BUSINESS CASE – NORTHERN AGRICULTURE CRC

'AgNorth CRC Ltd'

Northern Australia is undergoing an economic and demographic transformation, underpinned by major resource developments totaling tens of billions of dollars. Larger population centres have grown faster than other national and state populations, with new infrastructure demands and a more dynamic economy developing as a consequence. By 2050, over half the population will be Indigenous, with a large proportion living in remote communities. Northern regions are the frontline to Australia's Asian neighbours, and these changes are for the long term.

Northern Australia is climatically, environmentally and culturally different from the rest of Australia. Indigenous people continue to live on large tracts of their ancestral lands, have direct responsibility for managing over 40% of these lands and they have recognised interests in over 80% of these lands. The region is home to immense biological and cultural diversity that has been recognised as unique to the world. This uniqueness requires protection and respect to be managed sustainably into the future.

Agriculture (including aquaculture and fisheries) has and can play a strategically important part in this regional transformation. It can diversify and balance regional economies by attracting private investment, developing trade with domestic and overseas markets, sustainably drawing on natural resources, creating demand for infrastructure development, working with and creating business opportunities for indigenous communities, increasing local employment opportunities, improving livability of local communities and creating demand for new skills. Over the long term agricultural, fisheries and regional development are inextricably linked with these industries diversifying gross state product and mitigating economic cycles in the extractive industries.

Currently, there are a number of exciting, new agricultural development projects under way or at the feasibility stage. The Queensland, Western Australian, Northern Territory and Commonwealth governments are collaborating in a program of 'sustainable futures' regional-scale studies that examine the potential for further sustainable agricultural development, including irrigation. The Commonwealth Government is due to release a white paper on northern development in 2014, with new high-value agricultural production as one of its aims. All three State and Territory governments also have strong agricultural development plans and policies. Corporate and foreign investment in agriculture in the North has already begun to expand.

While these are optimistic developments, many large-scale agricultural development projects have over the years failed to meet expectations and it's important to understand why. The often cited climatic and soil constraints, and pest and disease outbreaks are now more manageable with better understanding and improved agronomic technologies and practices. The more common reasons for past failures were inadequate management, planning and financing over the development cycle, and the inability to secure market access with supply chain costs that were uncompetitive.

De-risking and lowering investment thresholds, and strengthening comparative advantage of the North for accessing South-East Asian and domestic markets are crucial to sustainable agricultural development.

How today's agricultural development projects work with Indigenous communities, and environmental and planning regulations is also crucial. Indigenous Traditional

Owners in relevant regions expect to be actively included, and can assist with co-investment and brokering of appropriate Indigenous knowledge, and as a resident source of skills and labour. Governments of northern Australia have stated their intentions to harmonise planning requirements to reduce compliance costs.

The opportunity now is to bring entrepreneurial ingenuity and public investments in science, technology development and policy coordination together in new, effective ways.

The Proposal

The Queensland, Western Australian and Northern Territory governments, with a consortium of research, education and commercial partners have joined forces to bid for a new Cooperative Research Centre, which from July 2015 will undertake the research and innovation, technology development and capacity building to transform 'doing agribusiness' in the North.

The CRC's private and public sector partners will collaborate in a process of 'entrepreneurial discovery', to identify opportunities for profitable and sustainable new enterprises, and to concentrate public investments in areas where economic activity can potentially succeed.

With the 'sustainable futures' studies coming to fruition, exemplified by the recently released Flinders and Gilbert Agricultural Resource Assessment, and the Commonwealth Government's white paper on northern development due in 2014, the CRC will undertake complementarity activities to build successful agricultural enterprises and industry value chains, from the identified development potential. To do this, the Northern Agriculture CRC will lead a public-private collaboration on regional, national and international scales.

The process of entrepreneurial discovery and technologies development, supported by concentrated public investments and an emerging Asia-Pacific research partnerships will involve new or existing companies with plans for agribusiness development and diversification, and specialist service providers (covering research, education and innovation). The CRC will draw on international and national resources to inform agribusiness and regional development projects, and support their pursuit of opportunities in the growing Asian economy. Businesses and regional organisations will be able to jointly invest in projects that address their challenges while strengthening comparative regional advantage.

AgNorth CRC Ltd will have the company structure and governance needed to commercialise intellectual property with individual joint venture partners while building knowledge in the public domain. Its activities will cover strategic investigations to prioritise public investments in technologies and infrastructure for supply chain development and market access; investment criteria and thresholds for regional development success; science for sustainable water and land use which protects regional cultural and environmental values; enterprise-specific and general purpose innovation and technology development to support new and diversified agribusiness ventures; strategies for Indigenous economic participation and improving community livability; and knowledge exchange, education and training.

The CRC proposal, to be lodged with the Commonwealth Government's Cooperative Research Centre Program, will seek a ten-year funding commitment from 2015-16. If successful, AgNorth Ltd expects to manage a $150 million program (cash and in-kind services) with the Commonwealth's investment more than matched by a private-public consortium of investors and research partners who share a long term commitment to sustainable development of the North. The CRC business model is uniquely suited and proven for this purpose

AgNorth CRC Vision

A growing northern regional economy, diversified and more sustainable, with new and expanding agricultural enterprises trading into Asian and domestic markets.

The growth of Asia will shape and deliver market opportunities for northern development in agriculture in Australia. These opportunities will become real over the next 50 years and for northern Australia to have the comparative advantage over other regions, including southern Australia, will require a new focus and new approaches. Without the capital, technologies and management innovatively developing value chains in favour of the North, these opportunities will pass by.

To capture these opportunities to benefit the North will require new thinking about how governments and industry invest in infrastructure, knowledge and communities. Elimination of duplication or waste in public investments is essential in this development zone. The northern regions will need to bring together entrepreneurship, technological innovation along the supply chain and a strong long-term commitment of government and industry to deliver a different future. To do this requires open-minded inquiry of what is possible and rigorous analysis of where to invest. It will require consideration of technologies, skills and capacities that do not yet exist in the agriculture sector, even though Australia's capacity in industries such as mining (e.g. field robotics) and transport (e.g. fast ships) is excellent and world leading.

AgNorth CRC's mission is to underpin this 50-year vision with 'smart' research, technology development and capacity building that grows the northern Australian economy while being sensitive to the unique cultural and environmental values of the region.

Aim

The CRC aims to make the North a good place for agricultural business, through:

- knowledge generation and more effective policies and public investments that build new value chains to Asian and domestic markets, sustains environmental and cultural values, facilitates innovative technologies and infrastructure, creates opportunities for businesses on Indigenous lands and enhances agriculture's and fisheries participation in regional development; and
- serving new and expanding agricultural and aquaculture industries and enterprises, regional communities and State/Territory governments with new ways to attract businesses, technologies, knowledge, skills and tools that will become the foundation for successful agricultural development.

Objectives

Facilitate innovation and co-investment in new agricultural enterprises through research, knowledge and skills that:

- Reduces investment, supply chain, market and production risks;
- Identifies where and what new infrastructure is needed, and more effectively uses transport and other supply chain infrastructure and;
- Makes regional development and natural resource policy, planning and regulation more effective; and
- Provide skilled managers, technicians and labour.

Facilitate expanding agriculture and fisheries contribution to regional development through:

- Transformative models for business that are suited to the North;
- Assessment of agricultural development and fisheries projects with insights

on success and failures;
- Indigenous economic and social participation;
- Sustainable environmental management; and
- Cultural awareness and exchanges within the region and in other tropical regions, particularly in Asia and the Pacific.

Provide a legacy to northern Australia through:

- Innovation in agricultural business, business models and regional development;
- Policy, planning and decision tools for infrastructure planning and value chain development, and sustainable water and land management;
- Building research and agricultural skills and capacity; and
- Building an innovative knowledge economy through trade, exchange and cooperation with Asia.

Geographic Scope

For this CRC proposal, northern Australia is considered to be that part of Australia north of the Tropic of Capricorn, ranging from Gladstone in the south-east, to Far North Queensland, the Northern Territory, the Kimberley and Pilbara in W.A.

To focus the CRC's work, the State / Territory jurisdictions will make an initial selection within the northern zone, of regions or districts (called precincts) where innovative or more intensive agricultural development is occurring or likely to occur. Over time the CRC's research capacity will be applied to refine the suite of agricultural development precincts, to better concentrate public investment where northern comparative advantage can be achieved or improved. This will also focus the scope of CRC activities and prioritise internal project-level investments, which is necessary in a geographic zone as large and diverse as northern Australia.

Current work under the Northern Australian Sustainable Futures Program provides foundational knowledge on the regional capacity for primary production, ranging from climatic and natural resource assessments to modeling growth in agricultural output and productivity. In agricultural development precincts the CRC will build on this information to provide the bridge from development potential to the necessary knowledge, technologies and policies to facilitate actual development. Most of the CRC's activities will be conducted in these precincts, with new knowledge integrated at the precinct-level and made readily accessible to businesses, communities, governments, and research and education providers across the North.

Northern Australia is also part of an international tropical zone, linked through trade, vertical integration, culture, ecology and existing collaborative networks of research, education and aid organisations. For example, some of the CRCs likely participants have facilities and joint projects in South-east Asia and the Pacific. The CRC will build on these partnerships and facilitate knowledge sharing where they advance northern Australia's comparative advantage and connectedness in the region.

Programs

The CRC will be structured to implement a conceptual framework for concentrating public investments in scientific knowledge, technologies and infrastructure development, policy coordination and cross-jurisdictional governance, to strengthen regional comparative advantage and transform opportunities for agribusiness development. Its research, modeling and analytical capacity will generate knowledge in the public domain and guide public investments to leverage private co-investments in technologies development and new infrastructure, and commercialisation of products and services.

The CRC will commence with four programs – Transformative Economic Investments; Sustainable Water and Land Management; Technologies for New Agribusiness; and Development Policies and Regional Change. The first two public good programs and the third private-public co-investment program will focus on selected agricultural precincts, and the fourth will apply the knowledge and innovation generated to the benefit of northern Australia as a whole. All programs contain activities that engage with Indigenous interests.

Program 1: Transformative Economic Investments, will investigate and research business models, and investment criteria and thresholds for economic success. These will prioritise CRC's internal investments – where its research, technologies development and capacity building can have the most impact, what scale of impact will confer comparative advantage to northern Australia, and what policies and reforms are needed to facilitate the change; and will guide investments external to the CRC – where are the economic prospects most clear, what are the benefits and costs of pursuing them, and what supply chain and market development will deliver the benefits.

The program will be international in scope; opening up new trade opportunities, investigating up and down potential value chains from northern Australia to identify where public investments can be concentrated to bring them to reality. The program will look to major resource and agribusiness companies, and financial and accounting institutions to assist in this 'entrepreneurial discovery' process. Its knowledge outputs will identify priority technology development and infrastructure co-investment projects in Program 3 and be incorporated into business, community and policy advice for the longer term in Program 4.

Program 2: Sustainable Water and Land Management, will research and develop the policies and decision tools for sustainably allocating and managing natural resources to realise their productive potential. Cultural and environmental goals will be worked into improved planning tools, underpinned by new field science and strategies for Indigenous participation in sustainable management. The program's activities will draw on existing regional-scale resource and productivity assessments, to inform development projects in the agricultural development precincts, which will evolve over time. The knowledge generated will form guidance for sustainable agricultural practices, and be incorporated into business, policy and governance advice in Program 4.

Program 3: Technologies for Agribusiness, is where technology development is initiated and undertaken, in commercial partnerships with agribusiness firms or for general purposes with public investments leveraging private co-investment and innovation. The 'entrepreneurial discovery' process is central to this program. The range of potential technologies necessary to enable development is wide and general purpose technologies may come from other sectors; with each project-level investment determined on the basis of the technology's contribution to the company's, precinct's or region's comparative advantage (from Program 1). Selected technologies may range from new crops that open up profitable markets, to robotics to cut transport and handling costs. The CRC Company will co-invest in commercialisation of these technologies.

Program 4: Development Policies and Regional Change, will bring together and scale up the knowledge from precinct and enterprise development to regional development outcomes, through policy and regulatory harmonisation, capacity building and international collaboration. It will tailor knowledge products and advice to businesses, communities and governments, and advance northern Australia's status in tropical agricultural and regional development knowledge, internationally. Prospectuses will be available to businesses and Indigenous corporations; and

evidence-based policy advice for more effective governance across and within jurisdictions and regions.

Integral but outside the four programs and supporting them will be the knowledge exchange, education and training activities, including a post-graduate program. The CRC's executive will oversee the important functions of end user and Indigenous engagement, knowledge delivery and product commercialisation. As the CRC builds program activities, the outputs will be integrated to achieve the regional development outcome of strengthened comparative advantage.

Program 1: Transformative Economic Investments

Outcome

The northern Australian regional economy having sufficient comparative advantage for new agricultural industries and diversified enterprises to trade profitably and sustainably into Asian and domestic markets.

Usage and Impact

From rigorous market access and supply chain studies in partnership with private companies, State / Territory policy agencies prioritise and concentrate public investments on knowledge generation, technologies development, new infrastructure public policies and structural changes that transform the development possibilities in the North.

From cooperative development and application of new business models, criteria and thresholds for regional investment, State / Territory agencies, regional development organisations and private companies partner to instigate and adapt over time agribusiness development of new industries and enterprises.

Through transformative technologies and infrastructure development in Program 3 and effective public policies in Program 4, hundreds of millions of dollars can be added to the regional economy

Program Overview

Program 1's purpose is to rigorously identify how economic activities can succeed in the North, and to develop investment thresholds and criteria for development performance. It will be international in scope; investigating up and down potential value chains from northern Australia to identify where public investments can be concentrated bring them to reality. The program will look to major resource and agribusiness companies, and financial and accounting institutions to assist in this 'entrepreneurial discovery' process. It will have clear consultation processes to achieve high levels of buy-in from the regional community, including Traditional Owners. Its knowledge outputs will identify priority technology development and infrastructure projects in Program 3 and be incorporated into business, community and policy advice in Program 4.

The transformative agenda of the CRC as a whole has its genesis in Program 1, with two lines of inquiry:

1. Value chain exploration and analyses both internationally and regionally to identify 'what is possible', and to consider technologies, skills and capabilities for supply chain development that do not currently exist in the agriculture sector but where Australia is world leading; and
2. Encouraging new models for agricultural development and development on Indigenous lands; and testing their effectiveness in contributing to the regional development vision for northern Australia.

Co-investment by Traditional Owners is required for companies to negotiate access to resources and markets. The CRC will work with Indigenous research agencies and landowners to explore pathways for commercial development on Aboriginal lands, which allow landowners to retain control over activities on their land and waters as well as manage any benefits that flow from commercial activities.

Program 1's 'smart' research has internal and external clients. Its work on value chains and development models, and regional consultation will inform:

- Adaptation of the initial selection of agricultural development precincts;

- Prioritisation of public investments in technologies and infrastructure development projects in Program 3;
- Public policies and structural reform in Program 4: and
- The wider business, community and regional development entities with a stake in northern agricultural development.

A by-product of Program 1 work will be an analytical framework for identifying, evaluating and prioritising project-level activities across the CRC; estimating their net benefits and determining the appropriate levels of co-investment.

Output	Year	Potential Products and Services
1.1 International and regional investigations of market, infrastructure and technology innovation and development, and economic performance of potential value chains	2016 onwards	• An assessment of market opportunities for northern Australia at a macro level; what is possible in terms of products, production and markets linked to the likely increased product demands in near Asia. This will include – o discussions with major private sector companies in Asia to ensure strong market engagement in knowledge development; o an investigation of barriers to capital flow into northern Australia; and o an assessment of the current status of trade agreement negotiations and market trends in key markets. • The development of a roadmap or scenarios for infrastructure/value chains to deliver the latest, cost effective and appropriate systems to support an expanded northern agriculture industry that captures these market opportunities. This roadmap will consider areas where Australia has world class business and technologies that would underpin the new supply chains. It will be in effect a 'fresh design' approach, to deliver new thinking and approaches to underpin a new future for the North. It will include – o a high level audit of infrastructure, scenario analyses for capacity sharing and further development, relevant to precinct selection. • A review to identify the 'competitive advantages' of each of the precincts; their bio-physical, production and technological capacities; and where they might diversify and specialise. This will include major private sector actors and Traditional Owners in those

		precincts; with the knowledge shared across precincts.
1.2 Strategies and business models for transforming agricultural development, supported by private sector and international co-investment	2016 onwards	• A review of agricultural development models and an analysis of their potential for the North, learning from all sectors of the economy and working with the business community. This will include – o an assessment of community aspirations for regional development and of community consultation models; and o an assessment of 'soft' infrastructure requirements, existing services and gaps. The development and application of investment criteria and thresholds for ongoing assessing and reporting on agricultural development activities and performance, precinct by precinct.
1.3 Pathways for agricultural development on Indigenous land	2017	• Research on pathways and business models for new enterprises on Indigenous land working with Indigenous communities, which accommodate Native Title and cultural requirements, This will include – o tenure arrangements to stimulate private or corporate Indigenous development; o strategies to engage with Indigenous interests; o an assessment of co-benefits with emphasis on targeting Traditional Owners; o a commercial framework for Traditional Owners to attract and engage investors and developers to their own enterprise aspirations; and o options for adding value to local produce through social impact bonds. • Co-investment models for ecosystems services delivery by regional non-government organisations expanded into mainstream economies, including: biosecurity management; conservation estate management (Ranger program); and greenhouse gas emissions reduction (Green Army)

Program 2: Sustainable Water and Land Management

Outcome

Agricultural development based on sustainable land and water management planning and allocation, farming systems suited to production potential, managing the risks of land use change and enhancing cultural and environmental values.

Usage and Impact

From new science, broad community engagement and a stronger evidence base for northern Australia, State / Territory agencies harmonise policy and procedures for land and water resource planning, allocation and governance, and for irrigated agriculture projects; and consistently apply decision tools for planning land use change across jurisdictions.

That private enterprises use new and existing research knowledge of natural resources and production potential for investment decisions, including bankability, resource security and risk assessment, and ongoing adaptive management sensitive to Indigenous culture and potential off-site environmental or social impacts.

Through coordinated policy and institutional reforms in Program 4, cultural and environmental values will be sustained while new development will benefit from natural resource access with reduced compliance costs.

Program Overview

This program will build on water and land resource assessments for northern Australia, such as the recently completed Flinders and Gilbert Agricultural Resource Assessment, with additional work to a level of precision necessary for planning and business decisions in agricultural development precincts. This will involve original science and integration of natural resource assessment agricultural production potential with economic, social, cultural and biodiversity considerations.

Anticipating and managing environmental impacts in the seasonally dry monsoon conditions of the North, while harmonising policy, planning and regulatory processes for land use change will require new models and tools for community engagement, risk assessment, planning and decision-making. These will be developed and applied to the precincts and adapted for wider use across jurisdictions.

Principles for water allocation and governance articulated in the Intergovernmental Agreement for the National Water Initiative will be interpreted and adapted to northern Australia; with further research on the concepts of environmental flows, cultural flows and Indigenous water reserves, conjunctive use with mine de-watering and managing water quality (e.g. avoiding downstream impacts on fisheries).

New methodologies for lower cost field surveys for development projects will be trialed and minimum standards for field investigations and resource condition monitoring will be developed, tailored to northern Australia.

The CRC will collaborate with state and territory agencies, community groups, research organisations and industry to draw together current and new knowledge to serve new agricultural land managers and existing landholders with guidelines for reducing off-farm impacts in the tropical North.

The program's knowledge output will also inform precinct-level prospectuses for new business, incorporating Indigenous land-use strategies, and more effective policy for sustainable management of natural resources, in Program 4.

Output	Year	Potential Products and Services
2.1 Cross-jurisdictional protocols, methodologies and decision tools for risk assessment, planning and ongoing environmental management associated with land use change in northern Australia	From 2016	For governments to harmonise planning and regulatory processes for agricultural development and land use change, avoiding ways that precipitated past northern development failures, and developing public policy principles and tools will be developed to be tested across the precincts. Cutting-edge research will develop an approach to multiple-objective and integrated catchment planning, which is explicit about tradeoffs. This will apply to both land and water (informed by Output P2.2 below), allowing decision-makers to understand the possible tensions between multiple conservation and development objectives and to rate between them based on an understanding of what is gained and lost for each objective. Objectives will include, but not be limited to: agricultural productivity, protection of rare species on land and in water, maintenance of terrestrial and riverine connectivity, carbon storage, water quality, associated with development for various agricultural uses. Contributing to this broad goal will be several more specific lines of innovative research: • Conceptual model(s) and methodology for resource risk assessment of northern agricultural developments that inform multiple objective planning and monitoring of natural resource condition; • Alternative land and resource use scenarios, linked to cumulative impact assessment with Bayesian Belief Network models (combining available and expert-elicited data); • Spatial configuration of agricultural developments to optimize production and sustainability; • Maps of priorities for selected study regions that reflect the relative importance of areas in contributing to objectives; • Demonstration of explicit co-benefits and tradeoffs between

		objectives; • Exploration of methods to enhance community engagement in land and water planning and governance; and • Review and design of effective catchment improvement and offsets procedures for new developments. New research will inform policy, protocol and risk assessment process for pest species associated with increased agricultural development – consistent with EPBC and EPA requirements
2.2 Cross-jurisdictional policies, governance and decision tools for water resource planning, allocation and use, and water development projects, informed by the best available science, tailored to the northern Australian environment and empathetic to cultural understanding		For governments to harmonise policy and consistently apply it to sustainable water resource development. Principles for water allocation, environmental flow management and governance will be adapted for northern Australia, drawing on regional assessments and underpinned by new research, conducted at appropriate scales to inform new development projects. Specific work will include: • Original research to inform water resource development proposals according to the Intergovernmental Agreement on the National Water Initiative, cognizant of the current NWI review and increased focus on low flow hydrology, and sustainability principles applicable to the North. • Designing the first flow allocation and environmental watering decision tool tailored specifically for northern Australian rivers. It will be underpinned by research to address critical knowledge gaps for determining environmental water requirements in northern Australia including new methods for measuring and monitoring: finer scale ground/surface water interactions and hydrological connectivity; water quality thresholds and responses of key ecosystem processes and the populations of aquatic species of conservation, economic or cultural significance. • Building capacity for Indigenous people to develop policy and governance instruments for negotiating the allocation and management of cultural flows and Indigenous water reserves.

		• Building new pathways for active management by Traditional Owners and ranger groups, including in water management, research and monitoring.
2.3 Cost effective technologies and standards for natural resource data collection and use	From 2018	Prioritisation of bio-physical, economic, social and cultural data collection will be guided by the need to inform the planning tools developed in P2.1 and P2.2. Mapping of cultural and social values and networks will be considered. In the process minimum standards for investigations, baseline data and innovative approaches for ongoing monitoring will be researched and adopted. Innovative survey methodologies (e.g. airborne electromagnetic surveys of groundwater systems, aerial video surveys of riparian and aquatic habitats) may be employed.
2.4 Practical guidelines for sustainable operation of agricultural developments to reduce off-farm impacts and provide environmental services	From 2019	The guidelines will be prepared in partnership with industry, drawing on the best available science and underpinned by innovative research addressing critical knowledge gaps identified for monsoonal Australia (eg. Isotopic analysis to identify the key sources of erosion, the fate of sediments and the effectiveness of various soil management techniques). Research will be conducted at sites in the dry monsoon tropics where development has already occurred and the effectiveness of the recommended practices may be tested in these sites and new precincts. They will cover topics identified as critical for sustainability of agricultural land uses and the environments and may include: • Erosion and sediment control; • Water management; • Nutrient and pesticide run-off; • Fire management and carbon emissions abatement; • Biodiversity and ecological functions; • Biosecurity and pest species; • Climate risk; and • Environmental and cultural monitoring services. The guidelines are intended for new agricultural land managers and existing landholders.

Program 3: Technologies for New Agribusiness

Outcome

New agricultural industries and diversified enterprises trading profitably and sustainably into Asian and domestic markets, through innovation and specialisation in enterprise-specific technologies and in general-purpose technologies opening up new value chains.

Usage and Impact

That companies to northern development or existing enterprises planning to diversify, partner with the CRC on transformative technologies and farming systems R&D and adopt them within their agribusinesses or commercialise them for wider adoption in the North.

That priority general-purpose technologies capable of opening up new supply chains (identified by Program 1) are developed and commercialised by the CRC, or that business cases for innovation and co-investment in supply chain infrastructure are recommended to governments and private industry, in a supportive policy environment (Program 4).

The concentration and prioritisation of public investments resulting from the 'entrepreneurial discovery' process in Program 1, with private-public investment in this program, will result in new technologies and infrastructure for supply chain development and facilitate innovation in agribusiness enterprises. This will open up new value chains and strengthen the comparative advantage of agricultural products from northern Australia. Through these new opportunities new industries and diversified enterprises potentially add hundreds of millions of dollars to the regional economy, and create thousands of new jobs.

Program Overview

This research and technology development program will partner with companies for innovation in enterprise-specific technologies and new infrastructure and other general-purpose technologies for agricultural precincts or regions.

1. Enterprise-specific technologies (Output P3.1): Agricultural businesses and industry investors collaborating with the CRC on production, post-harvest or biosecurity research and technology development that 'make or break' the future success of new enterprise development that could occur in one of the agricultural development precincts; and
2. General-purpose technologies (Output P3.2): The CRC joining with companies and applied R&D to identify and adapt innovative infrastructure and other technologies that can open up new value chains, and recommending the necessary public investments to facilitate their availability.

The relationship between Program 1 where entrepreneurial discovery of new technologies and infrastructure is conducted, and Program 3 where innovation and development is undertaken or facilitated, is one key aspect of the CRC's transformative agenda. The analytical tools of Program 1 will discipline investments in Program 3 and companies joining with the CRC in the technologies development will grow through its 10-year life of the CRC. Spin-out companies to continue the development and manage commercialization are likely.

NOTE: Early consultation with industry representatives and research providers intending to join the CRC has identified many potential research activities for commodities shown in the P3.1 Outputs table. This initial listing will reduce as consultations with prospective R&D partners continue, applying a 'make or break'

test to sharpen the focus on innovative or cutting edge products. Over time the Program 1 activities will guide priority activities.

Private sector project partners in P3.1 will vary in scale of production, market reach and commodities produced, ranging from agribusiness companies producing premium foods and bio-technology products to Indigenous micro-industries serving local markets. Co-investment by companies and Traditional Owners will be a feature of this program. A critical mass of commercial partners will be required at the outset of the CRC with additional partners and co-investment envisaged throughout its life.

From its base in northern Australia, the CRC is well placed to coordinate innovation, research and technology development activities across public, company and industry sector interests, including those adapting the 'smart' technologies and infrastructure of other world-leading industries for use by new agribusiness (P3.2). These projects will often be too large and specialised for the CRC's R&D partners, and could only happen with significant public investments and governments partnering with large non-agricultural firms, possibly requiring policy and structural changes (Program 4).

The CRC may broker projects with other research investors (e.g. agricultural R&D corporations) and other research providers (e.g. Plant Biosecurity CRC, Ninti One Ltd), where they are best placed to deal with priority technology development.

Output	Year	Initially Suggested Research and Technology Development Activities
3.1 Innovative production systems, new processes and enabling technologies for new industries and diversified enterprises *Note that the commodities, products and research activities will evolve as potential industry partners join with the proposed CRC. In addition to the initially suggested list, other products may include:* • *Plant food products: Nuts and vegetables;* • *Plant processed products;* • *Plant extract products: Sugar, oils, pharmaceuticals;* • *Plant fibre products: Cotton, hemp, kenaf;* • *Symbiotic industries: e.g. cogeneration of electricity;* • *Other livestock products: Buffalo, camel, goat etc;* • *Other aquaculture products: e.g. crocodile.* *Generic research questions may include:* • *Decoupling the environmental stimulus on the plant phenology to manipulate the production.* • *Developing high yielding production systems, designed to supply quality product to targeted markets for a maximum period of time.* • *Intensification of production systems adapted to northern Australia.* • *Utilising remoteness as an advantage for pest and disease freedom to maximize market access opportunities.*	Various	Production systems for finishing cattle in northern Australia for prime cut markets, involving: • Irrigated and non-irrigated fodder cropping • Feedlot systems adapted to the tropics • Genetics and management tools to meet new market specifications (e.g. for tenderness) • Freshwater macroalgae as cattle feedstock– closed production systems with algal bioremediation of feedlot waste streams • Logistics and business planning for vertical integration in nearby countries • Diversification options such as environmental services Rice • Rice varieties for new regions (e.g. The Gulf, Burdekin, Mareeba Tablelands, Tortilla (NT) and Ord • Monitor risk of impact on native rice populations Tropical fruit • Horticulture intensification systems adapted to northern Australia (e.g. cyclone proof, reduced labour) • High value niche horticulture (including market / supply chain assessment for multi-crop value chains) • New tropical fruit varieties for new locations and new markets. Pulses • New legumes for beef, and/or as part of other field crop systems (as a break crop, nitrogen source) such as soybean, pidgeon pea • New legumes for human consumption Aquaculture • Value chain development into Asian and other markets • Profitable bio-remediation systems for wastewater streams from

• *Evaluate cropping systems that enhance soil health and minimize environmental impacts but to ensure profitability through a diversified mix of compatible commodities.* • *Implementing high technology product monitoring systems to reduce quality loss from harvest onwards.* • *Identifying practices to best maintain the inherent health nutritional benefits of food products post-harvest, considering the long and large transport distances to markets.* • *Advancing genetically modified crops to produce non-food plant products.* *However, the selection of innovative products and cutting edge researchable questions for CRC co-investment will be criteria-based – including the 'make or break' test for a new industry or enterprise, and the prospect for enhancing business profitability.*		various sources, e.g. mine site de-watering • Integrated aquaculture systems based around algae for a range of end uses – including potentially protein powder for high value niche food markets • Incorporating aquaculture as a diversified option within an integrated/mosaic agriculture scheme to synergistically make the system more profitable and better use the water allocated • Polyculture systems for barramundi and redclaw • Indigenous aquaculture - low-tech, community-based redclaw (and other species) aquaculture to improve local livelihoods and produce local protein sources. • Prawn aquaculture – new high-tech approaches to integrated systems that produce high end safe food niche products (based on new genomics) Cotton • Production systems / supply chains for new locations • Assessment of elite high-value premium fibre varieties. Biomaterials (e.g. biodegradable plastics) and biofuel feedstocks • New cane varieties suited to low latitudes, production systems, supply chain logistics and processing infrastructure for 'non-sugar' products, e.g. bio-plastics, ethanol • Tree or grass varieties and production systems for biofuel or for other high value fermentation products Forestry • Teak, acacia, sandalwood 'Micro industries' • Niche products, for example, coffee, chia, bush foods, soap products, pharmaceutical products, essential oils and materials for Indigenous art • Herbs – vertical irrigation systems using recycled water or closed loop processes Enabling technologies

		• New information tools based on the evaluation of cropping systems that enhance soil health and minimize environmental impacts but to ensure profitability through a diversified mix of compatible commodities. • Infrastructure, technologies and management for sustainable irrigation practice, adapted to northern Australia (e.g. groundwater injection and re-use, first flush basins) • Whole enterprise economic models integrated with APSIM for the North, that can be applied at the pre-feasibility stage of new agricultural development and used to determine R&D priorities across development opportunities • Digital homestead options for beef cattle, aquaculture and plant based enterprises and the decision-support interface that makes the use of technology a significant tool to improve business performance • Innovative management of soil health for agricultural precincts (e.g. strip fertiliser, legume systems) • Innovative management of soil health – using biochar from a range of sources including from algae (as part of an integrated production system) as a bioamendment to soil condition for tropical cropping systems • Innovative use of non-destructive sampling tools (e.g. NIRS) to determine post harvest product quality and improve marketing decisions, quality assurance and profit outcomes
3.2 General-purpose technologies and infrastructure		*Note that an initial suite of potential general-purpose technologies for consideration will be identified prior to CRC commencement, through the entrepreneurial discovery and rigorous analyses outlined for Program 1. This will follow consultations with large companies, that either own the technologies or have the right expertise regarding infrastructure and value chain innovation.* *Two hypothetical examples are provided for illustration purposes:*

		1. *Field robotics and low cost handling: Rio Tinto's driverless rail, trucks and underground mining with the control centre at Perth international airport [CHECK];* 2. *Fast shipping and low cost routes: Austal Ships' high speed vessels operating from northern ports, as an alternative to rail + shipping from southern ports*

Program 4: Development Policies and Regional Change

Outcome

New agricultural development adding value and diversity to a sustainable northern Australian economy and society, while building regional capacity to remain integrally connected to tropical agricultural regions globally

Usage and Impact

That through the collaborative culture of the CRC, the partner organisations commit to synthesising knowledge from across its programs and promote knowledge products for developing agriculture in the North.

That the jurisdictional partners collaborate to undertake evidence-based, coordinated policy development and implementation, with the progression of structural reforms and governance changes as necessary.

That existing and prospective agricultural businesses use CRC-generated prospectuses to guide their business planning, community engagement and investment decisions, in projects in development precincts, key sectors and on Indigenous lands;

That research and education institutions, with regional organisations, expand on international knowledge exchange and capacity building opportunities identified by the CRC with respect to a wider tropical regions knowledge economy.

That the jurisdictions and regional stakeholders initiate and undertake further strategic policy development and targeted regional development projects as a consequence of pan-northern and regional-scale benefit analyses and business cases generated by the CRC

The whole-of-CRC capacity building, education and training function will provide the resources for usage of Program 4 knowledge, and all CRC knowledge exchange.

Program Overview

Program 4 provides the CRC's interface with government policy development and with business planning, and acts as the knowledge-integrating program drawing on the public good outputs of Programs 1 and 2, and the commercial breakthroughs from Program 3. This program's synthesis it will facilitate policy and regional development around the new agricultural opportunities that will contribute to wider northern and regional development and a knowledge-based economy in the international tropical zone. This will emerge through a number of partnership-based capacity building activities:

- Supporting an agreed strategic policy framework for building the contribution of agriculture to northern development (involving Government, researcher and stakeholder partners in the CRC);
- Based on agreed policy priorities and identified priority precincts, develop co-research and advice on necessary policy, structural and governance changes across northern Australia to assist Commonwealth / State / Territory governments (e.g. reform of leasehold tenure);
- Partnering with industry and communities in priority precinct regions to conduct regional benefit analyses associated with agriculture and drawing on integrated output from Program 1, 2 and 3 to recommend further regional development strategies and projects supported by business cases;

- Leading international collaboration and cultural exchanges to build a tropical knowledge economy and to facilitate an innovative culture among regional stakeholders and build a tropical knowledge economy;
- Ensuring a cross-jurisdictional approach to incorporating the ‘Close the Gap’ strategy on Indigenous disadvantage;
- Encouraging local employment, access to upskilling opportunities through remote training and pathways for a range of employment opportunities;
- Supporting the North’s Traditional Owners to build a strong policy position with respect to agriculture and prospective targeted investment opportunities; and
- Working towards a regional brand to galvanise promotion of northern agriculture, market access and investment attraction;

This program both integrates the knowledge flow and tools for targeted agricultural development by CRC partners, and draws on that development experience to initiate wider social change and economic growth. Program 4 is also the program that links precinct-based projects with wider application of that knowledge in northern Australia, other tropical regions and with trading partners.

Output	Year	Potential Products and Services
4.1 Priority policy reforms and their coordinated implementation to better achieve regional development through agricultural development across jurisdictions	2020	Acknowledging that the Commonwealth / State / Territory governments are responsible for policy implementation and implementation in northern Australian development, the CRC will partner with the jurisdictions and key north Australian stakeholders, to research and support implementation of necessary policy, structural and governance changes that will facilitate agricultural development. The priority reforms will be identified by the macro-level investigations of Program 1 (P1.1). Key examples arising from existing work among jurisdictional partners, that the CRC will investigate and support are: • More cost-effective regional and project planning and approvals processes for water resource allocation, agricultural development and land use change (Program 2), and infrastructure programming and investment (Program 3); • Reforming land use and tenure arrangements to increase operational flexibility, protect and enhance Traditional Owner interests, adopting CRC planning tools (Program 2); • Enhanced policy frames for Indigenous leadership/engagement in agricultural development and consequent wealth generation (NAILSMA partnership arrangement); and • Investigate other areas for cross-jurisdictional harmonisation of agricultural development strategies (Program 1).
4.2 Portfolio of investment prospectuses for northern Australia; for each agricultural development precinct and for Indigenous co-investment	From 2018, updated over life of the CRC	The purpose of each prospectus is to attract new industries and diversified enterprises, and to facilitate access to Asian and domestic markets; the sustainable use of natural resources; supported by government policies and reforms. The prospectuses draw together the knowledge outputs of other programs and will be an important usage path through their adoption by new industry entrants and investors, and their consultants. They will cover: • Trade initiatives, market assessments, consumer/cultural preferences and product definition

		• Economic modeling of new industry and diversification options, scale factors, complementary industries (e.g. water reuse from mine dewatering for agricultural production) • Scale, land tenures and water use, infrastructure and services, and social capacity • Production systems and risks • Un-priced (non-economic) regional benefits (e.g. added employment, spin-off industries, Indigenous entrepreneurship, environmental services, regional security) Preparation of an Indigenous prospectus for sustainable development will be guided by the North Australian Indigenous Experts Forum, which reported to the Northern Australian Ministerial Forum and was facilitated by NAILSMA. This will set out the aspirations of Indigenous people to participate in and share the benefits of future northern development and how landowners may consider co-investment in the commercial use of their lands, including research and development to investigate how land 'bankability' can be improved for development opportunities on various types of Indigenous land tenure. Over time the prospectuses will be supplemented by case study reports for businesses successful in capturing market opportunities in Asia, with a focus on new business models.
4.3 Regional benefit partnerships in identified priority precincts, leading to new or enhanced northern regional development projects that benefit further agricultural development	From 2020	In the process of developing strategic approaches and investment prospectuses for selected agricultural precincts (core CRC), the CRC will generate recommendations for further regional development projects supported by (and linking Programs 1, 2 and 3): • Agreed regional strategic partnerships in targeted precinct; • Regional benefit analyses, including un-priced benefits such as livability of northern communities; • Approaches to incorporating Indigenous interests in northern development and 'Close the Gap' on Indigenous disadvantage. • Strategies for encouraging local employment, access to upskilling

		opportunities through remote training and pathways for a range of employment opportunities. • Building business cases for the recommended projects
4.4 International knowledge sharing with tropical agricultural regions	2021	The CRC will collaborate with its partners to extend current international partnerships involving research and educational institutions, and with DFAT, AusAID, ACIAR and other donors, to progress the goal of a tropical knowledge economy. This will involve mutually beneficial knowledge sharing agreements and cultural exchanges in tropical regions considered to have strategic importance for northern Australia. For example: • University overseas partnerships / offices; and • Indigenous led diplomacy and relationship building.
4.5 A regional brand for northern agriculture and regional development	From 2020	A regional branding strategy for agricultural businesses and governments to promote the northern Australian region, and to access markets and attract investment, will be researched and published, including new ecosystem service market concepts.

Education and Capacity Building

As part of their charter CRCs must support post-graduate education, although their capacity building function need not be limited to this.

The Northern Agriculture CRC will facilitate a larger education and training program under its AgNorth brand. To help grow the research capability in northern Australia the CRC will collaborate with its research providers on post-doctoral opportunities located in the North and with university partners to enhance greater participation in undergraduate education with a tropical agriculture theme.

As access to trained managers and labour is a critical factor in northern development the CRC will work with the VET sector on design of training packages for agribusiness management and employment; for delivery to landholders, agribusinesses, Indigenous corporations, and rural communities using innovative approaches suited to the remoteness of the North.

The CRC will consider developing pathways for Indigenous people to actively participate in partner projects in the selected precincts at a variety of points of entry including, but not limited to, primary and secondary schools, VET training, workplace training, ranger training and universities.

Indigenous Engagement

The principle of 'free, prior and informed' consent is fundamental to government policies recognizing Indigenous rights. Under this principle, the CRC will facilitate two-way engagement between commercial and policy interests and Indigenous people by:

- supporting Traditional Owners to develop their own protocols for engagement; and
- assisting companies and governments to understand how to operate according to Indigenous protocols, including how to obtain free, prior and informed consent.

In the lead-up to an operational CRC, if successful, Indigenous engagement will occur in three phases:

1. Input on this Business Case and the application to the CRC Program due in June 2014;
2. Being consulted on how the CRC will collaborate with indigenous interests in project activities – from June 2014 through to July 2015; and
3. Involvement in the projects themselves, ranging from investing, partnering to provision of local knowledge once the CRC is operating.

Initial advice to this Business Case has been provided, but will not be limited to, the Northern Australian Indigenous Land and Sea Management Alliance (NAILSMA). Further advice will be sought from other indigenous organisations and enterprises through distribution of the Business Case. NAILSMA will facilitate a steering group to guide this engagement strategy.

Indigenous Land Councils and Indigenous bodies will be provided with the Business Case and will be invited to provide input. This consultation will cover:

- Information to these organisations on the intent of the CRC's activities and their implications;
- Advice from these organisations on what existing knowledge and capability may be available to CRC projects (e.g. cultural mapping); and
- Discussion of how the CRC will conduct its projects on country, including best practice for project-level consultation or collaboration.

When the CRC is operational, this practice will be put into effect. The nature of the engagement will vary according the project's purpose and location, and stakeholders. For example, there would be standards for consultation in modeling and

investigations projects for agricultural development precincts (Program 1). For field work on country (typically Program 2) there may be a research agreement with Traditional Owners to exchange knowledge. For agribusiness research projects (Program 3), Indigenous enterprises may be research partners.

Nature of the CRC

The CRC Program Guidelines (June 2013) explicitly state requirements for the institutional form of the CRC, including governance and resourcing. At any one time the CRC must have among its Essential Participants, at least one Australian end-user from the private, public or community sector and at least one Australian higher education institution or a research institution associated with the university. Essential Participants are those organisations providing cash or in-kind resources essential to the CRC's operations under a formal Participants' Agreement, which is audited. This does not preclude third party participation under other contractual arrangements.

The Northern Agriculture CRC will be incorporated, because this is a simpler and more appropriate structure for the private-public partnerships that will dominate its activities. The precise legal form of the CRC is yet to be determined, but regardless of its final form the CRC Program requires a governance model consistent with ASX principles. This includes a skills-based board, with a chair who must be independent of Participants and a majority of members who must be independent of research Participants.

In the interim a Steering Committee representing likely Essential Participants is directing the preparation of the application to Commonwealth funding on the basis of this business plan and, as part of that process, will determine the structure and governance of the CRC. A separate *Guidance to Commercial Partners*, explaining the CRC's likely approach to private sector partnerships, intellectual property management and commercialisation on for intending co-investors is available.

Although still to be confirmed by the Steering Committee, it is intended that the CRC headquarters will be located in northern Australia; and the term sought will be 10 years, with the possibility of a 5-year extension.

Resources to Operate

The resourcing of the CRC will be shaped by the contributions that Essential Participants bring to the joint venture. The CRC Program's requirement is that the total Participants' contributions, cash and in-kind, untied and tied, must at least match the funds sought over the life of the CRC. However, for a CRC application to be competitive the Participants' contributions should be up to three times the CRC funding, and Participants' untied cash is critically important for the CRC to strategically invest in its activities and to attract co-investment from third parties.

Under Steering Committee direction, there will soon be further guidance for building and allocating resources, that reflects the private-public nature of this proposed CRC. This requires an estimation of the resources to operate that will be made following an activities planning workshop March 2014. The final determination of the funds sought from the CRC Program will be made by the Steering Committee once Essential Participants have signed off their intended contributions.

Benefits

1. Regional and industry benefits

For industry (private sector) partners:

- Access to prospectuses and business modeling that inform the bankability of their proposed ventures;
- Technologies, infrastructure and knowledge from cooperative research as a 'stepping stone' to establishing profitable enterprises in the North;

- Access to high quality scientists and research institutions, in northern Australia and overseas, working on their projects;
- Better preparation and more straight-forward process for planning and natural resource access approvals; and
- Better trained and skilled managers, technicians and labour.

2. Partner benefits

For jurisdictional partners:

- Stake in a strategic, 10-year program working on their priorities for sustainable northern agricultural development;
- Effective coordination of research skills, resources and knowledge across jurisdictional boundaries, with freer collaboration and exchange of staff;
- Evaluation and adaptive management of their preferred development models, and a sense of momentum with demonstrated earlier success;
- New processes, skills and technologies for efficient policy and planning and regulation, and reducing administrative costs across the North; and
- Arms-length relationships with private sector developers for commercially driven R&D.

For research providers:

- Contracted research with cash funding for longer terms than conventional project funding;
- Effective coordination of R&D projects with a critical mass of private sector research partners;
- Opportunity to build and retain skilled staff, and train less experienced staff in the North; and
- Expanded international collaboration formalised across institutions.

For R&D corporations:

- Effective coordination of cross-sector R&D relevant to their industries' issues and opportunities in the North; and
- Potential co-investment with private sector developers, over and above levy payments.

For non-government organisations:

- Doing business with a well-resourced R&D joint venture located at nodes across northern Australia.