1 Preamble

Authors: Cuan Petheram, Ian Watson, Frances Marston, Heinz Buettikofer and Peter Stone

1.1 Context: development in northern Australia

Sustainable regional development is a priority for the Australian, Western Australian, Northern Territory and Queensland governments. Together, they are implementing a comprehensive plan for the sustainable development of northern Australia through the Northern Australia Sustainable Futures program managed by the (then) Australian Government’s Northern Australia Ministerial Forum. A key component of the program is the North Queensland Irrigated Agriculture Strategy (NQIAS), a suite of projects investigating the potential for development of water resources in north Queensland that seeks to unlock opportunities for new and existing agricultural production. The Flinders and Gilbert Agricultural Resource Assessment forms part of the NQIAS.

The Northern Australia Ministerial Forum and subsequent Northern Australia Sustainable Futures program arose directly from the recommendations of the Northern Australia Land and Water Taskforce which reported to the Australian Government in late 2009 (NALWT, 2009). The Taskforce foresaw a significant increase in the gross value of agricultural production in northern Australia. The Taskforce recognised that a number of improvements could help this growth:

- improved transport infrastructure
- harmonisation of regulatory frameworks across jurisdictions
- changed agricultural systems
- governance arrangements
- land tenure reform
- infrastructure upgrades
- intensification of the pastoral industry
- carbon markets
- increases in the total irrigated land (either through mosaic irrigation or larger precincts)
- investment in Indigenous pastoral businesses.

The Taskforce recognised that risk attended the opportunity for increased agricultural production. Environmental, cultural and community risks needed to be thoroughly considered in any analysis of the opportunity. The Taskforce also recognised that there are critical gaps in our knowledge and data sources and that addressing these would improve the prospects for sustainable development (NALWT, 2009).

Growth in agricultural production is needed in order to meet the growing demand for food globally. Between 2000 and 2050, the world’s population is projected to grow from six to nine billion people (UNESCO, 2009). The majority of this growth is projected to occur in the tropics, particularly sub-Saharan Africa and South-East Asia. With two-thirds of the world’s food insecurity in Asia, sharp upward price movements in food have been identified as potentially resulting in political and social unrest (PMC, 2012). At the same time, it is projected that Asia will become home to the majority of the world’s middle class, which will result in an increasing demand for high-quality food produce from this region (PMC, 2012). Australia’s National Food Plan recognises this and the Australian Government has explicitly developed a number of activities that aim to help Australia develop its food-producing potential, including in northern Australia (DAFF, 2013).

Irrigated crop-based agriculture, which currently occupies less than 1% of Australia’s farmed land, generates over half of the net value of the nation’s agricultural exports (NLWRA, 2002), but in doing so uses nearly 70% of all water used for human needs nation-wide (Prosser, 2011). Of Australia’s irrigated land, 95% lies south of the Tropic of Capricorn and 65% is located within the Murray–Darling Basin (MDB).
Overallocation of water resources in many areas of southern Australia, memories of the recent millennium drought, future projections of reduced rainfall across southern Australia (CSIRO, 2009; CSIRO, 2012) and perceptions of an abundant amount of water in northern Australia have domestic irrigation investors increasingly looking north for agricultural opportunities (ABC, 2013). In fact, some foreign companies have already invested heavily in irrigation in northern Australia (AAP, 2012). With studies in the southern MDB showing that irrigation production generates a level of economic and community activity that is three to five times higher than would be supported from rainfed (dryland) production (Meyer et al., 2005), many rural communities in northern Australia see irrigated agriculture as a means of reversing the long-term trend for population decline and a critical element of broader regional development aspirations.

![Map of Australia showing major dams, irrigation areas, and selected drainage divisions](image)

**Figure 1.1** Major dams (greater than 500 GL capacity), large irrigation areas and selected drainage divisions across Australia. The Flinders and Gilbert catchments of the Flinders and Gilbert Agricultural Resource Assessment are also shown.

Development of northern Australia is not a new idea. Initiatives to develop cultivated agriculture in the tropical north of Australia have a long history. Many of these attempts have not fully realised their goals, for a range of different reasons (Davidson, 1965; Kelly, 1966; Davidson, 1969; Lacey, 1979; Woinarski and Dawson 1997; Cook, 2009). Even as early as the 1930s, the view of northern Australia as a ‘problem region’ was well established – the tropical environment made the region’s full integration into the nation difficult (Courtney, 1977).

However, northern Australia is now seen to be located in the right place at the right time (PMC, 2012). With growth in Asia and the Tropics, the global economic centre of gravity is shifting towards Australasia and so the tyranny of distance is being replaced by the advantage of relative proximity. However, the relatively unspoilt natural features and cultural heritage of northern Australia have highly significant intrinsic values.
that warrant careful protection. The sustainable development of northern Australia will be assisted by evidence-based decisions that explicitly recognise the trade-offs and synergies involved in developing these lands.

The efficient use of Australia’s natural resources by food producers and processors is likely to increase the importance of understanding and sustainably managing Australia’s soil, water and energy resources. Finely tuned strategic planning will be required to ensure that investment and government expenditure on development is soundly targeted and designed. In terms of knowledge about and development of the natural resource base, northern Australia presents a relatively ‘blank slate’, with few ‘legacy issues’, particularly when compared to southern Australia. This presents a globally unique opportunity to strategically consider and plan the development of a vast area of Australia.

1.2 Flinders and Gilbert Agricultural Resource Assessment

The Flinders and Gilbert Agricultural Resource Assessment (the Assessment) – part of the NQIAS mentioned in Section 1.1 – provides a comprehensive and integrated evaluation of the feasibility, economic viability and sustainability of water resource development in the catchments of the Flinders and Gilbert rivers in north-west Queensland, an area known locally as the ‘Gulf region’. While the focus is on two specific catchments, the techniques and approaches have been developed so that they can be applied elsewhere in northern Australia.

The Flinders and Gilbert catchments were chosen because they are in a part of northern Australia where there has been a long-standing interest in irrigated agriculture and the government and local community believe there is opportunity for agricultural development. Pastoral settlement in these catchments dates back to the 1860s (Morwood, 1990) but in recent years there have been numerous calls by local landholders, shire councils and development advocates (such as the Mount Isa to Townsville Economic Development Zone (MITEZ) and Gulf Savannah Development (GSD)) for irrigation investment in the region.

These two catchments face many of the same barriers to investment as other regions across northern Australia, but have the advantage of being relatively close (about six to eight hours drive) to the two largest population centres in northern Australia, Townsville and Cairns. They are suitable candidates for a large-scale assessment of the economics and sustainability of irrigated agriculture.

The Assessment set out to determine what soil and water resources are available for irrigated agriculture and to determine the extent to which irrigated agriculture is economically viable and sustainable.

Additionally, the Assessment was designed to:

- address explicitly the needs and aspirations of local development – such as those identified by GSD and the MITEZ – to expand irrigated agriculture and to intensify beef production in north Queensland
- meet the information needs of governments as they assess sustainable and equitable management of public resources with due consideration of environmental and cultural issues
- meet the due diligence requirements of private investors, by exploring questions of profitability, environmental integrity and income reliability of agricultural and other developments.

The Assessment commenced in January 2012 and was completed in December 2013. Workshops to communicate results and outcomes were held in early 2014.

1.2.1 SCOPE OF WORK

The Assessment undertook a number of activities that together were designed to explore the scale of the opportunity for irrigated agricultural development in the Flinders and Gilbert catchments. The full suite of activities is outlined below, in Chapter 2 and a series of technical reports produced as part of the Assessment (listed in Appendix A).

The Assessment did not seek to advocate irrigation development or assess or enable any particular development; rather it sought to identify the resources that could be deployed in support of potential
irrigation enterprises, and the scale of the opportunities that might exist. In doing so, the Assessment sought to quantify the monetary and non-monetary values associated with existing use of those resources, to enable a wide range of stakeholders to assess for themselves the costs and benefits of given courses of action. The Assessment is essentially a resource assessment, the results of which can be used to inform planning and investment decisions by citizens, councils, and state and federal governments. Importantly, the Assessment does not seek to replace any planning processes, or to recommend changes to existing plans or planning processes.

The emphasis is on surface water resources. Groundwater was not assessed for use as a resource; rather the potential for dominant groundwater processes to change under irrigation development was investigated.

The Assessment sought to lower barriers to investment in the Assessment area by addressing many of the questions that potential investors would have about production systems and methods, yield expectations and benchmarks, and potential profitability and reliability. This information base was established for the Assessment area, not for individual paddocks or farms.

The Assessment did not assume a given regulatory environment. The Assessment evaluated the availability and use of resources in accordance with existing regulations, but also examined resource use unconstrained by regulations, so as to allow the results to be applied to the widest range of uses possible, for the longest time frame possible.

It was not the intention – and nor was it possible – for the Assessment to address all topics related to irrigation development in northern Australia. Important topics that are not addressed by the Assessment (e.g. impacts of irrigation development on terrestrial ecology) are discussed with reference to and in the context of the existing literature.

Functionally, the Assessment adopted an activities-based approach to the work (which is reflected in the content and structure of the outputs and products) with the following activities: agricultural productivity; aquatic and riparian ecology; climate; flood mapping; geophysics; groundwater; Indigenous water values; instream waterholes; irrigation infrastructure; land suitability; river modelling; socio-economics; and water storage.

In order to meet the requirements specified in the contracted ‘Timetable for the Services’, the Assessment provided the following key deliverables (listed in full in Appendix A):

- Technical reports present scientific work at a level of detail sufficient for technical and scientific experts to reproduce the work. Each of the activities of the Assessment has a corresponding technical report.
- Each of the two catchment reports (i.e. this report and another for the Gilbert catchment) synthesises key material from the technical reports, providing well-informed but non-scientific readers with the information required to make decisions about the opportunities, costs and benefits associated with irrigated agriculture.
- Two overview reports – one for each catchment – are provided for a general public audience.
- A factsheet provides key findings for both the Flinders and Gilbert catchments for a general public audience.
1.3 Report objectives and structure

This report is one of two catchment reports. The content reflects the activities undertaken by the Assessment, synthesising information from the technical reports (see Appendix A) so that people can answer questions such as the following in the context of their particular circumstances in the Flinders catchment:

- What soil and water resources are available for irrigated agriculture?
- What are the existing ecological systems, industries, infrastructure and values?
- What are the opportunities for irrigation?
- Is irrigated agriculture economically viable?
- How can the sustainability of irrigated agriculture be maximised?

The structure of each catchment report is as follows.

1.3.1 PART I INTRODUCTION

This part provides background, context and a general overview of the Assessment:

- Chapter 1 covers the background and context of the Assessment
- Chapter 2 provides a high-level outline of the methods used by the Assessment. This information is designed to assist in understanding the limitations to – and uncertainty associated with – the information provided by the Assessment.

Key findings can be found in the front materials of this report.

1.3.2 PART II INFORMATION FOR ASSESSING POTENTIAL SCHEME-SCALE AND FARM-SCALE IRRIGATION DEVELOPMENTS

This part summarises information from the technical reports for each activity and provides tools and information to enable stakeholders to see the opportunities for development and the risks that attend to them. Using the establishment of a ‘greenfield’ (not having had any previous development) irrigation development as an example, Figure 1.2 illustrates many of the complex considerations required for such development – key report sections that inform these considerations are also indicated.

- Chapter 3 is concerned with the physical environment and seeks to address the question of what soil and water resources are present in the Flinders catchment, describing:
  - geology – focusing on those aspects of geology that are important for understanding the distribution of soils, groundwater flow systems, suitable water storage locations and rocks of economic importance
  - soils – covering the distribution of key soil attributes and the general suitability for irrigated agriculture
  - climate – outlining the general circulatory systems affecting the catchment and providing information on key climatic parameters of relevance to irrigation under current and future climate
  - hydrology – describing and quantifying the hydrology of the catchment, specifically focusing on assessing the surface water resources under current and future climate.

- Chapter 4 is concerned with the living and built environment and provides benchmark information about the people and ecology of the Flinders catchment. Specifically, it discusses:
  - contemporary ecology
  - Indigenous pre-history and colonial history
  - Indigenous water values, rights and interests, and Indigenous development aspirations
  - catchment profile – describing the current demographics and existing industries and infrastructure of relevance to irrigation development in the Flinders catchment.
Chapter 5 presents information about the opportunities for irrigated agriculture in the Flinders catchment:

- water storage opportunities – examining large dams and on-farm water storage opportunities in the Flinders catchment and quantifying the amount of water that could be regulated (i.e. made available for irrigation)
- water distribution systems (i.e. conveyance of water from a dam and application to the crop) – examining the costs and losses associated with conveying water from a dam and its application to a crop
- cropping and other agricultural opportunities – examining the cropping opportunities and considerations and lessons learned from experiences in the Flinders catchment and providing maps of land suitability for selected crops.

Chapter 6 covers economic opportunities and constraints for irrigation development:

- economic analysis of costs and benefits conducted at the scale of farm, scheme and statistical division (SD)
- legislative and regulatory opportunities and impediments
– impact of capital costs, water availability, crop type, irrigation system, and commodity price on the viability of irrigation development.

• Chapter 7 covers how to maximise the sustainability of irrigated agriculture by considering:
  – the risk of rise in watertable level
  – the potential for increased groundwater discharge to rivers in the Flinders catchment
  – the risk of increased sediment, nutrients and pesticide loads from irrigation to the Flinders River
  – the impacts of altered flow regimes on aquatic and riparian ecology.

1.3.3 PART III CASE STUDIES

This part provides an assessment of three geographically distinct illustrative case studies for the catchment.

Part III builds on Part II, using the case studies to demonstrate the use of the tools and information provided in Part II. These case studies represent an integrated evaluation of the scale of opportunity for irrigation development in selected geographic areas of the catchment, and enable an assessment of the viability of irrigation and its sustainability.

The case studies are provided to illustrate the potential for application of the knowledge developed in the Assessment. The Assessment is not advocating these developments – or types of development – nor is it saying they are more or less likely than other developments.

In this report about the Flinders catchment, case studies are presented in chapters 8 to 10:

• Chapter 8 – the potential development of a dam at Cave Hill upstream of Cloncurry. This case study assesses irrigated sorghum (grain) for supply to a feedlot for cattle that are to be slaughtered in a local abattoir and destined for a north Asian market.

• Chapter 9 – the potential development of O’Connell Creek offstream storage. This case study assesses rice which is then transported to the Lower Burdekin for processing.

• Chapter 10 – mosaics of irrigation between Hughenden and Cloncurry, where water is harvested from the Flinders and Cloncurry rivers. This case study assesses the benefits of potentially incorporating (i) an irrigated fodder crop into an existing beef enterprise and (ii) an irrigated cash crop (cotton and chickpeas) as a separate enterprise and as a means of diversifying income.

1.4 References


CSIRO (2009) Surface water yields in south-west Western Australia. A report to the Australian Government from the CSIRO South-West Western Australia Sustainable Yields Project. CSIRO Water for a Healthy Country Flagship, Australia.


