (2001a,b, 2002); McKay and Bjornlund (2002); Meyer (2000); Productivity Commission (1999a,b); Quiggan (2000); Senate Select Committee (2000); Samanyaka et al (1997); Stoneham et al (2000); van Beuren (2001); Young and Hatton McDonald (2000).

Topic area 9: Knowledge base

Research to determine the requirements of a knowledge base appropriate to meet the irrigation community challenges and aspirations.

Underlying community stakeholder processes is a requirement for better understanding of the economic, environmental and social and cultural forces, processes and systems in regional communities and at all levels from local to national. The use of sound information and analysis by all stakeholders for awareness, vision building, planning, investment decision making and benchmarking, increases understanding of these issues. It also improves the efficiency of these

activities, the sharing of risk, the functioning of community and business processes and formulation of sound policy.

Development of more detailed and sophisticated environmental, economic and social data and information systems was marked with the establishment of the National Land and Water Resources Audit in 1997. Combined with strides in technology (especially for spatial data collection, mapping and analysis) the capacity of communities and industry to understand and better manage their impacts on the natural resource base will be significantly greater by 2030. However, this will require continued research.

At the national and State levels, state of region data sets for monitoring, analysis and benchmarking are important. However, it is well recognised there is a need to improve the regional and local statistical collection. Reviews conclude there is currently a metropolitan bias in some data sets, which could be rectified by:

- movement towards a comprehensive regional data set which is not focused solely on commodities;
- synchronisation of censuses;
- geo-coding of data sets to give adequate regional definition and provide the smallest possible building blocks for multiple purposes at the local level;
- adoption of the Accessibility/Remote Indicator of Australia (ARIA) methodology;
- coordination of integrated data sets; and
- recognition of the importance of small area data with economic, environmental and social dimensions.

Current statistics offer too narrow a vision for changes occurring in regional communities and for solution of many contemporary problems. Change to a more regionally or community based collection with central coordination would help with:

- public policy formation and decision making;
- cooperative planning and budgeting at all levels;
- improving statistical design and hence analytical capacity of the data;
- facilitating access through better retrieval and analytical services;
- providing a basis for standardised concepts and classifications, and for compatibility and integration with other data sets (such as administrative data sets);
- monitoring to implement 'whole of government' approaches to program and service delivery;
- development of 'community toolkits' to facilitate best practice.

Small area data become increasingly important with emphasis on distribution, equity and disparity in regions. Similarly, small area data can affect business investment decisions to locate industry and new enterprises. More research is required in these areas.

Governments have a role in facilitating and researching the uptake of this technology where there are social net benefits from its use. Governments could help resource data collection and analysis of Australia's regions, conduct research on knowledge bases, develop and demonstrate innovative strategies for sustainable regional development and play a part in provision of information and knowledge to stakeholders at all levels.

Some useful references are: ABARE (2001); ALGA (2001); ANCID (2001); Bradford et al (2001); BRS (2000); Dillon et al (2001); Dunlop et al (2001); Garnaut and Lim-Applegate (1998); Johnston and Chudleigh (1999); Mues and Opalinska-Mania (1998); MDBC (2001a); NLWRA

(2001); Nancarrow and Syme (2001); Norris et al (2001); O'Loughlin and Nambier (2001); Barr and Cary (1992).

Topic area 10: Capacity building and learning

Research into approaches to and frameworks and applied models for capacity building and lifelong education and training in irrigation and regional communities.

Achieving behaviour change in farming and business has become complex, requiring knowledge of the many factors and forces influencing business managers. In addition to adoption of new production technologies, farmers must now give more attention to investment in: human skills and education; the uptake, analysis and use of information; the management of risk; the production, quality and marketing of their products; the financial and personal management skills of the management team; and the institutional organisation and structure of their industry.

Business managers, including farm managers now require not only technical skills but also skills and insight into: the operation of new and sophisticated capital and electronic equipment and processes; management of sophisticated financial businesses; and the range of human and personal management skills required to manage teams and operate within groups at all levels. This will require shifts in the attitudes and perceptions of many farmers and their support workers and organisations and a new willingness to enter into cooperative dialogue and networking with their communities and groups of common interest.

Achieving a balance between all these areas will be important, requiring continuing access to, or willingness to participate in, education and training. These systems must meet the special needs of farming and indigenous communities with respect to isolation, face-to-face delivery, communication, case management, planning, lifelong learning and career development (see also topics 7, 11). This requires new approaches to skilling and re-skilling, and ways in which relationships are managed.

At the farm level, there are issues around the adoption of new technologies and management processes. Some considerations are:

- rapid adoption of new practices often does not occur because many natural resource management practices are accompanied by intangible benefits that are frequently captured by others;
- time delays are involved between decision making and tangible results, leaving the way open for the effects of others' actions to modify outcomes;
- policies to change motivation, such as encouragement of stewardship, may only have a small impact unless other factors are taken into account;
- where farmers have value systems that are different from those of 'change agents', there may be a need for collaboration to discover a basis for compromise and shared action;
- changes in the political, cultural and legal structure are important in influencing motivation and capacity;
- the structure and linkages in rural communities are important in bringing about change at the farm level; and
- achieving more sustainable agriculture is as much about industry restructuring as about farm level operations and systems.

These types of conclusions illustrate the importance of not only farm level factors but also wider off-farm economic and social factors, bonds and ties to wider circles of individuals and groups, influencing behaviour to improve natural resource management and create a learning culture (see topics 7, 11). Research is required in these areas.

Some useful references are: Binning and Young (1997); Castells (1996); Dunn et al (2000); Edquist (1997); Falk and Harrison (1998a); Falk and Mulford (2001); Kelly (2001); Kerby et al (1996); Kilpatrick, Bell et al (1999); Kilpatrick Johns et al (1999); RIWG (2001); ALGA (2001); Cary and Webb (2000); Cary and Wilkinson (1997); Curtis and de Lacy (1998); Kilpatrick (1997); Kilpatrick and Bell (1998); Napier (1997, 1999); Reeve and Black (1994); Smith (1999); SCARM (1998); RIRDC (1998).

Topic area 11: Innovation and extension

Research into new approaches to innovation, extension, and the uptake and use of technologies, management systems and knowledge, to create a culture of learning organisations, industries and communities.

Research shows that for innovation, and adoption of new and adapted technologies, regional businesses and communities must become **learning businesses and communities** based on knowledge intensive firms operating through continuous improvement and regeneration of organisational structures, networks and linkages. Commercial activity should be supported by networked, informed, and skilled local communities. There should be enabling leadership within the community as a basis for structuring partnerships and resolving conflict. Facilitating the uptake of technology and new management systems is often necessary.

Four sets of variables act to create competitive advantage, innovation and technological change. These factors include:

- the relative resource endowment of the region relative to other regions;
- the size of the home market;
- the connections within the region with complimentary and supporting industries which are already competitive including skills of suppliers, consumer demand, formal and informal networks and the structured support of public bodies; and
- the organisational structure of firms which influences their capacity to change.

Successful industries have strong linkages, such as to buyers, suppliers, customers, technology and networks, and these linkages work best where industries are geographically concentrated or clustered. Firms and industries are best able to achieve external economies through participation and partnership at all levels. The degree to which business enterprises can become embedded within regions, however, is related to the scale of enterprise and size of firms – large firms and institutions tend to be more detached from the regional community, that is, 'in' the locality not 'of' the locality. The dilemma is that as firms capture economies and become larger they also become less effective in helping to build social cohesion and unity.

Development of industries in irrigation and regional communities must be accompanied by institutional arrangements which lead to different more socially conscious businesses and networks, and by strong local stakeholder processes, partnerships and leadership. Governments will continue to have an important role to ensure an environment within which these activities can develop.

Regions need to attract skilled workers and high technology firms and have the mechanisms in place to retain them and encourage learning in the local economy. In turn, regional communities must be able to provide the environment not only to attract knowledge but also to retain and embed this into local economies.

The sense of 'place' implied in the above is the complex of intangible characteristics of a community that make it attractive to actual and potential residents and determine the degree to

which participants can grasp opportunities and create wealth. This concept extends to firms and industries connected through 'virtual place'.

Requirements for innovation and extension will vary across producer groups, farming structures (e.g. small farm *versus* corporate farming), industries and community groups. They will also vary with the image of the various irrigation industries and the nature of agricultural and value adding products. Often irrigated agriculture is not seen as an attractive investment. This can be changed with appropriate communications (see Topic 5) and reversal of a range of myths as discussed by Gleeson (2000).

The innovation system is also important. Aside from the public R&D and extension effort (State agencies, rural R&D corporations, special government programs), there has been relatively limited R&D. Public R, D&E has invariably been technically oriented, to the detriment of organisational and managerial innovation and R&D into information technology, supply chains and value adding. The interface between technical R&D and the uptake of technical R&D results has received relatively little attention.

New innovation systems should be designed to produce a diversity of evolutionary and revolutionary innovations, remove constraints and respond to the innovation and extension needs of the range of farmer, industry and community groups. This R, D&E should be supported by pooled resources from all these groups. Mechanisms for this are not well developed (see also Topic 6).

All the above factors contribute to more effective and efficient business structures, and private sector investment, innovation and risk sharing. Research into ways to influence these factors at the farmer, industry and community levels will have a high commercial and social payoff.

Some useful references are: Castells (1996); Cooke (2002); Gleeson (2000); Edquist (1997); ICA (2000); Gunningham and Sinclair (2002); Johnson et al (1999); Kilpatrick and Bell (1998b); Raine (1999); State Government of SA (1999); SCARM (1999); UK Roundtable (2000); ALGA (2000); Barr and Cary (2000); Cary and Wilkinson (1995); Cary and Wilkinson 1997); Glyde and Vanclay (1996); Mues et al (1998); RIRDC (1998); Wool Task Force (1999).

Topic area 12: Developing social capital

Research into the development of models and mechanisms to encourage and the growth of positive social capital in irrigation communities.

Communities can best develop and enhance their capacity to determine their own futures through strategies for empowerment, community planning, innovation and leadership. Research shows empowered, learning organisations and communities, which build on their social capital (see also topics 4, 10), will be highly effective in:

- achieving successful change;
- generating the climate of participation necessary for reforms to succeed;
- lowering transactions costs associated with economic and social activity;
- attracting new investment and creating partnerships with the private sector;
- developing inclusive stakeholder processes at all levels which work to minimise conflict and gain community agreement; and
- building local capacity for innovation and sustainability.

Research also indicates presence of a good stock of social capital in the community is central to achieving growth. Social capital is not only an important means for bringing about required change but it is also the product of such change.

Growth of social capital is dependent upon institutional and policy settings. It is institutional settings within which markets work, which give expression to economic and social behaviour and within which communities develop their social structures. Where authority, institutions and power, whether associated with government or business organisations, are remote and determined outside communities, there is a potential to undermine social capital.

Research shows a strong community precedes and is a precondition for strong and sustainable economic and social growth. Where strong regional communities are not evolving then attention could be directed towards:

- fostering community capacity building and learning;
- encouraging enabling and participative leadership;
- facilitating the growth of learning organisations, communities and more recently regional centres and cities;
- generating effective relationships, networks and multistakeholder processes;
- generating (two way) information and knowledge flows for business, community and government decision making;
- empowering women as key drivers of the inclusive values noted above and their commitment to integrated, holistic processes of growth; and
- supporting the creative arts as a basis for bridging the gap between narrow, profit based activity and broader socially useful activities.

Enabling irrigation communities in these ways will, of itself, create the environment for revival of local institutions and organisational structures. Where feasible, additional ways, which will help in the redesign of community structures to achieve this, are:

- re-examination of governance at all levels;
- assessment of the costs of access and connectivity to resources and management structures (including IT) in local communities;
- devolution of power and responsibility to regional communities; and
- analysis of processes, accountability arrangements, regulations and administrative machinery, which tend towards uniformity and control at levels beyond 'locality'.

Issues such as these have already been identified at forums such as the *Regional Australia Summit* and, in particular, the need for local leadership development, community capacity building and review of the roles of government, business and the community in achieving growth. However, further socio-economic research is required to develop the models and mechanisms to achieve on-ground results.

Some useful references are: CDN (2001); C of A (2001a); Cox and Caldwell (2000); Gitell and Vida I (1998); Falk (2001); Kelly (2001); Winter (2000); Kingma (2001); Melville and Walesh (1997); NRHA (2001); Vanclay (1997).

Topic area 13. Government and governance

Research into the role of governments at all levels in helping to achieve sustainability, and more broadly, appropriate forms of governance and devolution of power, and models for achieving responsibility and duty of care for irrigation communities.

Governance is the structure of institutions, or the formal and quasi-formal 'rules of business', within which groups operate (see also Topic 16). Central to this are issues of autonomy, representation and ownership, and the nature of pathways of decision making. Issues of who has and uses power, meaning the authority and authoritative structures surrounding the 'rules of business', designated responsibilities, rights and privileges, legislative systems and other

institutions, are also a part of governance. Many of these issues are not resolved and will require socio-economic research into models for participative governance, equitable representation, and for achieving voice and power in business, social and environmental affairs in local communities.

The development of 'pathways' of decision making at all levels will require cultural change, capacity building and introduction of more collaborative stakeholder processes.

A more integrated and cooperative approach to regional policy development to encourage business investment, structural change and community empowerment in regional communities may now be appropriate. This will require attention to governance structures. The three levels of government have an important role in developing these structures. Ways should be found for working in partnership with local communities to help overcome barriers to change, provide leadership for innovation, deliver equitable and efficient services and share risk and responsibility in new business and infrastructure investment.

Irrigation communities will have to develop a range of new regional structures and governance organisations and review their roles and responsibilities in and ownership of those structures and organisations. Further socio-economic research can help to achieve this.

Some useful references are: Amin and Hauser (1997); Close and McLeod (2000); C of A (2000a); C of A and ALGA (1999); DLWC (1999); Dore and Woodhill (1999); HLSG (2000); House of Representatives (2000); Marsden Jacob (2000); MDB Council (2000); Productivity Commission (1999a,b); Senate Select Committee (2000); SKM (2000); Sullivan (1995).

Topic area 14: Structural adjustment and support measures

Research into structural adjustment policies and support measures to help individuals, firms and industries to move away from obsolete investments and unsustainable production processes.

Irrigation areas will have to undergo structural adjustment to survive the forces impacting on them. Both governments and the community can legitimately play a role in facilitating this adjustment and to help people and communities tackle and cope with change. This has two dimensions. First, there is a case for positive measures to support businesses and communities create and recreate competitive advantage – this involves development of models of and measures for capacity building, leadership, risk sharing and new partnerships. Second, there is a case for ameliorating the effects of change by helping people, businesses and communities leave their present unviable occupations and enterprises and re-skill and/or re-invest in different ventures.

Socio-economic research is required into new approaches to encouraging positive structural change and innovation (see also Topic 11) in irrigation areas. In this context, various national competition policy reports have accepted the need to provide targeted assistance to regions. Without such assistance, potentially viable regional communities may fall by the wayside, locking resources in unproductive uses and placing an increased burden on welfare systems.

While generally used for welfare and income support (e.g. social security benefits and allowances), social 'safety net' arrangements are one form of assistance, which can be modified to meet adjustment purposes. Such **hardship support** for structural adjustment assistance can be aimed at providing special income support for people who are disadvantaged as a result of change, suffering hardship or in transition during periods of change. Assistance delivered *via* hardship support must be generalised but effectively targeted to meet basic needs across regions. This form of assistance can be justified on economic grounds if transitional losses are perceived to be larger or of longer duration than expected. This may be due to the fact that personal and business assets are locked into present unproductive uses (asset fixity),

unreasonably high transactions costs, reluctance to change location, or insufficient awareness, information or skills to make the changes.

Governments and the community can help in these circumstances by providing the necessary support and/or information to overcome such barriers. In agriculture, for example, schemes are available to provide relief and adjustment support for low income farmers. However, the extent of adjustment in some irrigation communities may require new approaches to the issues.

In appropriate circumstances, further adjustment assistance is warranted if the changes required of people, businesses and communities are perceived to be too slow from a national perspective. For example, it is accepted the capacity to adjust will be less the smaller and less diversified the community, where there is no large scale industry, where infrastructure and services are below critical mass and where communities have been subjected to a number of economic, environmental or social shocks. In these circumstances, well structured adjustment packages are appropriate to help overcome impediments and facilitate change.

There now appears to be a growing need for a proactive approach to structural adjustment in irrigation areas, focussing on positive measures for vulnerable farmers, industries and communities. Pilot regional transition strategies may be valuable in the first instance, to determine appropriate packages of support. Such measures could be aimed at attracting industry clusters, retraining, learning and capacity building, providing access to improved entry points for a range of programs and information, brokering of new models for industry transition and diversification of the economic base.

Pilot projects could be supported by assessment of regional competitiveness including impediments to adjustment in the vulnerable communities in declining regions. This might include the identification of economic and social factors, the impact of technological changes, labour market mobility and the community initiated preparation of 'transition strategies' to manage adjustment and recovery.

Brokering of support packages would help irrigation areas in bridging gaps between project proponents and potential investors. This would help to facilitate a greater flow of private sector capital into irrigation areas. Further research is required in this area.

Some useful references are: ALGA (2001); Allen (1999); Barr (1999, 2000); Bjornlund and McKay (2000b); Born and Genskow (2000); Gamble et al (1995); House of Representatives (2000); Hugonnier (1999); Mech and Young (2001); MDBC (2000, 2001b); Regional Aust. Summit Steering Committee (2000); State Government of SA (1999).

Topic area 15: Planning processes

Research into models and processes for more integrated planning for resources management, land use, water resource conservation and allocation, catchment management and farm business sustainability

Effective planning processes have a major role in helping communities and stakeholders generally, to reach agreement and cooperate. This enables farmers, industries and communities to move beyond development of regional structural and corporate plans to the implementation of investment strategies for greater sustainability. Planning processes are important as a tool to support change at the farm level, aid stakeholder negotiations, and facilitate conflict resolution, decision making and the reaching of agreement. Such processes rely on accurate and timely data, research and analysis.

Planning depends on capacity building within all sectors and at all levels and creation of a learning culture supported by state of the art information technology and expertise. Participative processes in which feedback loops ensure constant renewal of approaches to issues, and revision of management strategies, are necessary. Sound procedures for review, accountability and commitment to change at all levels are also required. This is particularly so at the bureaucratic and political levels, given many changes required are structural and institutional. There is a need to encourage greater community involvement and commitment to these planning and political processes. This will require further research and extensive consultation to achieve acceptance of the necessary changes.

Bearing in mind the issues associated with diversity and the differing needs and motivations of farmer, industry and community groups, appropriate stakeholder processes are necessary to ensure agreement on a way forward and to inform and influence policy processes at all levels. Information, analysis, planning, informal and inclusive stakeholder processes and mechanisms for carrying forward the outcomes of regional negotiations to policy makers are critical.

Associated biophysical, economic, social and systems research must proceed in parallel with stakeholder activities. Obtaining commitment to agreed targets for use of water will require the use of resource management planning strategies. Sustaining the commitment of participants at all levels, including bureaucratic and political, is essential, given the complexity of issues, long lead times involved and the need for cultural change. Some research has been conducted into stakeholder processes. However, this research is in the preliminary stages and should be developed.

Some useful references are: Allen (1999); ANCID (2001); Blackmore (1999); Chapman (2000); C of A (2001b); Dale (1992); Dale and Bellamy (1998); House of Representatives (2000); ILC (1996); McKay (1994); MDBC (2001b); Regional Aust. Summit Steering Committee (2000); Senate Select Committee (2000); State Government of SA (1999); WAPC and WRC (2001).

Topic area 16: Legal frameworks

Research to explore appropriate legal, statutory and regulatory frameworks to encourage continuous improvement in the use and management of water and other natural resources, and assess the conventions and perceived rights, which are not necessarily grounded in statutes, but which influence behaviour and attitudes towards resources management.

'Institutions' are the formal and quasi-formal legal structures, rules and conventions that govern our actions, relationships, ways of doing things and ways in which individuals and groups interact to achieve ends. Institutions are given expression through law, statutes and regulations. In this report, institutions are referred to as the formal and quasi-formal legal frameworks in society. They are reflected in, for example, legal or perceived entitlements, property rights and regulatory arrangements. By giving access to income streams and power to particular individuals and groups, institutions largely determine the distributional characteristics of society. They also determine who benefits and loses from policies we implement and conventions we support, who seeks to acquire rights and who does not have access to property rights.

Change in these frameworks is, generally, a process of gradual shift in policies in response to crises, in other words, a grafting of new legislation onto old ways of doing things. For many natural resources, the impact of negative externalities, largely through over use of the particular resource, has led to revised legal arrangements. In part, this has been because issues such as environmental sustainability have not previously been on the public agenda. In a wider context, the allocation of rights to groups has been a somewhat imprecise process, as part of a broader policy formation agenda. Action, at times, has been in terms of attempts to control externalities

where change is called for. This has generally lead to moderate shifts in policy where pressures require particular groups, whether producers, consumers or industry, to be supported.

Change is required in the policy agenda governing change in legal frameworks, if we are to address emerging resource use issues and the socio-economic effects these are having. This will require new ideas on market arrangements, new, smarter ways to use regulatory measures and clearer policies on responsibilities and duty of care. There is lack of clarity about how to weigh up ideas in law against the wider socio-economic issues in irrigation communities, and the value of other mechanisms, such as accreditation of natural resources management activities and planning. There is also limited information on how legal and regulatory measures, and market power, might be mis-used by participants, giving rise to ecological, economic and social impacts. For example, in a water trading environment, the impacts of horizontal mergers between water suppliers and concentration as a result of vertical mergers between producers, are unresolved issues with impacts on communities.

A more holistic approach is necessary in the development of these ideas and measures, to take account of the impact they may have on the economic, social and cultural environment. For example, there is little information on the second and third round effects of water trading. Yet water trading, particularly where this is between regions and on a more permanent basis, can lead to the disintegration of communities. There is a lack of information on the characteristics of participants, who gains and loses from institutional change, the magnitude and location of socio-economic impacts, and timing of changes in rights. There are also issues in the communication of institutional arrangements to stakeholders, the administration and enforceability of laws and regulations and the adequacy of monitoring and feedback processes. Improved participatory processes are required to debate the uncertainties and develop effective legal frameworks. There is a dearth of data and analysis on which to base these activities.

Some useful references are: ARMCANZ and ANZECC (2000); Born (2000); DLWC (2000); DNRE (2001); Dore and Woodhill (1999); Dovers (2001); HLSG (2000); Industry Commission (1998); McKay (2001a,b, 2002); McKay and Bjornlund (2002); McKay and Moeller (2000); Mobbs and Dovers (1999); Productivity Commission (1999a,b); Quiggan (2000); SKM (2000); Sullivan (1995); Tan (2001); Young and Hatton McDonald (2000); Young et al (1996).

Some priorities for socio-economic R,D&E

This report has identified 16 inter-related Topics for socio-economic research, development and extension (R,D&E), for consideration by NPIRD. The topics are summarised in Figure 1. These topics range across a number of disciplines, given the need for more holistic approaches to the present problems and issues in irrigation areas. Research results will be required in these areas if communities are to make the successful transition to more sustainable irrigation communities under the revised water and human landscapes for 2030, discussed in "Scenarios for change", pp. 6 to 9.

Clearly NPIRD will be unable to fund all the R,D&E within these topics and the communication and extension effort that should accompany research. Thus priorities should be established to focus the work but still give insight across the 16 topics. Three priority areas for R,D&E have been identified in Figure 1. These are R,D&E into:

- community structures with linkages to topics, 1,4,5,6,7,8,10,12,13,14,16, namely, social capital, capacity building, community structures, communications, partnerships, innovation,

labour, water and other natural resources market and trading issues, governance, structural adjustment and legal framework;

- people or human relationships issues and communication in irrigation communities, with linkages to Topics 2,3,5,6,7,10,11,12,15, namely, community vision, relationships, partnerships, capacity, learning, innovation and community and regional planning structures; and
- legal and quasi-legal frameworks and structures, with linkages to Topics 5,6,7,8,13,14,15,16, namely, communications, partnerships for investment, labour, water and other natural resources market and trading issues, structural adjustment and planning.

There is an urgent need for more information on the structure of irrigation communities, the various farmer groups and their particular needs, the needs of industry and community groups, and the linkages and motivational factors that will facilitate innovation and a learning culture.

Knowledge about the efficacy and effects of legal and quasi-legal frameworks and structures within which we operate, is vital for innovation and growth. These frameworks and structures determine responses from individuals, groups and industries, the capacity to adjust to change and to ability to take advantage of opportunities.

Underlying all activity is the extent to which individuals and groups have the capacity and ability to learn, interact and innovate. This requires delivery of sound education and training and other rural services and the presence of the networks and positive social capital which facilitate good relationships, avoidance and resolution of conflict and the ability to respond to the changing agenda for continuous improvement.

Socio-economic R,D&E projects in these three areas are urgent and should be ongoing in irrigation communities, funded from pooled resources contributed through innovative partnerships between producers, industries, government and the community.

Attachment A. Socio-Economic Issues Affecting Positive Change in Irrigation Communities – A Discussion Paper – January 2002

Purpose and introduction

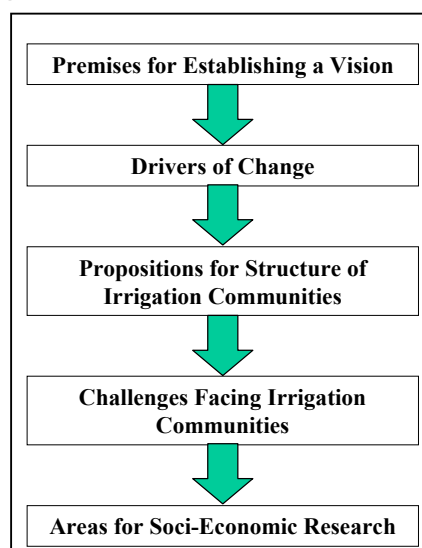
To foresight what viable irrigation communities will look like in 30 years and scope the range of social and economic issues which could be aided through research now.

This study asks questions about what the world and the Australian irrigation industry may look like in 2030. Of interest are issues such as what will be the impacts on and challenges faced by irrigation communities between now and 2030. While there are many unknowns there would appear to be opportunities for communities, through their involvement in a range of planning activities, to influence the direction over the next 30 years. This will help inform participants, policy makers, administrators and those involved in new irrigation developments, in their planning and decision making. Visioning and foresighting can help raise awareness, improve relationships and create a culture for environmentally sustainable development of irrigation regions and industries in the longer term.

This paper will be used for consultation purposes early in 2002. A number of individuals have been identified as being representative of the major stakeholders in the national irrigation industry. Each will be involved in refining the areas of socio-economic research for the irrigation industry¹, identified in Section 8.

Figure 1 summarises the methodology and the flow of the arguments used in this paper. We have stated some generally accepted premises and drivers of change. We have then developed a number of propositions which set a scene for definition of challenges and areas of socio-economic research. For presentational reasons we have chosen to omit references in this discussion paper but will include a bibliography in the final report.

Figure 1: Methodology and the flow of arguments



Basic premises for this paper

Attempts to catch a glimpse of irrigation communities over a long time horizon of some 30 years requires some heroic assumptions. We have chosen to frame the paper bearing in mind a

¹ *CapitalAg* has been commissioned by the National Program for Irrigation R&D (NPIRD) within Land and Water Australia (LWA) to undertake this project. The propositions, assertions and suggestions in the paper do not necessarily reflect the views of NPIRD or LWA but have been developed to assist discussion. Contact details are: Noel Beynon 02 6255 583 or capitalag@bigpond.com and Onko Kingma 02 6288 5173 or onko.kingma@bigpond.com

number of 'premises' which define the environment within which communities operate. Key premises are outlined below.

Premise 1 Uncertainty underlies all decision making

There is one thing that will not change and that is uncertainty. In investigating what viable irrigation communities may look like in 2030 we can be sure that, at that time, there will still be uncertainty with respect to a range of factors including the weather/climate, commodity markets and political situations. We can be sure that there will be issues of major concern that we have yet to identify or which have yet to rise to the national focus of attention, mainly due to the long lead times involved. This is not new as for example we have known for around hundred years that soil degradation and salinity were issues but they have only latterly become priority issues. There will be shocks to our social, economic and environmental systems which we have no way of predicting due to, for example, wars, earthquakes, pestilence and supply disruptions to our information/transportation systems. Communities must learn to thrive under uncertainty.

Premise 2 Change is inevitable

Another thing that will be certain is change. There will always be change and associated pressures to modify behaviour. By 2030 we may have fully integrated natural resource planning systems strongly linked and/or even integrated with regional socio-economic plans for development and administered by local government (singly or in consortiums). But there will still be a need to address a range of social issues such as health (but at a much more advanced level than today) and education (because in part not every one is inclined or has the capacity to participate in formal systems). We may not be able to pin point the issues of 2030 but we can conclude that a number of topics will be of concern.

Premise 3 Prediction is not possible

Commonly, foresighting exercises make a number of assumptions about things like economic growth rates and then use these in simulation models to generate or predict a spread of possible outcomes. We have not attempted to predict the future. Instead, we have reviewed a number of studies which have taken a forward looking position, and then built results from these studies into this paper.

If one looks back 30 years we see a non-computerised Australia pushing ahead with the clearing of forests and open woodlands, increasingly using larger machinery in large scale monocultures and still building dams and irrigation infrastructure without recognising the needs of the broader environment. At that time we had poorly developed road and air transport systems, were largely dependant on agriculture for export income and had a finance sector which used regulations to ration funds instead of interest rates and markets. Statutory marketing authorities dominated agriculture, including producers decisions on varieties, which blurred market signals and led to the reliance on a relatively small number of commodities.

Progress since the early 1970s has been astounding and many of the major breakthroughs have been unpredictable. We argue there will be even more astounding (for example in bio-technology and communications) and unexpected breakthroughs in the next 30 years. To therefore attempt to predict the economic and social situation in 2030 is not feasible – visioning is the appropriate analytical tool.

Premise 4 Success in technical R&D is assumed

This study focuses on the socio-economic dimensions of future communities. In doing so we make assumptions about technical and process R&D which will impact on communities. Technical and process R&D for irrigation communities is not addressed here. It is assumed this R&D will proceed with successful outcomes providing a base for productivity growth and

progress. Irrigation in Australia is seen to have a sound future within the framework outlined below.

Premise 5 Holistic systems approach is required

There is also increasing recognition of the linkages between changes in land use (including irrigation) and impacts on water resources – surface run-off and water storages, groundwater quality and quantity (including water table issues), stream and river flows (or lack of), and the efficiency and efficacy of our water distribution infrastructure and institutional arrangements. The need to consider these inter-relationships implies a systems approach and in many areas, a change in attitudes and behaviours.

Premise 6 A change in mindset is necessary

There is increasing recognition that agriculture, and especially land uses such as irrigation, need to change to better reflect the characteristics of Australia's diverse, complex and unique range of environments. Increasing salinisation of our water resources, competition for water, dryland salinity and other land degradation processes, and the prevalence of significant weed problems in some areas, are all signs that many land use systems are placing the natural resource base under significant long-term pressure. We argue a change in mind-set or cultural shift is required to make the transition to sustainable communities. By definition this implies a break with past institutions and ways of doing things. Again, visioning is the appropriate analytical tool.

Premise 7 It can't work without people

Physical and technical impacts are important but only one aspect of the process of structural change. Equally important are the relationship, social and community dimensions of sustainable development. We argue it is the capacity of individuals and communities to innovate, respond and participate in decision making processes that will ultimately determine the success of land use ventures. The structure of relationships and group processes is therefore, of paramount importance in shaping irrigation communities of the future.

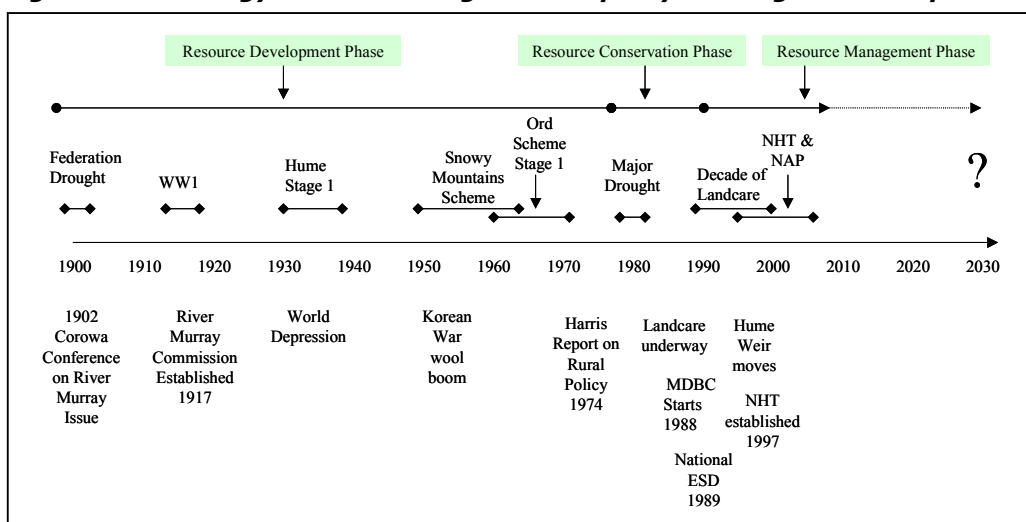
Changes in approach to the management of resources – an introduction

The introduction of European agriculture and associated clearing of land at a time of little or no understanding of the highly variable climate, the sensitive ecological processes that had adapted to that climatic regime, and the fragility of soils that were predominantly poorly structured, deeply weathered and leached, have been the main causes of many of the problems associated with Australian landscapes. There has been considerable adaptation of some elements of agriculture to Australian conditions. However, in some areas radical shifts will be required to move towards land uses which are more compatible with Australia's ecological systems.

There is no doubt our environmental and natural resources policies have undergone significant change (Figure 2) as conditions have changed and as knowledge has grown. An example of this is the need to change practices as degradation issues and limits on availability of resources such as water intensify.

We often forget that only 15 years ago we were still focusing on physical or engineering approaches to address water and soil degradation issues. Landcare had yet to be developed and adopted by the community and governments alike. We have only now moved past the Decade of Landcare and the Natural Heritage Trust (NHT) - Mark 1 and are about to start NHT Mark 2 and the National Action Plan for Salinity and Water Quality (NAP). Over those 15 years there has been growth in awareness of the issues and the need for action, even if exactly what that action is, has not always been clear. There has also been a sea-change in the involvement of the community in planning and increasingly in decision making.

Figure 2. Chronology of Australian agriculture: policy and irrigation examples



In many respects these developments mark a shift towards a new paradigm for addressing the management of natural resources. This paradigm also increasingly is about holistic approaches and solutions for regional communities. As noted above traditional measures of economic growth will therefore, have to be supplemented by indicators of community health, quality of life and social dimensions such as the desires and values of communities.

Shifts in the roles of communities and individuals, will require governments to continue their efforts to reform institutional and related arrangements for water and other resources. Over the next decade the processes of water reform, commenced in 1994 by the Council of Australian Governments (COAG), should be nearing completion resulting in different arrangements for water property rights, pricing and trading. Over the same period there will continue to be a debate on how to fund the renewal of infrastructure (especially irrigation storage and distribution systems) and environmental works of communities and local government (the cost of salinity to urban communities in terms of, for example, road damage is often overlooked and in many cases repairs are beyond the capacity of local resources).

By 1988, growing awareness of land degradation issues in the community had led the Australian Conservation Foundation (ACF) and the National Farmers' Federation (NFF) to make a joint submission in 1988 to Government seeking a new direction on land management. This has been followed up again in 2000 with calls for funding to address a wide range of environmental issues across Australia. Research commissioned for the ACF/NFF indicates degradation of Australia's natural resources and environment is a national issue with profound economic, social and ecological impacts across communities. The annual cost of degradation is estimated at \$2B annually and rising, and this cost could increase substantially if no action is taken.

Some 70 per cent of the gross water consumed in Australia is for irrigation. Agriculture, horticulture and forests are continuing to expand and the productivity of these enterprises is continually increasing. With a finite water supply and issues of water quality as a result of intensification of production systems, the sustainability of the irrigation industries in some areas will have to be addressed, as must the question of whether the contribution of the irrigation industries to the nation outweighs environmental considerations.

With increasing awareness of environmental impacts on rural and urban communities and industries such as tourism, alliances such as between the ACF and the NFF, are likely to expand

to include groups such as the Australian Local Government Association (ALGA), regional organisations and industry groups.

Over the next decade, the roles and responsibilities of communities will be important where institutional arrangements, such as catchment plans, are incomplete or implemented without adequate two way consultation with the local community and/or consideration of the community's social norms. Resulting conflicts associated with resource use could be a major impediment to the development of more sustainable management systems. There may, therefore, be a need for special processes for conflict resolution and avoidance through mechanisms such as dialogue and consultation, improved information flows, education and other means of inducement (eg grants, taxes, fines etc). The choice of approach (instrument) will have an impact on community responses and whether that response is a permanent or temporary. This is a major challenge for governments. At minimum, governments may need to be more sensitive to community views and to implementation of processes to modify institutional arrangements to better suit community situations.

A fundamental landscape (re)design principle is to ensure ownership of the new landscape by those who participate and invest in it. This is best achieved where the landscape reflects community aspirations. Attempts to develop more sustainable land uses often fail, or under-achieve, because this principle is ignored. This does not mean that the community should have absolute control of all decision making but rather that there are clear lines of responsibility agreed in advance by all parties. 'Rules of business' will have to be clearly understood, and abided by, by all players. Tradeoffs and transparency will be necessary. These 'rules' are the broad range of social norms and institutional arrangements (legal and organisational) which must reflect those social norms. They must be tailored to local conditions and be adaptive to changing needs. Institutions must also be inclusive and not oblivious to the aspirations of wider stakeholder groups (e.g. tourism, urban, industry, recreational and cultural users of natural resources).

Drivers of change

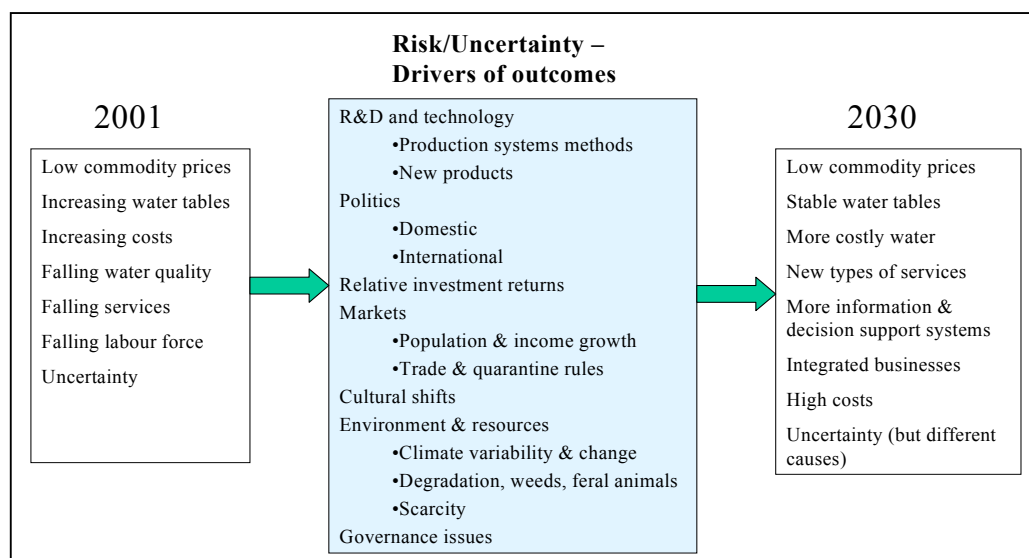
To identify appropriate irrigation policy and research agendas, it is important to examine the key factors affecting prosperity in irrigation and regional communities. Some of these drivers, many of which are inter-dependent, are:

- Resource use pressures arising from an increased number of users and uses of these, resulting in scarcity, degradation etc.
- The globalisation of economic activity, trade and capital which, if resisted will lead to isolation and ultimately, traumatic rather than gradual change. For local communities, a key issue is the interface with large scale input suppliers, service contractors and the agribusiness sector;
- Technological advances in most areas influencing social and economic activity and importantly,
 - new production technologies in a range of non-agricultural industries,
 - bio-technology impacting on health, food production, electronics and many other areas,
 - energy generation and efficiency,
 - transport and telecommunications which provide new ways of communicating, increasing connectivity, providing a catalyst for participation and learning and improving access to resources and strengthening of social capital and infrastructure;
 - A range of demographic and lifestyle factors that influence the form and pace of regional development, the capacity for innovation, and differential impacts across regions. These factors relate to changes in, for example:
 - consumer tastes, resulting in the growth and decline of industries (e.g. wool, tourism);

- living preferences which favour particular activities and consumption patterns; and
- population size, structure and density.

As well as drivers there are areas of risk and uncertainty which interact to ameliorate or enhance the effectiveness of drivers. Figure 3 lists a number of these which may also act as drivers and will influence the socio-economic and environmental outcome in 2030.

Figure 3. The big picture



A major driver for irrigation communities is accommodation of growth in the large scale input supply industries, service companies and other areas of agribusiness. These sectors are highly competitive on world markets, and have developed sophisticated supply/demand chain linkages, competencies and resource sharing arrangements. Companies involved manage functions within chains, share gains and costs and have embarked on cross-disciplinary innovation and participation to enhance their competitive position. Irrigation communities will have to keep pace with these developments.

To grasp the growth opportunities associated with the above drivers of change, and to undertake the associated structural reforms will require team efforts on the part of businesses and communities, and stakeholder processes which are inclusive and effective in resolving conflict and achieving agreement. This will necessitate flexibility, responsiveness and involvement on the part of governments, and adaptability, resourcefulness and innovation on the part of communities.

Irrigation communities of the future

The above drivers of change and imperatives for taking of new directions in irrigation communities suggests a number of 'pillars' or essential building blocks which are likely to characterise irrigation communities. Together these will form the basis of new economic, social and environmental cultures important to survival and growth. The following thirteen *propositions* begin to outline some characteristics irrigation communities may have to embrace by 2030, if they are to survive and grow.

Vision and principles

In recent years there have been substantial advances in our understanding of the likely requirements for sustainable natural resources management in Australia. There is now increasing awareness of, and responsiveness to, the issues involved. Communities are beginning to seek ways to grapple with the challenges. In many cases this requires that they take charge of their own destiny, develop visions for their future and implement local solutions. This trend should continue and strengthen as communities seek to create outcomes they want.

Proposition 1: By 2030, irrigation communities and those associated with natural resource use and management will be vision oriented and committed to principles which enhance ecological sustainability, social capital and sustainable industries.

Value adding industries

Consumers of the future will demand quality and sophisticated goods and services. A 'bulk commodity' approach to agricultural and horticultural production will be unacceptable and will have to be superseded by activities which add value to basic products. Value adding industries provide a range of services to the communities they operate in. They provide significant employment opportunities, new prospects for local farm produce, markets for a range of input supplies and services and opportunities to re-invest funds locally. Agribusiness will continue to be important in achieving value adding. Value adding activities can strengthen linkages between the local level and larger scale agribusiness, bringing a sense of place and identity.

Proposition 2: By 2030, irrigation communities will have worked in partnership to establish the conditions required to:

- encourage strong local industries which value add their produce
- form strong business linkages into their communities, relevant export industries and the agribusiness sector generally.

Regional structures

Australia is still developing new socio-economic structures for managing regions and communities. These structures are diverse and include for example Ministerial Councils, Regional Forest agreements, Landcare groups, Catchment Management boards and authorities, and (statutory) Research and Development corporations such as Land & Water Australia. There is currently discussion about roles and functions of for example local government and the interaction of organisations responsible for regional water, land and vegetation management. This is a healthy sign that Australia is prepared to try new governance structures and to develop these to meet particular situations.

Proposition 3: By 2030, irrigation communities will have set in place regional and local arrangements for the development of business and community infrastructure, services and networks. Investment in these areas will have involved all levels of government and associated agencies in partnership with industry and the community.

Governance

While irrigation communities will have a range of new regional structures by 2030 as noted above, their roles and responsibilities in and ownership of those structures (organisations) is likely to be quite different from 2001. This will require new approaches to governance.

Proposition 4: By 2030, irrigation communities will have secured equitable representation, voice and power in all business, social and environmental affairs relating to them and will have developed inclusive and participative governance arrangements to support their empowerment and ability to liaise at all levels.

Research and knowledge

The need to develop more detailed and sophisticated data and information systems was marked with the establishment of the National Land and Water Resources Audit in 1997. Combined with strides in technology (especially for spatial data collection, mapping and analysis) the capacity of communities and industry to understand and better manage their impact on the natural resource base will be significantly greater by 2030. To support decision making in this environment we will see a range of scientific developments in crop and livestock production, and new knowledge about inter-relationships within and between ecological and production systems. This will aid decision making and lead to more sustainable agricultural and horticultural systems by 2030.

Proposition 5: By 2030, irrigation communities and governing bodies at all levels will have a strong human and capital investment in data collection, analysis and dissemination systems and associated information technology. This will be seen as a prerequisite for informed decision making, structural change and representation.

Impacts of land use change

A key current policy issue is that for some land uses, such as (dryland) plantation forestry, dryland cropping, and land improvement, no specific water allocation is required, despite the potential (positive or negative) impacts of these land uses upon ground and surface water quality and quantity. Similarly, for farm water storages, while some States have policies for regulation of dams, there are no policies for inclusion of the effects of storing of water within regional estimates of water availability. In addition, laws governing land use are in some instances framed such that landowners may not be fully responsible for the impacts of their activities on the environment – an example is land clearing.

Proposition 6: By 2030, irrigation communities and all stakeholders will have recognised that competing demands on their natural resource base, both locally and regionally, necessitate commitment to:

- a conceptually sound policy approach to land use change
- regular assessment of the **availability** of water and other resources
- better mechanisms for allocation of these resources
- resolution of difficulties which accompany the need to change property rights and water entitlements from time to time.

Policy frameworks

Over the past decade there have been a number of attempts to develop policy frameworks for rural and regional Australia. At best, these have had a variable success rate. For water resources and associated issues such as land use change, improving water use efficiency and the integration of land, water and biodiversity planning, it is likely that sound policy frameworks will be developed and agreed over the next decade or so. Gaining full agreement from all stakeholders for these frameworks will not be easy or fast but it will be done.

Proposition 7: By 2030, irrigation communities will identify with the policy frameworks, which will have been agreed in partnership at all levels. They will have a strong commitment to institutional change as an ongoing issue and also to the associated processes of structural

change. Governments at all levels will have effective and participative processes in place for communication of these arrangements and for the equitable treatment of those negatively affected in the process of growth.

Market mechanisms

Many irrigation areas are presently characterised by different types of water allocations, with some specified in volumetric terms and others by area. Policies for water rights, rules for water quality protection and trading arrangements, are not integrated, have developed incrementally and have competing objectives. Markets for water are 'thin' and while trading arrangements are in place, these are not optimally used. Further development of water resources is, in part, predicated upon the development of water trading arrangements. A 'mature' market for water trading including limited trading between different river systems should be in place well before 2030.

Proposition 8: By 2030, irrigation communities will have developed, in partnership with appropriate agencies, efficient technical and economic market arrangements for the trading and allocation of water. They will also be committed to the development of markets for environmental services for associated natural resources where appropriate. Where this is not appropriate, communities will have set in place governance processes for the allocation and use of environmental resources, and for resolution of resource conflicts.

Targets, planning and management frameworks

Targets at the local level need to be set in the context of wider policy arrangements and different degrees of planning for natural resource use. The different levels of NRM planning also require different levels of targets. The integration of plans (and their targets) is also important to ensure that external (positive and negative) effects of land use are clearly articulated and accommodated so that participants can differentiate the impacts of their own activities from those outside their area of responsibility. Likewise changes in, for example, water harvesting entitlements, the price of water and regulations for the allocation of water can all have impacts on sustainability. Targets, planning and management frameworks are important to reconcile all these influences.

Proposition 9: By 2030, irrigation communities and governments will be committed to agreed targets for use of natural resources and maintenance of their quality, and will have in place attendant resource management planning strategies and processes of a high quality.

Relationships

Participants in irrigation communities and regions are influenced by values and institutional arrangements, which embody the **norms**, ways of doing things, conventions and 'rules of business' of the day. These, in turn, determine patterns of natural resource use and management. The key factor reinforcing these behavioural norms is relationships and inter-relationships which stakeholders have with each other and the wider community generally.

Foresighting analyses must address the structure and operations of relationships and ways in which people operate in groups at all levels. It is the relationships which provide the 'constructedness' of society. This is particularly so given the external impacts associated with natural resource use which inevitably require collective solution and sound relationships among stakeholders. When relationships fail, progress becomes difficult, at times leading to disintegration of communities.

Community and industry learning and capacity building will be central to developing more sustainable natural resource management regimes in which the community and industries have vested interests.

Proposition 10: By 2030, irrigation communities and governments will have recognised that relationships and networks are the cornerstone of their success. They will have devoted adequate human and capital resources to learning, skills development, capacity building, training and re-training, communications and consultation, for better decision making and the development of effective groups and networks.

Involvement of the community

As noted in a number of areas above the role of communities has taken on increasing importance in natural resource management and regional development over the last decade. This trend should continue and strengthen in the coming decades as governments at all levels seek to develop more effective systems to deal with issues, particularly where there are large spatial dimensions and where the basis of action lies mainly with private landholders.

Proposition 11: By 2030, irrigation communities will be using, where appropriate, community-based approaches to address economic and social issues and the management of their natural resource base. Where these community-based approaches work, communities will have developed approaches unique to their particular situations and regional characteristics, in partnership with governments, industry and regional organisations.

Monitoring, assessment and feedback

The above activities will need to be accompanied by effective monitoring, evaluation, assessment and feedback mechanisms. These activities will also underpin administrative structures and management systems that facilitate synthesis of information and knowledge, management of risk and uncertainty, adoption of learning processes and effective decision making.

Many of the above activities and particularly those involved with structuring and collecting regional data sets, have a significant public good component which will justify continued government funding. In the near future funding models and partnerships between governments, communities and the business sector will be developed and implemented, to ensure current data sets are maintained as time series and enhanced where appropriate.

Proposition 12: By 2030, irrigation communities will have recognised the importance of monitoring and assessment of their natural resource base and, indeed, all key areas of their socio-economic environment, and will have programs in place to provide effective information, analytical results and feedback to their stakeholders.

Resilience

Individuals and groups learn in a number of ways, including from experience. The sense of community is what will enable communities to survive major events, particularly calamities. Following such events, civic and other leaders look to ways to minimise or prevent such events occurring again. The community develops knowledge and wisdom which in traditional societies was held by the elders and which current rural societies are again turning to, to supplement scientific and technological knowledge. In the face of constant and major change, resilience of communities and learning through experience and other means, will be important.

Proposition 13: By 2030, irrigation communities will have lived through a number of unexpected shocks and in each case, worked together to deal with the social, economic and environmental consequences. Communities will have learning from these experiences, how to thrive and capitalise on uncertainty.

Irrigation community structures

If the above thirteen *propositions* are accepted, then what might irrigation communities look like by the year 2030?

Irrigation communities would likely have a high degree of knowledge of the environmental, economic and social structures in their living environment. Information, sharing of information and communication would be a cornerstone of a philosophy of cooperation and tolerance. Communities would have power because institutions would recognise the need for local authority, responsibility and institutions tailored to local needs. Duty of care for the environment would be accepted. Cultural values and rights and responsibilities of all Australians, would be respected.

There would be belief in the ability of the community to be a world leader in sustainable food production and demonstration of holistic land, water and vegetation systems. This would require resources to make ideas work – to be exporters of ideas and demonstrate solutions. There would be strong linkages to regional and corporate industry and agribusiness, which in turn, would have sophisticated linkages to local and regional organisations and governance.

Organisations charged with community governance together with the different levels of government, and irrigation and other industries, would form partnerships or consortia for investment and the marketing and distribution of produce. These partnerships would generate the environment for innovation, development of sophisticated and discriminating home markets and export ideas. Industries would be supported by a highly skilled local and regional workforce, world-class R&D and the presence of supporting industries.

Industries would be motivated by a 'bottom line' which includes meeting of environmental, economic, social and cultural community goals. Remuneration and performance would reflect these wider perspectives. Technological change would also be 'community and natural resource friendly' and be directed to meeting business and social community objectives and activities, which enhance social capital. Infrastructure and service industries would operate on the same basis. Private and public partnerships would ensure the availability of resources to sustain communities.

To maximise innovation, employment and the quality of the skills base, learning and capacity building would be well resourced and nurtured by all participants. Similarly, necessary resources would be directed to local and regional governance structures. Successful operation of these structures would be seen as vital for negotiation on tradeoffs for resource use, administration and planning. Relationships, networks, pathways of communication and community processes for change would be central to these functions.

Close cooperation and partnership arrangements in land use investment would be important, to achieve social goals, resolve externalities and accommodate the trade-offs involved. Governments, industry and non-government organisations would have to be actively involved in strategic and adaptive management of the processes for private and public investment in natural resource use.

There would be debate about and understanding of the structure, size, concentration and location of local and regional communities and industry. Underpinning this would be strong land and resource use planning and regional planning processes. Mechanisms such as these would be vital in maintaining long term community viability, growth and structural adjustment. Emphasis would be on thriving under uncertainty.

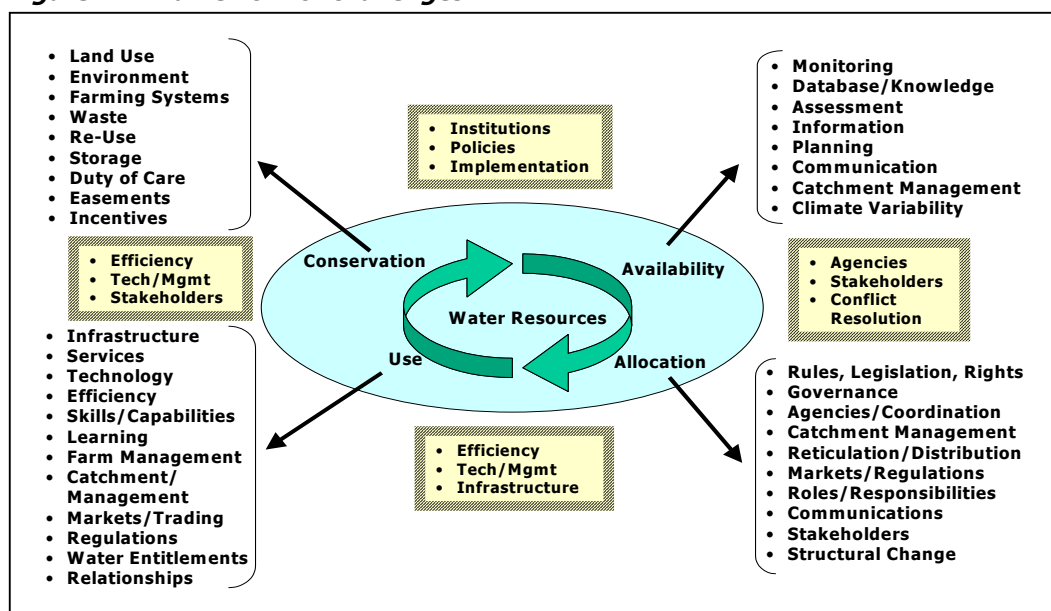
The policy environment would be precautionary and aimed at ecologically sustainable development. Resource use would only take place within the limits of long term capacity, preservation of future options and the reasonable requirements of current and future users. Development processes would integrate decision making across all resources and potential uses and be based upon sound scientific and economic information about the resource base and the associated physical and human systems.

Finally, there would be recognition that the arts play an important role in generating social capital, breaking down relationship barriers, transmitting information and underpinning trust and reliability in business. The arts would complement and enhance economic activity and knowledge.

Challenges in the years ahead

The above propositions and the community structures the propositions engender, bring many challenges that will require attention if irrigation communities are to make the transition to sustainability. In particular, there must be greater emphasis on delivering sustainability on the ground, and increasing the sophistication and adaptability of industry. Figure 4 differentiates some of the challenges in terms of four key areas of the water cycle – water availability, allocation, use and conservation. Framing the challenges in terms of these four areas focuses the discussion on irrigation communities.

Figure 4. A framework of challenges.



Challenges in the availability of water are concerned with monitoring of the 'water account', assessment and of the resource base and planning to ensure water use is within the capacity of the natural resource base. Related issues are: the management of changes in land use, requiring coordination between land use planning and water agencies; water use efficiency

(WUE) as this relates to recognition of appropriate assessment of surface and groundwater resources and translation of these assessments into decisions on availability of water for users, including the environment; handling of drought and other risks; determination and management of 'caps' on water extractions; valuation of water and other resources, land use planning and benchmarking; and the treatment of water savings. The latter area for example involves judgments about who should capture the benefits of efficiency savings of water.

Challenges for the allocation of water to users and the environment are concerned with property rights, stakeholder processes, conflict resolution, regulation and infrastructure. They involve the making of policy and its implementation, and hence, also the interface between governments and the community. In addition to the above, issues range as widely as: replacement or refurbishment of irrigation supply and drainage infrastructure; development of water legislation and policy; tackling external impacts of land use change, modifying entitlements to water in the face of new priorities; developing codes of practice for environmental management systems (EMS); and the operations; inter-relationships between agencies and jurisdictions.

Challenges relating to the use of water are concerned with achieving better WUE, sustainability of farming systems, business structures, the operation of markets and water trading arrangements, capacity building and structural adjustment. They also involve issues in: the uptake of new technologies from production to processing and distribution; supply chain management and development of linkages with agribusiness; modification of inefficient management and cultural practices; overcoming constraints of small farm size and lowering unit costs of production; coping with new management demands such as the increase in reporting requirements of taxation and banking, and accounting arrangements; and managing, in a business sense, competitive crops and water requirements for agriculture, horticulture, forestry and vegetation generally.

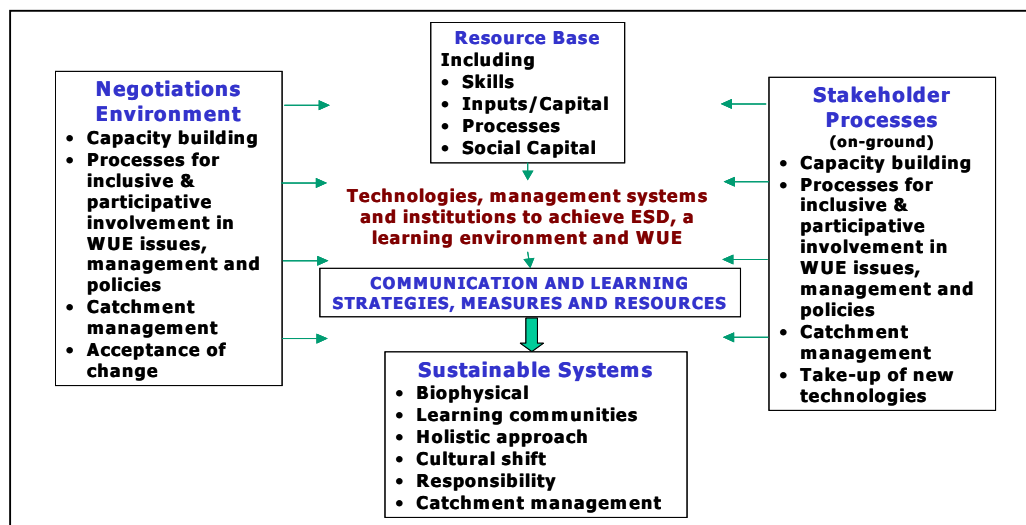
Challenges in the conservation of water are concerned with the integrity of environmental resources, the impacts of land use change and assessment of the costs to the environment of commercial activities; responsibilities and duty of care, water re-use, drainage and quality issues; and water storage. They also include: issues in aquifer and catchment management; development of markets and other measures for environmental services; develop of a conservation ethic including protection of wetlands and coastal ecosystems and awareness about the need for environmental flows; developing policies to cope with environmental pressures brought about by high productivity industries, such as increased fertiliser use, salinity, high stocking rates, greater supplementary feeding, nutrient and veterinary side products, etc; issues in catchment and river health; preserving water quality; and developing policies for use of energy, greenhouse and climate variability.

Many of these challenges require a socio-economic response and these are summarised in Figure 5. Addressing socio-economic issues will require attention to:

- **Knowledge** about the resource base available to the community as a key input to sound decision making. This includes a stock take of skills and different forms of capital as well as an understanding of the physical and socio-economic processes which generate change, growth and social capital. The building of knowledge and its use will require ongoing attention and is linked closely to innovation, adoption of new technologies and systems and the capacity of individuals and groups to change;
- The **negotiating environment**, which provides the framework within which relationships are moulded and where conflicts are resolved and avoided. Institutions, policies and conventions determine participation, power, property rights, responsibilities (eg duty of

- care) and the capacity of stakeholders to make an input. These are wanting in many instances. Improving these institutions will be a major and ongoing challenge;
- **Stakeholder processes** on the ground as the basis for agreement on collective solutions to water resources issues. Attention to capacity and relationship building and community wide strategies such as integrated catchment management, will, in many instances be the only way forward; and
 - **Communications and consultation** as the basis for developing a learning society with a high stock of social capital.

Figure 5. Socio-economic challenges



Possible areas for socio-economic R&D

The propositions in "Issues Raised for Socio-economic R&D", the possible community structures in "Issues in each of the research topic areas" and the associated challenges in "Some priorities for socio-economic R,D&E" can begin to suggest socio-economic analysis in a number of areas.

Such research must be wide ranging to capture the dynamics of the development process in communities. Key areas where projects are likely to have a high pay-off might be:

- Research into the structure of industries and local and regional economies, from the viewpoint of environmental, economic, social and cultural sustainability. Such research would include an analysis of linkages between sectors and industries, including agribusiness;
- The conduct of surveys and consultations where appropriate within specific communities, or desk top reviews, collation and analysis where surveys have already been conducted, to identify needs and aspirations of communities, gain community participation in change and develop improved models for consultation;
- Work to determine the requirements of a knowledge base appropriate to meet the above challenges;
- Development of improved models for communication with stakeholders including appropriate information and communication technology;
- Enquiry into the structure of relationships, pathways and networks best suited to effective community processes, working in teams and groups, and getting to agreement;
- Research into the types of partnership, consortia and affiliation arrangements and networks required to achieve joint community, industry and government investment in irrigation

communities. This area would include development of public-private models for infrastructure and service industry development;

- Exploration of the role of social capital in facilitating and hampering community progress, and associated with this, the role of the arts in generating social capital and enhancing economic activity. The requirements of communities based on 'thriving on uncertainty and change' are not well understood;
- Development of approaches, frameworks and applied models for capacity building and lifelong education and training, and ways to bring about a culture of learning organisations, industries and communities. One aim would be to develop action learning and empowerment approaches to the development of linkages to large scale industry in the input supply, service and agribusiness areas;
- Research into rural and regional labour markets and identification of policies to overcome employment problems particular to rural and remote communities;
- Examination of new approaches to innovation, extension, and the uptake and use of technologies, management systems and knowledge;
- Research into measures and models for appropriate functioning of markets, trading arrangements for water, and environmental services associated with natural resources generally. The latter area might include development of tradeable market permits, auctions for environmental services and environmental service contracts. Research might include analysis of the trade-offs between markets and forms of 'smart' regulation in meeting objectives;
- Research into the role of governments at all levels in helping to achieve sustainability, and more broadly, appropriate forms of governance and devolution of power, and models for achieving responsibility and duty of care for irrigation communities;
- Identification of structural adjustment policies and measures to help individuals, firms and industries to move away from obsolete investments and unsustainable production processes. Support measures and incentives during transition phases can be important in achieving change, particularly where property rights issues are concerned. Associated questions are who gains and who loses from change and whether specific policies are required to manage the issues involved;
- Models and processes for more integrated planning, including resource management planning, land use planning, water resource allocation, catchment planning and farm business planning.

Consideration and discussion

This discussion paper has listed a number of key socio-economic research requirements of irrigation communities some 30 years into the future. It is important for this project that we have consultations on our approach, and the feasibility and completeness of the above research areas. Discussion could start with questions such as:

- Is there general agreement about the propositions, assumptions and challenges facing irrigation communities, which we have discussed above?
- Will all these forces and influences, when brought together, result in the short and long term futures for irrigation communities we have outlined in "Issues in each of the research topic areas"?
- Are the socio-economic R&D areas listed in "Some priorities for socio-economic R,D&E" relevant and will they provide useful building blocks for irrigation communities to change and grow?
- Are there other issues or R&D areas which are of equally high priority and which might forestall irrigation communities achieving sustainability?

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