

INSTITUTE OF AGRICULTURE



THE UNIVERSITY OF
WESTERN AUSTRALIA

INSTITUTE OF AGRICULTURE STRATEGIC PLAN

March 2008

A STRATEGIC PLAN FOR THE INSTITUTE OF AGRICULTURE

The Institute of Agriculture is an Institute established by The University of Western Australia with a mandate to integrate the University's research, education, training and communication in agriculture and the management of natural resource.

The Institute is lead by a Director with the support of an External Advisory Board as to strategic direction, and governed through an Executive Group. Institute operations are managed as a set of flexible Programs encompassing the academic and physical resources of the Schools and Research Centres of the Faculty of Natural and Agricultural Sciences and other relevant Faculties of the University.

The intent of this document is to outline the purpose, the operating environment, and the vision, mission and strategic intent of the Institute of Agriculture, The University of Western Australia.



Kadambot Siddique
Director

March 2008

OUR VISION

To be recognized for excellence in serving agriculture and the management of natural resources through research, education and training in a regional, national and international context.

MISSION STATEMENT

To advance research, education, training and communication in agriculture and natural resource management for the benefit of mankind.

OBJECTIVE:

To enhance The University of Western Australia's contribution to agriculture and to the management of natural resources in Western Australia, and in selected national and international settings.

For Western Australia, the Institute will work with the agricultural and natural resource management sector to improve workforce skills, and to generate new knowledge that will assist the industry's participants to advance their individual aspirations, underpin local and regional prosperity, and exercise responsible stewardship of the environment.

STRATEGIES

The Institute's objective will be achieved through the implementation of its key strategies:

COMMUNICATING

Strengthening communication links with regional industry, farmer groups and the broader regional and scientific communities;

RESOURCING

Increasing the pool of resources available for investment in critical R&D in Western Australia;

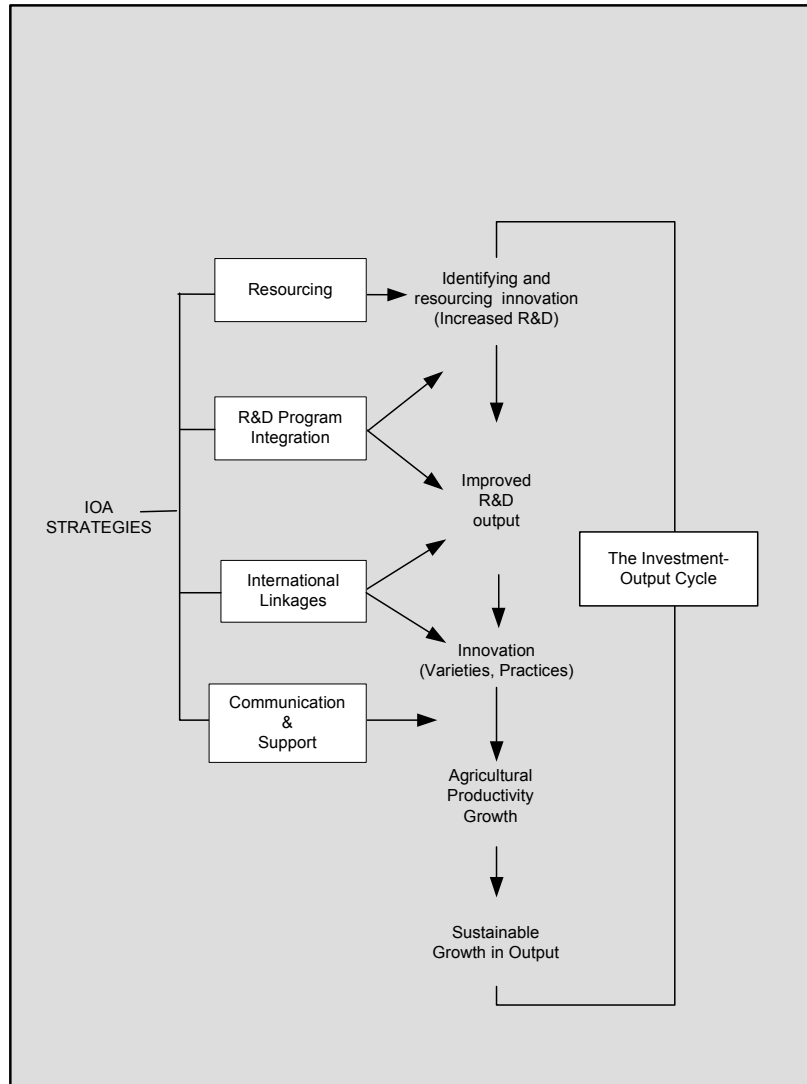
INTEGRATING

Bringing together the University's agricultural research, teaching, training and communication activities; integrating complementary activities across disciplines and organizational units, and providing a focus for leading-edge R&D; and

CONNECTING

Fostering national and international linkages and alliances that bring new knowledge and expertise to Western Australia, and allow Western Australia to share its knowledge with the world.

FIGURE 1. THE INSTITUTE OF AGRICULTURE’S VALUE-PROPOSITION



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1. CHALLENGES AND PRIORITIES - GLOBAL, NATIONAL AND REGIONAL

THE GLOBAL CHALLENGE

AGAINST A BACKDROP OF RAPID DEMAND GROWTH, CHANGING CLIMATE, DECLINING NATURAL RESOURCES, RESTRICTIVE TRADE POLICIES, AND REGIONAL DISTURBANCES, AGRICULTURE'S ABILITY TO INCREASE FUTURE FOOD SUPPLIES IS A CRITICAL ISSUE FOR THE WORLD COMMUNITY.

The world's population is growing, and is expected to continue to do so until the mid-21st Century and this growth is fuelling a corresponding increase in demand for food. At the same time, rapid industrialization in major economies and

looming

shortfalls in the supply of oil

are increasing

the demands

on agriculture to produce

fibre, fuel and

industrial raw materials. Yet,

at the same time, the

world's finite supply of

agricultural land and water

are declining

under the pressures of

climate change,

urbanization and human-induced degradation.

The challenge, both internationally, and for Australia, is to meet society's needs for food, fibre and fuel in ways that can be sustained into the future – economically, environmentally and socially.

The Facts of Life

- Every human is a net consumer of food and maintaining the world's food supply is the most critical for human existence
- Globally, about 800 million people are currently undernourished (FAO)
- World population is projected to increase to over 9 billion by the mid-21st Century and, just to keep pace, food production must increase by over 50%
- This increase in food production has to come from shrinking natural resources, particularly land and water
- World economic growth will see rapidly changing food preferences and, increasingly, more demanding standards for food quality.
- Degradation of agricultural lands, urban encroachment and competing uses of scarce resources for agriculture is increasing the cost of production and will require farmers to continue to adapt to change through innovation and improved management practices.
- Climate change is expected to have an increasing impact on the world's agriculture and natural resources. Australia, already the world's driest inhabited continent, is predicted to get drier in the southern agricultural regions, with an added complication of increased climate variability.

NATIONAL ISSUES

Australia is already a major supplier of food and other agricultural commodities, but faces many challenges for the future. Some of the most immediate include climate change, salinisation of rain-fed and irrigated crop lands, soil acidification, pests, diseases and weed issues, limited diversity in farming systems, shortage of reliable and skilled farm labour, and a declining and aging rural population.

Two recent reports¹ have focused on the challenges facing Australia's rural sector and have laid out their vision of the priorities for the sector to meet these challenges. The Agriculture and Food Policy Reference Group report *'Creating our Future'* highlights the very significant and ongoing rapid change in the environment in which rural businesses must operate.

'Creating our Future'

makes the point that "The agriculture and food sector has an impressive record of operating successfully in the domestic market and the intensely competitive and frequently distorted international market [and that] it has achieved this success by adapting to unrelenting change, through technical and managerial innovation, strong leadership, and improved policies and strategies."

Notable changes affecting the agriculture and food sector*

- Floating the Australian dollar, greater competition in the provision of credit as banking regulations have been eased, and electronic funds transfer
- Personal computers, the internet and mobile phones
- Laser levelling, and drip and underground irrigation technology
- In-shed wool testing, enabling improved clip preparation and sheep classing
- Improved crop varieties and livestock genetics
- Minimum tillage farming and associated herbicide and management techniques
- Precision farming, GPS satellite navigation, four-wheeldrive tractors and increasingly large machinery
- Mechanical harvesting of grapes and other fruit and vegetables
- Less regulated agricultural commodity marketing, and greater entrepreneurship and innovation in the crop and livestock industries
- Consolidation of industries associate with agriculture, including grain handling, seed and chemical supply
- Hazard analysis critical control point (HACCP) technologies that provide paddock to plate food safety and traceability
- Food manufacturing technologies that deliver shelf stable products that enhance consumer convenience
- Food processing innovation driven by consumer demand for 'healthier' foods
- Increased value adding to agricultural and food commodities in response to growing consumer demand for convenient, ready to eat products.

*From the Corish Report – Creating our Future

¹ Creating our Future – Agriculture and Food Policy for the next Generation ('Corish Report'). Report by the Agriculture and Food Policy Reference Group, February 2006; and Rural Research and Development Priorities, DAFF, 2007.

The report goes on – “The sector and its individual businesses must continue to innovate, evolve and adapt. Not doing so would mean a rapid decline in profitability, sustainability and the sector’s contribution to the well-being of country communities and the nation at large”.

The Reference Group identified the principal issues and challenges facing the sector if it is to be successful over the next ten to fifteen years and identified the foundations of success as:

- **Innovation**
A stronger emphasis on innovation in production and marketing, underpinned by leading edge research and development, is fundamental to longer term business success.
- **Globally competitive**
Sound macroeconomic and microeconomic policies, supported by substantial ongoing investment in infrastructure, will be vital to a low cost, globally competitive sector.
- **Whole of Chain**
A whole of chain, paddock to plate approach is needed to service consumer requirements efficiently and effectively.
- **Self-Reliance**
Policies must focus on achieving greater self-reliance of business operators.
- **Regulation**
The regulatory burden facing businesses must be reduced.
- **Communication**
Relevant information must be communicated in a clearer, more timely, accessible and accurate manner.
- **Partnership**
A partnership approach between businesses and governments will bring the best longer term improvements to the sector’s viability and sustainability.
- **Cooperative and consistent approach**
A genuinely cooperative and consistent approach by governments — Australian, state and territory — is essential for policies and programs affecting the sector.

It is noteworthy that the first foundation identified above is that there must be ongoing INNOVATION underpinned by LEADING EDGE RESEARCH AND DEVELOPMENT.

The terms of trade for agriculture (the ratio of prices received relative to prices paid for inputs) have been falling for decades. The downward trend has arisen principally because as technological change has improved productivity global production has historically grown faster than global demand causing commodity prices to fall in real terms; and although there have been recent increases in 'soft' commodity prices, there is no reason to expect that the trend will change over the medium to long term. Increased global output as developing economies adopt technological innovation and increasing cost of inputs are two important factors that will contribute to the ongoing decline in the terms of trade.

Despite the paradox that productivity growth is one of the causes of declining terms of trade, further productivity growth, driven by research and development and subsequent innovation, is the only effective way to offset the impact of the downward trend in farmers' terms of trade on Australian agriculture. In part in response to *'Creating our Future'*, the Commonwealth Government has reaffirmed its National Rural Research and Development Priorities. These were first formulated in 1994 to balance the new and ongoing R&D investment needs for the primary production sector, and to ensure the Australian Government's own R&D objectives were met. The priorities were reviewed in 2007 to refresh the national understanding of current critical R&D investment needs and to better target the National agricultural and food industry R&D efforts. The priorities were developed in consultation with state governments, industry, research funders and research providers including the University sector. The R&D priorities are intended to focus R&D investment in areas of greatest need.

The 2007 National Rural Research and Development Priorities are:

- **Productivity and Adding Value**
Improve the productivity and profitability of existing industries and support the development of viable new industries.
- **Supply Chain and Markets**
Better understand and respond to domestic and international market and consumer requirements and improve the flow of such information through the whole supply chain, including to consumers.
- **Natural Resource Management**
Support effective management of Australia's natural resources to ensure primary industries are both economically and environmentally sustainable.
- **Climate Variability and Climate Change**

Build resilience to climate variability and adapt to and mitigate the effects of climate change.

- Biosecurity

Protect Australia's community, primary industries and environment from biosecurity threats.

Supporting the Rural Research and Development Priorities (above) are two additional priority tasks:

- Improve the skills to undertake research and apply its findings; and
- Promote the development of new and existing technologies.

The '*Creating our Future*' foundations for success and the National Rural Research and Development Priorities are mapped against the role and capacity of the Institute of Agriculture in Section 2 of the Strategic Plan.

WESTERN AUSTRALIA

Whilst the Institute recognizes, and will address its role in meeting global and national needs, its primary focus will be on service to the agricultural and natural resource management industry sectors in Western Australia.

Western Australian agriculture is relatively well placed to meet the challenges of the future. Its human resources, in both ownership and management, and in technical and professional support are well educated and high skilled. Commercial farming operations are large-scale, highly mechanized, and financially viable, and have a history of rapid and successful uptake of technical innovation. The industry operates in a substantially de-regulated environment and has learned to live with the risks and benefits of exposure to international trade. It is financially sophisticated and has strong supporting institutions including government agencies, Universities, marketing organizations and a strong private sector.

The industry's weaknesses/threats (see box) stem largely from the changing social fabric of the Australian nation and the declining role of agriculture in the broader economy. The rural population is aging and agriculture is currently seen to offer a relatively less attractive career path, compared to other sectors of the economy, for both professional and technical careers. Increase in farm size through amalgamation and the high degree of mechanization have meant that employment in rural areas has declined, leading to declining physical and social infrastructure which in turn is a discouragement to those interested in a career in a rural location. High land prices similarly restrict the entry of new, potentially younger and more innovative entrepreneurs to the industry. Such long-term social trends are

unlikely to be reversed and so must be accepted as the social backdrop for agricultural development for the foreseeable future.

For Western Australia, the small size of the research community and the physical isolation from the major Australian and international research groups create special issues for agricultural and natural resource management research. Agricultural Research Western Australia (ARWA) of which the University is a partner is one approach to pooling and sharing the limited physical and intellectual resources available.

SWOT - Western Australian Agriculture

Strengths

- Based on large-scale, commercially viable enterprises, with relatively low levels of debt
- Capital-intensive, highly mechanized with a high level of technical innovation and rapid uptake of new technology
- Highly educated management and workforce
- Reliable (but annually variable) climate
- Strong institutional support for technical training, R&D and marketing

Weaknesses

- Aging management and workforce; agricultural employment (professional and technical) seen as unattractive relative to alternatives
- Declining physical and social infrastructure in rural areas
- Declining government investment in agriculture
- Lack of domestic markets for agricultural products, leading to an over-dependence on Eastern States and/or export markets

Opportunities

- 'Clean-Green', 'Ethical' and Quality-assured production for discerning markets
- Branding and differentiation of product
- Introduction of new crop species as well as genetically modified crops
- Diversification of enterprises, *e.g.*, crop-animal, crop-animal-perennial etc
- On-farm value adding
- Developing tropical agriculture in north-western and northern Australia

Threats

- Competition from low-cost producers (e.g. Brazil, Central Asian Republics) in the international market
- Increased climatic variability and declining long-term rainfall as a consequence of climatic change
- High and continuing dependence on fossil fuel-based inputs – fuel, nitrogenous fertilizer, herbicides etc
- High, and continuing, dependence on herbicides for weed management

Acknowledged technical threats to Western Australia's agriculture include the impact of climate change, in particular declining rainfall over the short to long term over the south-west of the state; potentially greater season-to-season variability; and the high dependence on oil-derived products for

transport, on-farm operations, chemicals and nitrogenous fertilizers. Herbicide resistance, because of its impact on crop production - the most profitable part of the farming system - represents a particular threat. Ongoing degradation of the landscape and the soil resource are of equal importance and include salinisation of the landscape as the result of clearing, acidification, waterlogging and the ever present threat of wind erosion.

Opportunities for Western Australian agriculture include greater emphasis on 'quality' to meet the demands of consumers who have both the ability to pay and increasing interest in the environmental and ethical standards applied to the production systems. 'Identity tagged', 'Clean-Green' and 'Ethical Animal Production' all fall into this category. Greater on-farm value adding through low or high-level processing or value adding through animal feeding are related opportunities.

Increased mechanization and automation of agricultural operations – precision agriculture - will build on the existing strengths of scale and the high levels of mechanical innovation and computer expertise already being applied by the industry.

Expansion of large scale corporate farming, possibly based on investment from overseas countries (e.g. China and India) is an opportunity, as is further development of tropical agriculture in the Ord River Irrigation Area. Expanding the Ord's area and diversity of production represents a unique opportunity for WA agriculture, and for the Institute of Agriculture.

In summary, Australia is already a major supplier of food and other agricultural commodities, but it is also a potential supplier of knowledge, innovation, skills and expertise that, arguably, can contribute as much, or more, to feeding and clothing human kind. All the above issues should influence the way we plan future training, research and development in agriculture and related areas. Recognition that agriculture must be productive, environmentally responsible and has an obligation to contribute to building strong, self-sustaining communities is at the heart of the programs of the Institute of Agriculture.

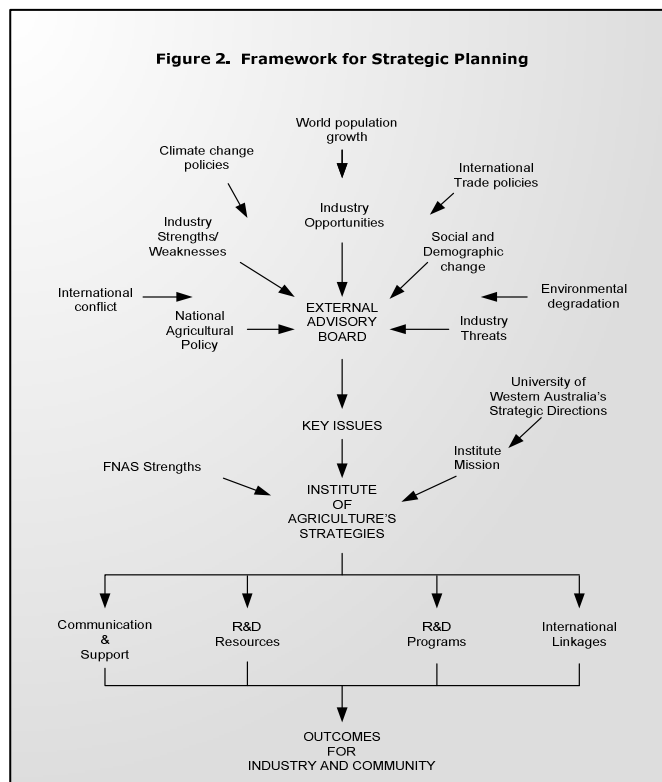
2. OBJECTIVE AND STRATEGIES

THE INSTITUTE’S OBJECTIVE IS “TO ENHANCE THE UNIVERSITY OF WESTERN AUSTRALIA’S CONTRIBUTION TO AGRICULTURE, AND TO THE MANAGEMENT OF NATURAL RESOURCES IN WESTERN AUSTRALIA, AND IN SELECTED NATIONAL AND INTERNATIONAL SETTINGS.”.

For Western Australia in particular, the Institute will work with the agricultural and natural resource management sector to improve workforce skills, and to generate new knowledge to assist the sectors at all levels.

Within this context The University of Western Australia has re-established the Institute of Agriculture with a mission to advance the University’s role in research, education, training and communication in agriculture and natural resource management.

FIGURE 2. FRAMEWORK FOR STRATEGIC PLANNING



Critical issues / opportunities arise primarily from the international and national context in which Australian agriculture operates and which were discussed in Section 1. This International and National context is dynamic and the External Advisory Board has an important role in identifying the key issues and opportunities for the agricultural and resource management sectors, whether they fall within the Institute’s mandate

and, if so, how the Institute should respond.

A strategic framework for the Institute’s planning is shown in Figure 2.

For the Institute, the key task is to mobilize the intellectual and physical capital present within The University of Western Australia and direct that resource toward resolution of the issues and opportunities facing agriculture and natural resource management.

The key strength of The University of Western Australia in these fields resides in:

- The pool of high-level scientific skills residing in the Schools of the Faculty of Natural and Agricultural Sciences, the Research Centres, CRCs and elsewhere in the University that can be brought to bear on the threats and opportunities facing agriculture
- The world-class teaching facilities, research laboratories, libraries and field stations available to support agricultural teaching and research
- The linkages of the University to the national and international agricultural research and development scene, that can bring new ideas and skilled people to work with colleagues based in Western Australia
- The high quality students and teaching of the University

To fulfill its Mission and to achieve the objective of enhancing The University of Western Australia's contribution to the agricultural and natural resource management industries, the Institute has identified four broad strategies.

- **Strategy 1: Communicating**
Strengthening communication links with regional industry, farmer groups and the broader regional and scientific communities;
- **Strategy 2: Resourcing**
Increasing the pool of resources available for investment in critical R&D in Western Australia;
- **Strategy 3: Integrating**
Bringing together the University's agricultural research, teaching, training and communication activities; integrating complementary activities across disciplines and organizational units, and providing a focus for leading-edge R&D; and
- **Strategy 4: Connecting**
Fostering national and international linkages and alliances that bring new knowledge and expertise to Western Australia, and allow Western Australia to share its knowledge with the world.

These strategies reflect the reality of the Institute as an organization whose primary role is to motivate, facilitate and integrate the productive capacity of the Faculty of Natural and Agricultural Science's Schools and the wider University.

To be relevant, and to survive, the Institute must be pro-active in addressing industry needs and Table 1 maps the roles and capacity of the Institute of Agriculture against the 'Creating our Future' Foundations for Success, and

the Australian Government’s National Rural Research and Development Priorities discussed earlier.

TABLE 1. RELEVANCE OF IOA ROLES TO NATIONAL RURAL R&D PRIORITIES

Rural R&D Priority	IOA Contributing Strategies
Productivity and Adding Value	Communicating, Resourcing, Integrating, Linkages
Supply Chain and Markets	Communicating, Linkages
Natural Resource Management	Communicating, Resourcing, Integrating, Linkages
Climate Variability & Climate Change	Communicating, Resourcing, Integrating, Linkages
Biosecurity	Communicating, Resourcing, Integrating, Linkages
Improve the skills to undertake research and apply its findings*	Communicating, Integrating
Promote the development of new and existing technologies.	Communicating, Resourcing,
*Primarily in support of the Schools and Faculty	

INSTITUTE ROLE IN IMPROVING THE SKILLS BASE

Both ‘Creating our Future’ and the National Rural Research Priorities pay special attention to the importance of improving the skills base if the agricultural and natural resource management industries are to remain competitive.

Farm and food businesses are becoming increasingly sophisticated and managerial capability is a major determinant of farm performance. Traditional farming skills must now be supplemented by requiring a highly educated and skilled workforce. As well as traditional farming skills, producers must now have knowledge across a wide range of disciplines encompassing information technology, natural resource management, financial management, marketing and risk management.

The agriculture sector has displayed stronger growth in education qualifications than the average for the rest of the workforce, but is starting from a low base compared with the rest of the economy. The number of university graduates involved in agriculture, forestry and fishing more than tripled between 1984 and 2004, however in recent years, interest in agriculture at higher education institutions has declined (Department of

Education, Science and Training 2005),. Rural campuses are under particular pressure, with student numbers in agriculture courses falling by 19 per cent in the three years to 2004.

Although primary responsibility for education and training remains with the Schools and the Faculty of Natural and Agricultural Sciences, the Institute has a role in communication of the opportunities for careers in agriculture and resource management, and in integrating and coordinating the opportunities for postgraduate training that will contribute to the future skills base.

TABLE 2A. IOA STRATEGY 1 - COMMUNICATION

ENHANCE COMMUNICATION BETWEEN THE UNIVERSITY AND THE AGRICULTURAL AND NATURAL RESOURCE MANAGEMENT INDUSTRY REPRESENTED BY GROWERS, ADVISORS AND AGRIBUSINESS

Effective communication of agricultural research and training activities at UWA to the industry, farmer groups, collaborators (national and international), funding bodies and potential students is a core strategy of the Institute. Benefits follow from the application of knowledge and expertise to practical agriculture and the Institute has a key role in linking scientific and technical advance made either within the Faculty or internationally to commercial agriculture in the field.

Wider awareness of the Institute and The University’s role and capabilities may also stimulate interest in undergraduate learning and attract talented undergraduate and post-graduate students to undertake agricultural training and research at UWA.

Equally, the Institute has a role in listening to growers, advisors and agribusiness and bringing back their ideas and perspectives to contribute to the identification of key issues and opportunities.

SUB-STRATEGIES

- Develop a comprehensive and well resourced Communications Program for the Institute – See Appendix 5
- Host grower groups and group support personnel within the Institute of Agriculture.

KPIs

- An increase in awareness of the Institute of Agriculture and its objectives amongst its various audience groups – industry, growers, agricultural advisors
- An increase in the numbers of undergraduate students entering agriculture and natural resource management courses at UWA
- An increase in the numbers of graduate students applying for post-graduate studies in agriculture and natural resource management at UWA
- Documented instances of consultation/problem definition with industry groups followed by Institute initiated research and development

TABLE 2B. IOA STRATEGY 2 – RESOURCING

INCREASE THE POOL OF RESOURCES AVAILABLE FOR INVESTMENT IN CRITICAL RESEARCH AND DEVELOPMENT IN WESTERN AUSTRALIA

Increasing the overall quantum of research and development applied to regional and national issues will, in the medium term, produce improved outcomes for the industry. Many studies have pointed out that investment in agricultural research and development is highly profitable and generally has a high benefit to cost ratio.

A second important benefit in increasing the overall pool of research and development funds is that it provides the opportunity for greater flexibility in investment. New opportunities and challenges will continually emerge and having a greater pool of investment funds and a greater diversity of sources will allow new challenges to be met as they arise.

<p>SUB-STRATEGIES</p>	<ul style="list-style-type: none"> ▪ Pro-actively showcase UWA capabilities in agriculture and natural resource management to rural industry research and development funds (GRDC, RIRDC, MLA, HAL, LWA) ▪ Identify and engage potential new sources of investment not traditionally available for agricultural research from agribusiness and government ▪ Identify synergies, and work with other providers of research (e.g. the ARWA partners) and development services to most effectively meet the needs of the rural industries ▪ Provide seed capital (Institute funds) to initiate research immediately new needs or opportunities arise; thus circumventing the often long delays in getting new research and development resources applied to critical problems.
<p>KPIs</p>	<ul style="list-style-type: none"> ▪ The level of the funding pool available for investment in R&D through the Schools and Centres ▪ The number of new, non-traditional sources of investment ▪ More effective use of endowment funds for bringing international experts to the Institute and developing strategic research areas

TABLE 2C. IOA STRATEGY 3 – INTEGRATING

FOSTER AND SUPPORT PRO-ACTIVE RESEARCH AND DEVELOPMENT ADDRESSING KEY ISSUES AND OPPORTUNITIES FACING AGRICULTURE AND NATURAL RESOURCE MANAGEMENT

The Faculty has some 200 highly skilled academic staff in disciplines that span the natural, agricultural and natural resource management sciences. Equally, the interests of individual academics are as diverse as aquaculture, botany, geography, geology and zoology in addition to the traditional agricultural sciences. The mandate of the Institute is to identify issues and then to build teams that draw on this diverse expertise (and that outside the Faculty) to address problems and opportunities in agriculture and natural resource management.

By integrating UWA’s research, training and communication under one umbrella, the University can better serve agriculture by focusing its diverse resources on critical issues. The role of the Institute is to identify which groups and individuals across the Faculty and University can contribute on key issues and then to provide the framework in which their contribution can be made.

<p>SUB-STRATEGIES</p>	<ul style="list-style-type: none"> ▪ Develop a robust Research and Development Program framework for the Institute of Agriculture ▪ Undertake leadership training for the Institute’s Executive and Program Management Team ▪ Develop an independent, external review framework to be applied to the review of the Institute’s Programs, and apply this framework to the Institute’s Programs within a five-year time- frame
<p>KPIs</p>	<ul style="list-style-type: none"> ▪ Increased support for the Institute concept and operating model amongst Program Leaders, Heads of Schools and the Faculty (measured by independent survey) ▪ The number of new, multi-disciplinary research projects initiated through Institute action involving groups inside and outside the Faculty and/or outside The University of Western Australia ▪ An increase, over time, in the publications and citation index (number of papers per academic staff member) ▪ Demonstrable adoption of technology and products developed by the Institute’s R&D Programs ▪ Numbers of highly motivated graduates and post-graduates in agriculture and NRM from UWA

TABLE 2D. IOA STRATEGY 4 – CONNECTING

FOSTER NATIONAL AND INTERNATIONAL LINKAGES AND ALLIANCES FOR MUTUAL BENEFIT

National and international linkages bring the benefit of connecting regional agriculture to the world’s leading centres of agricultural innovation and germplasm development. Through these linkages, agriculture can benefit from the transfer of knowledge, expertise and germplasm. Exchange of academics and students can bring the best minds to focus on the State’s agricultural problems and opportunities.

Equally, Western Australian innovation and expertise can be transferred to other countries for the benefit of all.

<p>SUB-STRATEGIES</p>	<ul style="list-style-type: none"> ▪ Develop a robust Research and Development Program framework for the Institute of Agriculture ▪ Undertake leadership training for the Institute’s management groups including the Executive and Program Management Team ▪ Develop an independent, external review framework to be applied to the review of the Institute’s Programs, and apply this framework to the Institute’s Programs within a five-year time frame
<p>KPIs</p>	<ul style="list-style-type: none"> ▪ Establish linkages with Australian universities and other research institutions to foster the aims of the UWA-IOA ▪ Develop international relationships with key agricultural universities in Australia's sphere of influence in order to explore joint research, training and teaching opportunities ▪ Support pre-tertiary, undergraduate and post-graduate student activities that demonstrate the career opportunities in agriculture and natural resource management

3. STRUCTURE AND OPERATIONS

THE INSTITUTE OF AGRICULTURE IS A BODY ESTABLISHED BY THE UNIVERSITY OF WESTERN AUSTRALIA WITH A MANDATE TO INTEGRATE AGRICULTURAL AND NATURAL RESOURCE MANAGEMENT RESEARCH, EDUCATION, TRAINING AND COMMUNICATION ACROSS THE UNIVERSITY. IT IS LED BY A DIRECTOR WITH THE SUPPORT OF AN EXTERNAL ADVISORY BOARD AS TO STRATEGIC DIRECTION, AND GOVERNED THROUGH AN EXECUTIVE TEAM AND SUPPORT STAFF.

The structure of the Institute is shown in Appendix 1.

EXTERNAL ADVISORY BOARD (EAB)

The External Advisory Board is the most important source of the Institute's industry interaction, advice and feedback. The EAB has an independent Chairperson and meets twice each year. The members of the EAB are chosen to represent a cross section of the agricultural and natural resource management industries.

The Dean, FNAS, and the Director of the Institute are also members of the EAB (Appendix 2).

The External Advisory Board is responsible for:

- Providing high-level Industry feedback on agricultural industry trends, needs and issues in order to guide the Institute's strategic planning and policy setting
- Providing independent advice to the Director on formulating the Institute's responses to strategic issues
- Enhancing the profile of the Institute to the industry and wider community

EXECUTIVE TEAM

The Institute is a partnership between the four schools within FNAS and key agricultural, food and health, and biotechnology centres within and outside the Faculty. The Institute is governed by an Executive with the Dean of FNAS as the Chair.

The Executive consists of representatives from the four Schools, one Centre representative (on a rotational basis) plus the Director of the Institute. The agendas and minutes of the Executive meetings will be emailed to all Centre Directors for comments and input. Updates from the meetings will be relayed back to Schools and Centres via 'postcards' listing key decisions in

order to keep everyone informed. The Executive will meet 4 times per year or more often if required.

DIRECTOR AND SUPPORT STAFF

The Director, Deputy Director, Personal Assistant and the Communications Officer form the institute staff. All other staff (e.g. Program Leaders and Deputy Leaders) will remain affiliated with their parent Schools, Centres and the Faculty, subject to their standard conditions and practices of employment, operating jointly within the Institute of Agriculture programs.

The Director's functions are:

- Lead the Institute and work with the EAB to identify issues for the industry and develop the IOA's high-level strategic response.
 - Develop and manage operational and communication plans, and resource requirement for presentation to, and approval by, the Executive; and ensure that these plans are effectively implemented
 - Ensure that the Executive is provided with relevant and timely decision support information
 - Build relationships with the agricultural industry; nurture and enhance research alliances and represent and promote the Institute
 - Lead and integrate agricultural research within FNAS – manage research programs/themes; provide Institute members with strong and empowering leadership to enhance the motivation, focus and satisfaction they derive from their contribution to the Institute
 - Facilitate linkages across agriculture-related research groups within the University (e.g. Plant Energy Biology Centre)
 - Advise the Vice-Chancellor and the Dean, FNAS on issues related to developments in agriculture and natural resource management

Executive Team Responsibilities
<ul style="list-style-type: none"> ▪ Overall governance of the Institute; establishing policy and implementing high-level strategic directions ▪ High-level decision making with respect to the Institute's operation ▪ Institute's policy in relation to external and internal partnerships ▪ Monitoring and adapting to changes to internal and external environments ▪ Promoting the Institute and its key relationship with Schools and Centres ▪ Legal compliance and accountability ▪ Monitoring the Institute's performance ▪ Advice and support for the Director

- Contributing to research training in agriculture and natural resource management
- Day-to-day management of the Institute and staff

COMMUNICATIONS

Effective communication of agricultural research and training activities at the University to the industry, farmer groups, collaborators (national and international), funding bodies and potential students is one of the major objectives of the Institute.

The Institute's communication objectives are:

- To increase the rate of uptake and extent of use of the University's Agricultural research outputs by industry, farmer groups and the community at large
- To attract talented undergraduate and post-graduate students to undertake agricultural training and research at the University
- To enhance opportunities for collaboration with industry, national and international organisations
- To assist in diversifying and increasing the University's agricultural funding base

A number of communication strategies are proposed (Appendix 6).

RELATIONSHIP TO THE FACULTY, SCHOOLS AND CENTRES

The Institute of Agriculture is co-located with the University's Faculty of Natural and Agricultural Sciences (FNAS), and the Institute and Faculty work together to deliver education, training and research and development outcomes for the agricultural industries and natural resource management agencies.

Undergraduate and postgraduate students are enrolled in FNAS or another UWA Faculty and Research Programs and are managed through the four Schools of Agricultural and Resource Economics, Animal Biology, Earth and Geographic Sciences and Plant Biology and relevant Centres. The Faculty currently has approximately 250 academic and research staff working in the areas of agriculture and related disciplines and 1000 students spread across several degree programs. About 70% of students are undergraduates and the remaining 30% are research postgraduates, including 250 undertaking PhD's.

The Institute serves to integrate the Faculty's activities with those of other groups in the University with interests in agriculture, land and water management, rural economy, policy and development, food and health; it

acts as the interface between the University and the agricultural industries and wider community, ensuring that the University's teaching, training and research resources are properly resourced and are addressing issues critical to the long-term success of the industries.

An overarching principle of the Institute's operations is that the impacts of its activities will be seen within Schools and Centres. This means that all research grants and students attracted to the University through the activities of the Institute will be managed by Schools (with Centre input where appropriate). Furthermore all research outputs will be credited to Schools and Centres. The complementary roles of the Institute and the Faculty are summarized in Table 3.

RESOURCES

The Institute is dependent upon the resources allocated to it by its partners and on access to agricultural bequest funds. As a matter of policy, the Institute will not keep any research grants and other sources of income (e.g. royalties, DEST funds, publication funds etc) and all funds will flow back to its source of origin through the FNAS funding model.

The Institute's budget will be resourced by a mix of funding sources including the Faculty budget, the agricultural bequest funds and partner (including Schools) contributions. An annual budget will be developed by the Institute Executive Team and then forwarded to the FNAS Planning and Budget Committee for endorsement.

The likely 3 year total budget for the Institute of Agriculture is approximately \$1.2 Million. This will be drawn from a number of sources including University funds (\$595,000); Agriculture bequest funds (notionally \$310,000) and Faculty strategic funds (approx \$250,000). This represents a major strategic commitment by the Faculty of Natural and Agricultural Sciences and the University.

TABLE 3: INSTITUTE OF AGRICULTURE – FNAS RESPONSIBILITY MATRIX

Key activities	Schools	Institute of Agriculture
Research grants	Grants will be located and managed within the School/Centre of the Chief Investigators. Infrastructure sharing between schools/centres will be determined by the parties involved in the project and based on normal issues around the role of other investigators.	The Institute’s role is to facilitate project development and especially bring industry partners to the project.
Research training	Research students will be enrolled in Schools. Any sharing of funding allocation for load or completions will be arranged by Schools to reflect the supervision arrangements. Current Faculty guidelines will be used.	The Institute will attract high calibre domestic and overseas students through its promotional activities and linkages.
Publications	Publication credits will follow the School / Centre that meets the salary costs of the UWA Author.	Where appropriate, Staff will be encouraged to add a by-line noting their affiliation with the Institute of Agriculture and also to enhance the profile of the Institute to the Scientific community. The Institute will list all relevant publications in its annual research report and newsletters.
Undergraduate teaching	Units are delivered by Schools; funds will be allocated to Schools per the FNAS Budget Model.	The Institute will facilitate guest lecturers to undergraduate units where appropriate.
Postgraduate coursework teaching and research supervision	Units are delivered by Schools; funds will be allocated to Schools per the FFM.	The Institute will facilitate guest lecturers to graduate students where appropriate. Co-supervision of Post-graduate students with industry partners and other relevant institutions (e.g. DAFWA and CSIRO) will be facilitated.
Promotion / communication	The Faculty budget currently meets a high proportion of the marketing / promotion activities for recruitment of undergraduate and postgraduate students.	An increase in promotional activities is expected through the Institute and the costs of these new activities will be shared between the Faculty and the Schools.

4. MEASURES OF SUCCESS

THE INSTITUTE OF AGRICULTURE WILL BE JUDGED A SUCCESS TO THE EXTENT THAT IT ACHIEVES ITS OBJECTIVE, THAT IS - "TO ENHANCE THE UNIVERSITY OF WESTERN AUSTRALIA'S CONTRIBUTION TO AGRICULTURE, AND TO THE MANAGEMENT OF NATURAL RESOURCES IN WESTERN AUSTRALIA, AND IN SELECTED NATIONAL AND INTERNATIONAL SETTINGS".

Because the agricultural and resource management industries are so diverse and The University of Western Australia's responsibilities in research, teaching, and training so wide, there can be no single, objective measure of 'success'. Instead, the Institute's progress must be judged against a set of diverse criteria.

INTERNATIONAL RANKING

In the 'Life and Agricultural Sciences' category (Shanghai Jai Tong Academic Ranking of World Universities)², The University of Western Australia is currently ranked 37th in the world in terms of citations (3,302 in 2005). To move to 10th place (9,512 citations) would involve an approximate tripling of the Institute's current scientific output – clearly an impossibility in the short term.

Feasible high-level goals for the Institute, however, are

- Achievement of a ranking of 20 by 2015; and
- To increase the number of citations per paper published to 8.0 from the current 6.94 in the same time - frame.

NATIONAL RANKING

The University of Western Australia is current ranked first amongst Australian Universities in the Shanghai Jai Tong Academic Ranking of World Universities 'Life and Agricultural Sciences' category

Although there cannot be an improvement in rank, measures of success in the national context could be:

- The number of major NATIONAL research initiatives in agriculture awarded to The University of Western Australia
- Co-location within the University of private companies or corporatized agencies servicing agriculture
- Attraction of more (mature-age) PhD students from the eastern states.

² Shanghai Jai Tong Academic Ranking of World Universities:
<http://ed.sjtu.edu.cn/ARWU-FIELD2007/LIFE.htm>

KEY PERFORMANCE INDICATORS

Key Performance Indicators can be applied to achievement of each of the Institute's strategies. These performance indicators are listed against the four key strategies identified and discussed in Section 2.

Given that the Institute operates mainly as a 'virtual' centre in support of the Schools and Faculty, its performance can also be measured by the difference it has made to the Schools and Faculty.

The performance indicators in place for the Faculty of Natural and Agricultural Sciences³ can also be applied to the Institute of Agriculture. It must be recognized, however, that the achievement of these performance indicators is a shared responsibility between the Institute and the Schools and Centres within the Faculty. These key performance indicators are listed in Table 4, below for the initial establishment phase of the Institute of Agriculture.

TABLE 4: PERFORMANCE INDICATORS

Performance Indicator	2007	2009	2011
*Additional Research Income above 2003 – 2005 average (\$10 million in agricultural related areas)	1.0	1.0	1.1
Additional Higher degree by research student load (EFTSL)	10	11	11
Additional Higher degree by research completion (WOU)	6	7	7
Additional Postgraduate coursework student load	3	3	4
Annual Research publications (WOU)	15	15	15

* Faculty of Natural and Agricultural Sciences has had an average annual agricultural and related research income in 2003-2005 of nearly \$9.8 million.

³ Faculty of Natural & Agricultural Sciences Operational Priority Plan 2006 – 2008.

5. PROGRAMS

THE MAJOR IMPACT OF THE INSTITUTE OF AGRICULTURE WILL BE THROUGH ITS STRATEGY OF FOCUSING AND SHARPENING THE AGRICULTURAL TEACHING, TRAINING, RESEARCH AND DEVELOPMENT UNDERTAKEN WITHIN THE UNIVERSITY. FIVE INSTITUTE PROGRAMS HAVE BEEN ESTABLISHED AS A FRAMEWORK TO APPLY ITS STRATEGIES.

Five Institute Programs have been established and will be managed through a Program Team composed of the Director, Leaders/Deputy Leaders of the Research Programs, the Communications Officer and the Personal Assistant to the Director.

The programs are structured to be, where possible, interdisciplinary, intersecting across the varied strengths of the Faculty's Schools, Centres and discipline groups (See Table 5, below). The Institute's programs have been developed under key themes relevant to future agricultural, food industry and natural resource management needs. The program team will act as a 'brains trust/think tank' and meet monthly or more often if required.

TABLE 5: INSTITUTE PROGRAMS AND PROGRAM LEADERS

	Title	Leader/Deputy Leader*
1. ILWM	Integrated Land and Water Management	Leader Professor Zed Rengel Deputy Dr Daniel Murphy
2. APS	Animal Production Systems	Leader Professor Graeme Martin Deputy Dr Phil Vercoe
3. PPS	Plant Production Systems	Leader Professor Stephen Powles Deputy Dr Guijun Yan
4. REPD	Rural Economy, Policy and Development	Leader Professor Matthew Tonts Deputy Dr Graeme Doole
5. EOTE	Education, Outreach and Technology Exchange	Leaders Professor Kadambot Siddique and Mrs. Christine Richardson

* Contact details are provided in Appendix 7

Program Leaders will be responsible for:

- Providing rigour and scientific credibility to the Institute
- Developing and integrating research, training and communication activities under each program
- Providing leadership and facilitating collaboration within and between groups
- Identifying potential funding opportunities and developing proposals in consultation with program members

Full Program outlines are provided in Appendix 7 to this Strategic Plan.

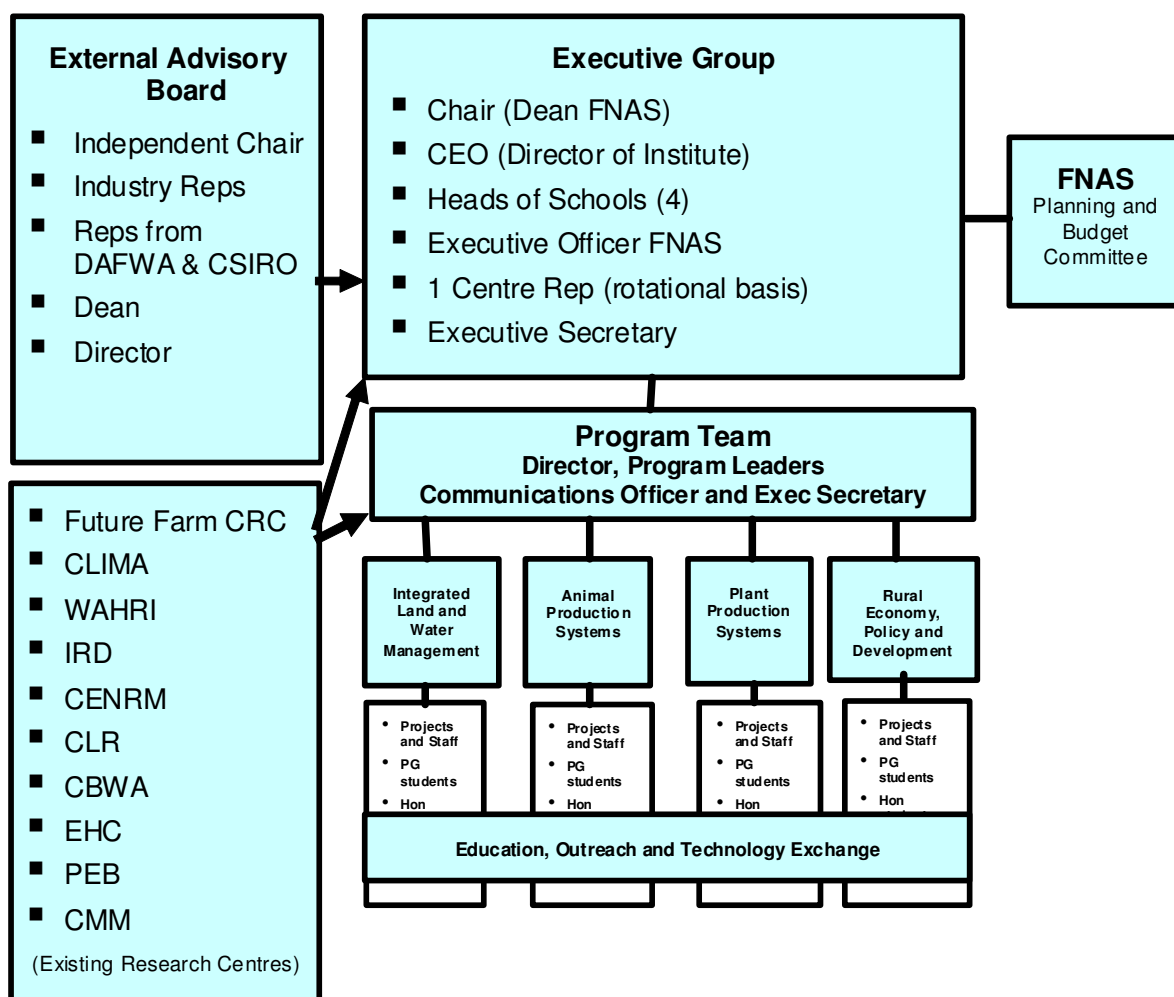
6. APPENDICES

Appendix 1	The Institute of Agriculture
Appendix 2	External Advisory Board
Appendix 3	Executive Team
Appendix 4	History and Achievement
Appendix 5	Acronyms
Appendix 6	Communications Plan
Appendix 7	Programs

APPENDIX 1 – THE INSTITUTE OF AGRICULTURE

The Institute of Agriculture is an Institute established by The University of Western Australia with a mandate to integrate agricultural and natural resource management research, education, training and communication across the University.

The Institute is lead by a Director with the support of an External Advisory Board as to strategic direction, and governed through an Executive Group and support staff. Institute operations are managed as a set of flexible Programs encompassing the academic and physical resources of the Schools and Research Centres of the Faculty of Natural and Agricultural Sciences and other relevant Faculties of the University.



Effective communication to industry, farmer groups, collaborators (national and international), funding bodies and potential students is critical to the success of the Institute and is the role of the bridging Education, Outreach and Technology Exchange Program.

APPENDIX 2 – EXTERNAL ADVISORY BOARD

Mr. Bruce Piper (Chair)	Farmer and Chairman, COGGO
Dr. Stephen Loss	Manager Fertiliser Services, CSBP
Mr. Neil Young	Farmer and Chairman, GRDC Western Panel
Mr. Philip Gardiner	Farmer
Mr. Imre Mencshelyi Mr. David Fienberg (Alternate)	Chief Executive Officer, CBH Group Manager, Australian Grains Centre/Metro Grains Centre, CBH Group
Mr. Garry Robinson	Export Manager, Emanuel Exports Pty Ltd
Mr. Peter Trefort	Principal, Hillside Meats and Board Director, Meat and Livestock Australia
Dr Tony Fischer	Honorary Research Fellow, CSIRO, Canberra
Dr Jim Fortune	Agricultural Consultant
Ms Naomi Arrowsmith	Manager, Department of Water, Albany
Dr Don McFarlane	WA Coordinator, Water for a Healthy Country Flagship, CSIRO, Perth
Dr Peter O'Brien	Managing Director, Rural Industries Research and Development Corporation
Mr. Roger O'Dwyer	Executive Director, Industry and Rural Services, DAFWA
Mr. Andrew Ritchie	President, Australian Association of Agricultural Consultants, WA
Prof. Alistar Robertson	Pro-Vice Chancellor, Research Initiatives UWA
Prof. Kadambot Siddique	Director, Institute of Agriculture, UWA
Ms Hayley Newberry	Personal Assistant, Institute of Agriculture, UWA

APPENDIX 3 - EXECUTIVE TEAM

Prof. Lyn Abbott	Acting Dean, FNAS (Chair)
Prof. Kadambot Siddique	Director, Institute of Agriculture
Prof. Lyn Abbott	Head, School of Earth and Geographical Sciences
Prof. Graeme Martin	Head, School of Animal Biology
Dr Ben White	Head, School of Agricultural and Resource Economics
Prof. Hans Lambers	Head, School of Plant Biology
Mr. Kevin Goss	CEO, CRC for Future Farm Industries
Mrs. Christine Richardson	Faculty Manager, FNAS
Ms Hayley Newberry	Personal Assistant, Institute of Agriculture, UWA

APPENDIX 4. HISTORY AND ACHIEVEMENT

AGRICULTURE AND NATURAL RESOURCE MANAGEMENT AT THE UNIVERSITY OF WESTERN AUSTRALIA⁴ -

The University of Western Australia has a proud history of teaching and research in agriculture and natural resource management. Teaching of agricultural science began within two years of the University's opening to students in 1913, but it was not until 1938 that the building known as the 'Institute of Agriculture' was constructed. In 1936 agriculture achieved full faculty status, after 23 years as a department of the Faculty of Science.

Establishment of the Institute of Agriculture provided the critical research facilities and staff essential for the effective training of professional agricultural graduates and scientists at the post-graduate level. The initial research focus of the Institute was on the nutrition of ruminants, baking quality of wheat, the fertility of sheep and the economics of various primary industries.

In the late 1940s, the Institute oversaw an expansion of both teaching and research. New sources of funds were tapped from endowments and the influence of the Institute of Agriculture's Professor Underwood⁵ and of Dr John Millington was paramount in the ground-breaking decision of the Farmers' Union of WA to support a voluntary levy of one farthing a bushel on all wheat delivered for sale in the State for the purposes of soil fertility research. This was the start of the national research levy system so important to the advancement of agriculture today.

In the period from 1948 to the mid 1970's research widened to include plant breeding and genetic studies on crop and pasture species, soil science and plant nutrition, nutritional and reproductive physiology of sheep, agricultural economics, crop physiology, and production agronomy research. In the 1950s and 1960s, the Institute fulfilled a critical role in providing the agricultural graduates needed to support the rapid expansion of agriculture onto the new 'light land' areas of the State. These graduates made an enormous contribution to the agricultural development of the State, and many returned to the Institute of Agriculture applying their practical experience to the pursuit of Masters or Doctoral degrees.

In 1977, the Faculty of Agriculture, with the support of other faculties, introduced a Masters' degree course in Natural Resource and Environmental Management – responding to the growing concern over environmental

⁴ 50 Years Agriculture UWA (1986) – held by UWA Archives

Agriculture in Western Australia 1829-1979. Chapter 17 (G. H. Burvill, Ed) UWA Press, 1979.

⁵ Watson, I.A. & Butler, F.C. (1984). Wheat rust control in Australia. pp 30-43. The University of Sydney.

issues and the impact of agriculture on the environment. The growth of the Faculty of Agriculture with its four Schools was, however, at the expense of the Institute and by the beginning of the 1980s the Institute of Agriculture existed in name only.

During the decades of the 1980s and 1990s the Faculty of Agriculture consolidated its research efforts and developed further strength in the eco-physiology of crop/pasture systems and of native plants, herbicide resistance research in broad-acre cropping systems, plant molecular biology, farming systems research and soil and water management. Horticulture joined the Faculty in 1992 bringing new staff and new interests in floriculture and tropical horticulture.

In the 1990s the Faculty was also instrumental in attracting to the University the Cooperative Research Centre for Legumes in Mediterranean Agriculture (1992-2000), the CRC for Fine Wool (1994-2003) and the CRC for Plant-based Solutions to Dryland Salinity (2000-2007) – now the CRC for Future Farm Industries (2007-2014). The CRCs, established in partnership with funding bodies, farmer groups, and national and international organizations have added significantly to the Institute's capacity to contribute to agriculture and natural resource management in Western Australia.

A new Faculty of Natural and Agricultural Sciences (FNAS) was formed in 2002 by combining the former Faculty of Agriculture with the University's Departments of Botany, Zoology, Geology and Geography, previously part of the former Faculty of Science. The major aim of this restructure was to build on strengths in teaching and research across the University's broad areas of interests in production systems, biotechnology, the environment and natural resource management, biodiversity, and land and marine ecosystem management issues in WA and the region.

In 2006, recognizing that the new Faculty had wider responsibilities, the University made the decision to re-establish the Institute of Agriculture to focus and coordinate the teaching of agriculture and agricultural research within the Faculty and to strengthen links to other relevant Faculties of the University. The main objective was to enhance The University of Western Australia's contribution to the agricultural and natural resource management industries by strengthening links with industry, farmer groups, the community, and national and international organizations.

In 2007 the Institute of Agriculture is addressing the emerging challenges facing agriculture and natural resource management in Western Australia.

**INSTITUTE OF AGRICULTURE – RESEARCH ACHIEVEMENTS
(1930 – 1960s)**

1930's - to date	World-class agricultural scientists, managers and agri-business people serving agriculture in Western Australia, the nation and the international community
1930s	Discovery (1935) of cobalt deficiency 'Denmark wasting disease' and copper deficiency in cattle in the South-West of the State. Definition of feed composition, dietary requirements, mineral nutrition and trace element requirements of livestock
1940s	Identification of plant oestrogens in subterranean clover as the main cause of infertility in sheep Establishment of the subterranean clover breeding program, release of Geraldton subterranean clover in 1950
1950s	Development and release of annual medics adapted to low rainfall areas and heavy soils – release of Cyprus barrel medic (1959)
1960s	Domestication of narrow-leafed lupin (<i>Lupinus angustifolius</i>) and release of the world's first commercial varieties Collection and documentation of naturalized subterranean clover strains; selection of Dalkeith Selection, breeding and introduction of low-oestrogen subterranean clovers Definition of the South-West wine region as a climatic analogue of Bordeaux and first vineyard development in the region Elucidation of the hormonal regulation of breeding in sheep Identification of 'pasture dieback' as due to a rhizobium failure on light land Development of the Farm Management Group movement

**INSTITUTE OF AGRICULTURE – RESEARCH ACHIEVEMENTS
(1970s TO DATE)**

1970s	<p>Pioneering studies on the eco-physiology of wheat in Mediterranean environments</p> <p>Development of the National subterranean clover breeding program based at the University of WA (Stern and others)</p> <p>Definition of toxicity/deficiency symptom for nutrients in legumes N, P, K, Ca, Mg, Cl, Cu, Zn, Mn, Fe, B, Mo</p> <p>Physiology of rhizobium survival in acid soils and selection of tolerant strains, development of inoculant technology</p> <p>Development of the barley germplasm collection and definition of the genetic and physiological basis of barley plant development</p> <p>Contributions to the understanding and management of the reproductive physiology of sheep</p> <p>Ruminant nutrition – management of sheep during drought and pregnancy</p>
1980s	<p>Brassica genetics and development of Brassica germplasm</p> <p>Physiology and adaptation of chickpea and other alternative crops</p>
1990s	<p>Establishment of CRCs – Center for Legumes in Mediterranean Agriculture and the Wool CRC.</p> <p>Establishment of WAHRI (1999) and the program on management of herbicide resistance in weeds</p> <p>Development, by CLIMA, of the world’s first genetically modified lupin</p>
2000s	<p>Establishment of the CRC for Plant-based Management of Dryland Salinity.</p> <p>Breeding and release of low-rainfall-adapted canola varieties</p> <p>Germplasm development and commercial release of novel pasture and grain legume cultivars through CLIMA</p> <p>Definition of the role of perennials in farming systems</p> <p>Development of salt-tolerant wheat breeding lines through inter-generic crossing with sea barley grass</p>

APPENDIX 5 - ACRONYMS

ARWA	Agricultural Research, Western Australia
CBWA	Canola Breeders, Western Australia
CENRM	Centre of Excellence in Natural Resource Management
CLIMA	Centre for Legumes in Mediterranean Agriculture
CLR	Centre for Land Rehabilitation
CMM	Centre for Microscopy and microanalysis
COGGO	Council of Grain Grower Organizations
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFWA	Department of Agriculture and Food, Western Australia
EAB	External Advisory Board
EFTSL	Effective Full Time Student Load
EHC	Eco-Hydrology Centre
FNAS	Faculty of Natural and Agricultural Sciences
GRDC	Grains Research and Development Organisation
HRDC	Horticultural Research and Development Corporation
IRD	Institute for Regional Development
PEB	Plant Energy Biology, ARC Centre for Excellence
RIRDC	Rural Industries Research and Development Corporation
UWA	The University of Western Australia
WAHRI	Western Australian Herbicide Resistance Initiative

APPENDIX 6 - COMMUNICATION PLAN (MARCH 2007)

ITEMS
Institute Launch
<ul style="list-style-type: none"> • Official launch 2007 (March 30) • Invite 'whose who' in agriculture
Institute Brochure
<ul style="list-style-type: none"> • High quality brochure for distribution and on the website
Institute Strategic Plan
<ul style="list-style-type: none"> • First draft developed for the EAB meeting scheduled for 30th March 2007
Institute of Agriculture Website
<ul style="list-style-type: none"> • Hosted on UWA domain. • Contents (Background and information, structure, staff, Program leaders, EAB members) • Top Alumni profiles
Institute of Agriculture Newsletter (3-4 newsletters per year)
<ul style="list-style-type: none"> • Identify the target audience (e.g. farmers, industry, alumni etc.). • Distribution list being developed from internal mailing list, alumni, major funding bodies, agribusiness, grower groups, and research institutions)
Brendon Cant and Associates (BCA)
<ul style="list-style-type: none"> • Regular press releases on various topics - 10 to 12 per year
Banners
<ul style="list-style-type: none"> • Promotional display boards for events
Agriculture and Food Lecture series
<ul style="list-style-type: none"> • 4 to 5 per annum on bigger picture stories by eminent local, national and international speakers • Post-graduate research in Agriculture at UWA. Showcase one per year • One lecture per year to first year Agricultural students to excite them- big picture. In conjunction with Orientation Day.
Engagement with Australian Institute of Agricultural Science and Technology
<ul style="list-style-type: none"> • Engage both Undergraduates and Post-graduates

Institute of Agriculture “Open day”
<ul style="list-style-type: none"> • Farmers, industry, community • Once every two years • Crawley and Shenton Park. Suggest a date in August
ITEMS
Agricultural Industry Forum
<ul style="list-style-type: none"> • On selected topics – one or two per annum • Targeted at the Industry
Farmer and Industry Group visits to UWA
<ul style="list-style-type: none"> • Invite farmers/industry groups • Provide brief topics , capability and contacts of various schools and the Centres • Based on demand
Feature articles
<ul style="list-style-type: none"> • Kondinin Group Magazine • Australian Grains Magazine • Animal Magazine
Funding body visits to UWA
<ul style="list-style-type: none"> • Target one or two funding bodies per year
Promotion of Agriculture Undergraduate and post-graduate programs
<ul style="list-style-type: none"> • In partnership with Schools and Faculty • Regional and Metropolitan schools • Post-graduate promotion - domestic and overseas
UWA Expo
<ul style="list-style-type: none"> • Coordinated promotion of Agricultural Science Degrees in partnership with FNAS
Rural Agricultural Expo’s
<ul style="list-style-type: none"> • Dowerin Field Day, Perth Royal Show, Mingenew Expo, Wagin Woolarama
Impact Assessment
<ul style="list-style-type: none"> • Commission impact assessment of one or two major agricultural activities/ projects at UWA • Widely publicise the outcomes to industry and funding bodies
Scientific Papers
<ul style="list-style-type: none"> • Original papers and review articles
Institute Annual Research Report
<ul style="list-style-type: none"> • Research and development summaries

APPENDIX 7 – PROGRAMS

PROGRAM LEADERS - CONTACT DETAILS

	Title	Leader/Deputy Leader
1. ILWM	Integrated Land and Water Management	Leader: Professor Zed Rengel Email: zed.rengel@uwa.edu.au Deputy Leader: Dr Daniel Murphy Email: dmurphy@cyllene.uwa.edu.au
2. APS	Animal Production Systems	Leader: Professor Graeme Martin Email: gmartin@cyllene.uwa.edu.au Deputy Leader: Dr Phil Vercoe Email: pvercoe@animals.uwa.edu.au
3. PPS	Plant Production Systems	Leader: Professor Stephen Powles Email: spowles@plants.uwa.edu.au Deputy Leader: Dr Guijun Yan Email: gyan@plants.uwa.edu.au
4. REPD	Rural Economy, Policy and Development	Leader: Professor Matthew Tonts Email: mtonts@cyllene.uwa.edu.au Deputy Leader: Dr Graeme Doole Email: gdoole@cyllene.uwa.edu.au
5. EOTE	Education, Outreach and Technology Exchange	Leader: Professor Kadambot Siddique Email: ksiddique@fnas.uwa.edu.au and Leader: Mrs. Christine Richardson Email: christine.richardson@uwa.edu.au

PROGRAM 1 - INTEGRATED LAND AND WATER MANAGEMENT

Leader: Professor Zed Rengel

Deputy Leader: Dr Daniel Murphy

OBJECTIVE

Enhance the sustainability of farming systems by (i) providing leadership in dealing with major challenges in managing land and water resources in agricultural and natural systems, and (ii) addressing industry issues and needs from a strong scientific base.

BACKGROUND

Western Australia's agriculture (including broad-acre agriculture, horticulture, viticulture and agroforestry) is based on ancient, highly leached soils of poor chemical, physical and biological fertility, including low water-holding capacity. This impoverished soil resource is now subject to a trend of decreasing rainfall (climate change) exacerbated by short-term water scarcity due to more frequent drought (climate variability). In addition to the temporal changes, integrated water and land management must address spatial issues and impacts - from paddock, to catchment, to landscape - in order to take a proper account of on-site as well as off-site effects of land and water management.

Water management in the continuum of agricultural and natural landscapes needs to include considerations of water use in urban and peri-urban environments. Water, as an increasingly scarce commodity, will become progressively more expensive; hence, agriculture, as a relatively low value user of water, will have to demonstrate the best possible water management that maximizes yield and return (\$ per unit of water) whilst at the same time minimizing adverse environmental impacts such as off-site movement of agrochemicals. It may also need to use water of lower quality than at present, including treated wastewaters.

Traditionally, land management has been based on a notion of extracting maximum profitability from a farming system. However, future land management in agriculture will increasingly have to take into consideration the carrying capacity of land in order to achieve sustainable use. In addition, improvement of the soil resource, where it has been impoverished by years of exploitation, will need to be accomplished before the goal of sustainability can be achieved.

It is of utmost importance that a sustainable water and land management regime can be realized in profitable farming systems. This nexus between sustainability and profitability will ensure continuing viability for rural

communities, which are vital for land and water management on a broad scale.

CHALLENGES FOR THE INDUSTRY

The basic challenge of sustaining yields and profitability in farming systems is inextricably linked to the integrated management of land and water as the two major environmental resources. Sustainability needs to be achieved in environments with decreasing rainfall and frequent severe water scarcity linked to the drying climate in the south west of WA. An additional challenge is escalating climate variability that causes increasing uncertainty for management and for yield prediction. In many farming systems, sustaining yields and profitability can only be achieved via a major improvement of the soils resource base, especially from the standpoint of water-holding capacity and biological fertility. Improving and maintaining soil quality (with a particular emphasis on soil biological fertility) will enhance sustainability and will also underpin the transition to the sustainable environmental management systems that will be demanded by quality-conscious markets for agricultural products.

NOVEL SCIENCE AND TECHNOLOGY

State-of-the-art analytical capabilities to characterize chemical, physical and biological properties of land and water, coupled with world-class microscopy equipment, underpin the research in integrated land and water management in the Institute. The strong scientific background and extensive experience in farming systems of program members ensures development of novel science and technology as well as transfer of such knowledge into practical agriculture. Some recent examples of producing new technology based on novel science include a risk-assessment tool for predicting pesticide leaching, a set of soil quality indicators, methods for fractionation of organic matter; and the monitoring of greenhouse gasses (N_xO) for model parameter validation.

EXPERTISE

Program members have a broad range of expertise in basic sciences (soil chemistry, soil physics, geology, mineralogy, microbiology, crop physiology etc) combined with the knowledge and capacity in modeling the hydrological cycle from rainfall patterns to crop uptake and evapotranspiration. Areas of expertise include water percolation into soil profile; transport of water and solutes in the soil-water-plant continuum; surface chemistry and biology (soil particle and root surfaces); pesticide leaching; soil erosion; decomposition of organic matter and nutrient cycling; crop-microbe interactions; soil acidity and the formation of acid sulphate soils; acidic drainage waters, ecologically-wise disposal of saline waters; links between soil mineralogy and soil functions; soil fertility and productivity of farming systems; aluminium and

heavy metal toxicity and environmental flows in agricultural landscapes. Highly motivated honours and postgraduate students contribute to project activities within this program.

OUTCOMES

SCIENTIFIC

Increased understanding of the chemical, physical and biological components of the soil-water-plant continuum and interactions among these components; and development and application of simulation models underpinned by understanding of relevant process and interactions at spatial scales ranging from paddocks to catchments.

COMMERCIAL/INDUSTRY

Improved capacity to harvest water and nutrients and convert them to yield; understanding of soil quality parameters and sustainable management; improved capacity to link rainfall predictions to management actions on the ground; and a range of risk-assessment tools and decision-support systems allowing farmers to improve their land and water management.

PROGRAM 2 - ANIMAL PRODUCTION SYSTEMS

Leader: Professor Graeme Martin

Deputy Leader: Dr Phil Vercoe

OBJECTIVE

Our general objective is to develop *clean, green and ethical systems for improved animal production*. This concept is more than a major driver of our research because we also incorporate it into all of our teaching in the science of animal production.

Most of our scientific effort focuses on pasture-based, extensive production systems, although we are also involved in the more intensive industries, such as aquaculture, pig meat, poultry and dairy cattle. In addition, we have a significant research effort in the breeding of game birds, including the ratites (the emu and ostrich).

BACKGROUND

Animal industries around the world are being challenged by changing consumer attitudes to animal products - there is an increasing consumer demand for products that are '*clean*', '*green*' and *produced to agreed ethical standards* – and this is impacting the marketplace. For the animal industries, including the producers, this can be turned to advantage because, as we work towards a better understanding of the physiology and behaviour of our animals, we can improve productivity and profitability and, simultaneously, promote *clean, green and ethical* production.

What do these three words signify?

CLEAN

Here, we focus on human health – the drive toward reducing or even eliminating potentially detrimental hormones, drugs and chemicals in the animal products, plus the concept of nutraceuticals, in which components of food that might be beneficial for human health are promoted (e.g., 'healthy fats'). There is little doubt that, in general, this demand is driven by market forces that are rarely themselves generated by scientific argument – hormonal treatments rarely leave residues, especially after withholding periods, and it is relatively easy to demonstrate that products from animals that have not been treated with exogenous hormones can contain significant amounts of the same hormone (e.g., steroids in cow's milk). The positive aspect of the demand for clean products is that the demand comes from modern, high-priced markets where farmers can make large profits (e.g., the market for so-called 'organic' products).

GREEN

We should consider the impact of the industry on the environment, with the aim of minimizing the impact and making the industry more sustainable for

the long-term future. For producers, the most important issues are the production of greenhouse gases by ruminants, the production of animal waste (especially for intensive animal industries), and the excessive use of fertilizers to generate animal feeds. The need to minimize environmental impact also applies to the allied industries ... those that participate in the processing of the products from the farm (e.g., transport, abattoirs, and milk factories). Again, if we can say that our industry is green, it will help with the marketing in highly developed economies and, at the same time, guarantee the long-term future of the industry.

ETHICAL

Here, the obvious focus is the attitude of the industry to the animals themselves. Animal welfare is a major concern for all industries that are working in sophisticated markets, where the consumers expect their products to be derived from animals that have been managed sympathetically. This can be a complex issue because, by pursuing a clean image and avoiding the use of antibiotics, for example, we may compromise the welfare of the animals. In addition, the application of ethical judgment needs to be broader than simply animal management, but should include clean and green aspects of the transport, manufacturing and processing sectors – the processing, packaging and marketing of the products.

CHALLENGES FOR THE INDUSTRY

Animal industries around the world are being challenged by changing consumer attitudes to animal products. Consumers purchasing decisions are increasingly influenced by their perceptions of the animal production process, and in consequence there is an increasing demand for products that are *clean, green and produced to high ethical standards*. This is particularly evident in discerning markets, where the potential profits are highest.

NOVEL SCIENCE AND TECHNOLOGY

For the animal industries, including the producers, the consumer-led drive towards clean, green and ethical production systems need not pose difficulties or increase costs. On the contrary it is an opportunity. By working towards a better understanding of the physiology, nutrition, genetics and behaviour of our animals, we can often improve productivity and profitability and, simultaneously, promote *clean, green and ethical* production. Thus, the scientific core of our research is our holistic approach to the animal and its environment, in which we consider all of the factors that it has to respond to in order to survive and prosper. We can then develop ways to manage the animals and improve their productivity by manipulating their environment.

EXPERTISE

The Animal Production Systems group has expertise and interests in: avian reproductive biology (in particular of the emu, the ostrich and game birds),

reproductive physiology in sheep and cattle, rumen physiology and microbiology, the impact of diet on animal product quality, and the nutrition of poultry. There is special interest in the behaviour of animals including the impact of selection for calm temperament on the management and welfare of ruminants. The Program also has expertise in aquaculture including production technology, nutrition, breeding, and bio-economics.

OUTCOMES

SCIENTIFIC

The general outcome is a deep understanding of the way that animals 'measure and interpret' their environment, and then respond to environmental challenges. The responses of animals to changes in their environment differ among species (goats, sheep, birds) and among genotypes so, ultimately, we expect our research to yield a molecular genetics explanation of the reproductive, metabolic, behavioural and physiological processes involved. For example:

- When sheep are genetically selected for calm or nervous temperament, which genes are affected and which other processes, apart from the behaviour, are altered?
- Why does the Merino sheep respond so profoundly to socio-sexual signals (ram-induced ovulation) whereas other genotypes (basically, the meat breeds) do not? Which brain pathways are involved? Does the effect involve memory?
- What explains the differences among species with respect to tissue accumulation of conjugated linoleic acids (healthy fats)?
- How does a change in nutrition affect the processes within the ovary that control the development of follicles and thus the number of ovulations?
- Among the new forages being developed, are there plants that produce 'nutraceuticals' that might help animals combat parasites or produce less greenhouse gas? How do these compounds work at the molecular level?
- How do we use these new forages to develop novel production systems based on plant mixtures that are suitable for different landscapes, as well as being both sustainable and profitable? How do we use grazing behaviour and an animals' ability to 'self-medicate' in the design of these novel systems?

COMMERCIAL/INDUSTRY

The primary outcomes of our research programs are improved systems for managing farm animals within a *clean, green and ethical* framework. Manipulation of the animals' environment is the primary focus. Thus, for the management of extensive sheep flocks, we have concepts such as 'focus

feeding' and the 'ram effect' for controlling reproduction, and the development of quantitative breeding values for improving temperament. The same principles are used, wherever feasible, in our advice to other animal industries, such as the dairy, aquaculture, beef and pig-meat industries.

PROGRAM 3 - PLANT PRODUCTION SYSTEMS

Leader (Extensive agriculture): Professor Stephen Powles

Deputy Leader (Intensive agriculture): Dr Guijun Yan

OBJECTIVE

Contribute to the productivity and sustainability of plant-based Australian agriculture through the application of science and technology.

Australian agriculture includes a large land area (300-600 mm winter rainfall) devoted to rain-fed annual temperate crops, pastures/livestock (hereinafter referred to as extensive agriculture and/or the grain-belt). There is also much more intensive agriculture in areas of high rainfall and/or irrigation with crops (cotton, vines, orchards, vegetables, flowers etc), perennial pastures/livestock and other higher value agricultural products. Accordingly, the UWA Institute of Agriculture Plant Production Systems activities are separated into the two areas of extensive and intensive agriculture.

EXTENSIVE AUSTRALIAN AGRICULTURE (GRAINBELT)

BACKGROUND

Annual crops and pastures dominate across a vast area of south-western Western Australia and other Australian states (termed the grainbelt). Within the grain-belt, agricultural activity is centred on the production of rain-fed winter cereals (mainly wheat then barley) grown in rotation with canola, pulse crops (lupins, field peas, faba beans, chickpeas etc) and/or legume based annual pastures grazed by livestock (sheep, cattle). Much of the Australian grain-belt has a mediterranean type climate characterised by a lengthy hot summer devoid of effective rainfall and a moist winter/spring growing season with approximately 200-500 mm rainfall. The growing season (April-October) commences with seasonal drought-breaking autumn rains (an opening break). Within weeks of the season break (15 mm or more rainfall); crops are seeded using minimum to zero tillage systems (pasture areas show volunteer emergence from the seed bank). Plant growth is slow through the usually wet winter months, followed by a short period of rapid growth then flowering during the warmer, yet still moist, spring months. Seed maturation in annual crop and pasture species is hastened as day temperatures rise and plants experience water stress in late spring. High temperature and the cessation of rainfall means that the annual crops/pastures produce seed and desiccate in late spring. Crop harvest occurs in November/December.

It is important to realize that, by world standards, Australian farms are large. Average WA grain-belt crop/pasture family farm enterprises are upwards of 3000 hectares. The predominant farming system can be described as highly

mechanized, with low-inputs (e.g. herbicide, fertilizer and labour) and relatively low-output. The challenge of sustaining plant and livestock profitability in the farming system is linked to maximizing rainfall utilization and hence plant productivity achievable during the short winter-spring growing season. In the past three decades there has been a marked intensification and expansion of annual cropping, with reduced livestock numbers and reduced emphasis on pasture productivity. There has been very high adoption of minimum/zero tillage crop seeding with farmers minimizing soil tillage and devoting more of the farm to crop and less to livestock production.

CHALLENGES FOR THE INDUSTRY

Major productivity and sustainability challenges exist within the Australian grain-belt. Particularly in the WA grain-belt, there is the longer term challenge resulting from rising saline water-tables and subsequent land degradation (dryland salinity). A significant challenge to intensive cropping is posed by high weed pressures due to widespread evolution of herbicide resistance in weeds. These and other significant issues require research and development attention.

NOVEL SCIENCE AND TECHNOLOGY

UWA has high quality infra-structure for modern plant science research, both fundamental and applied. Excellent laboratories and plant growth facilities are situated on the main UWA campus and at the nearby Shenton Park field station which has land and infra-structure for the conduct of field agronomic experiments, plant breeding and other plant production activities.

EXPERTISE

Key UWA staff members, postdoctoral fellows and post-graduate students are working in plant production research, applicable to the Australian grainbelt. Undergraduate students pursue subject units in crop and pasture science and have the opportunity to conduct final year research projects in these areas. Of major importance is that there are four UWA-based research centres with significant activities focused on plant production systems within the Australian grain-belt. These are the Centre for Legumes in Mediterranean Agriculture (CLIMA), the CRC-Future Farming Industries and the WA Herbicide Resistance Initiative (WAHRI). Additionally, there is a canola breeding company (CBWA) based at UWA.

INTENSIVE AUSTRALIAN AGRICULTURE

BACKGROUND

Intensive agriculture in Australia embraces many important industries including irrigated broadacre crops (cotton, rice, etc), horticulture (trees, nuts, vines, fruits, vegetables, flowers and turf), agro-forestry, controlled environment (such as glasshouse) and plant nurseries. Access to areas with suitable soil, temperature and rainfall and/or access to water for irrigation largely determine the geographic distribution of intensive agriculture, but in some cases the industries are centred on metropolitan zones (some horticulture, plant nurseries). Tropical fruit production is mainly in northern Western Australia, the Northern Territory and northern Queensland, whereas subtropical and temperate fruits are mainly located in southern parts of Australia with suitable microenvironments. Intensive agriculture can be characterised as high input-high output and optimizing the factors affecting profitability is a main focus of research. Development and adoption of new and profitable cultivars, suitably zoned production of different crops, increased fertilizer and water use efficiency, highly mechanized operation and reduced labour input, and the development of fine-tuned production systems for different crops are just a few priority research areas for these industries.

CHALLENGES FOR THE INDUSTRY

Major challenges for Australian intensive agriculture include high labour costs, long distance transport to overseas markets and increased land value pushing new growers to marginal areas. Global climate change is another challenge for the industry.

NOVEL SCIENCE AND TECHNOLOGY

To meet these challenges, an integrated approach to breeding and/or adapting new cultivars, high yield and quality and post-harvest maintenance of quality are important priorities. Intensively grown plants, especially in marginal areas, require balanced water and nutrient supply and protection from disease and pest attacks. Research in understanding plant stress physiology and the associated biochemistry, proteomics and genomics, and integrated pest and disease control are key to the further development of these industries. Other important research areas include evaluation of the potential for nutraceutical/pharmaceutical value of products, post-harvest handling and processing, agronomy of diverse crops and artificial manipulation of growth and reproduction under Australian conditions.

EXPERTISE

As indicated earlier, UWA has high quality infrastructure for modern plant science research, with excellent laboratories and plant growth facilities on the main UWA campus. The nearby Shenton Park field station has land and infra-structure for field agronomic experiments, plant breeding and other plant production activities. Key UWA staff members, postdoctoral fellows and post-graduate students are working in plant production research, applicable to intensive agricultural crops including but not limited to wild flowers, nursery plants, tropical and temperate fruits, agro-forestry plants, turf grass, olives, grapes, *Brassica* vegetables, potatoes and tomatoes. There is interest in organic production. UWA research strength in intensive agriculture includes genetics and breeding of new cultivars, physiological, biochemical and genetic understanding, agronomy and plant production systems and disease and pest control. To support research in intensive agriculture areas, UWA has modern molecular, tissue culture and plant physiology and biochemistry laboratories at the main campus and turf, wine, wildflower, olive research facilities at the Shenton Park field station.

OUTCOMES

SCIENTIFIC

Underpinning science which is ultimately manifested in the sustainable, economic production of agricultural plants within Australian agriculture. The understanding and application of plant science from the laboratory to production in the field.

COMMERCIAL/INDUSTRY

Delivery of improved crop and pasture varieties for Australian agriculture. Delivery of technology and decision-support models for use in plant production systems.

PROGRAM 4 - RURAL ECONOMY, POLICY AND DEVELOPMENT

Leader: Professor Matthew Tonts

Deputy Leader: Dr Graeme Doole

OBJECTIVE

The objective of the Rural Economy, Policy and Development program is to enhance the sustainability of rural industries, communities and regions. More specifically, the program aims to provide innovative research and education that:

- Improves the productivity and prosperity of agricultural industries;
- Addresses the environmental challenges facing rural regions;
- Contributes to the broader economic and social development of rural industries, communities and regions;
- Enhances decision-making and rural policy.

BACKGROUND

The Rural Economy, Policy and Development program of the Institute of Agriculture recognizes that agriculture is fundamentally a human activity with important social, economic and environmental dimensions. It draws on expertise from a range of social sciences, including economics, geography, history, policy studies and sociology to provide insights into agricultural issues and problems.

A central concern of the program is with maintaining or improving the productivity and sustainability of farm businesses and the families that they support. The program pays particular attention to farm economics, land use, commodity mix, and production methods, farming practices, business management, property planning and natural resource management.

At a wider scale, the program is interested in the broad economic and social processes and problems in rural areas, many of which are linked directly to processes occurring at the farm level. These include rural demographic change, regional economic development, land use, natural resource use, and Indigenous issues. Other issues that come under the theme include rural employment, rural infrastructure and service provision, and socio-cultural change.

The research conducted as part of the program is designed to contribute to both education (at undergraduate and postgraduate levels) and enhanced rural policy. Members of the program have an outstanding track record of engaging with policy and planning processes, thereby contributing to improvements in the economic, social and environmental conditions of rural areas.

CHALLENGES

Agriculture not only provides food and fibre for the world, but also makes a direct and indirect contribution to the economic and social wellbeing of millions of people engaged in the industry. Yet there are increasing concerns about the capacity of agriculture to continue to underpin development, particularly given the range of economic, social and environmental challenges facing the industry. These challenges include:

- Ongoing cost price pressures in agricultural industries,
- Difficult and complex trading conditions in domestic and international markets,
- The need to ensure food safety and quality,
- Agricultural policy reform, particularly the liberalization of trade and removal of industry protection,
- Economic, social and cultural barriers to the adoption of innovations that will improve the productivity, profitability and sustainability of agriculture,
- Environmental degradation and the associated loss of productive land,
- The loss of productive agricultural land to urban and other uses, particularly in the peri-urban and growth zones,
- Land tenure issues, particularly in the Australian rangelands,
- Shortages in skilled and unskilled labour in agriculture and allied industries,
- Demographic changes, including out-migration, depopulation, an ageing population, and counter-urbanization pressures,
- Low incomes and poverty, particularly in developing areas/countries,
- The adequate provision of services and infrastructure,
- Declining stocks of social and human capital in rural areas under economic stress,
- Deteriorating levels of social wellbeing in many rural communities.

EXPERTISE

Rural Economy, Policy and Development program members have a broad range of expertise in the disciplines related to rural economy, development and policy, including economics, geography, history, planning and the other social sciences. The breadth of expertise spans not only the Australian context, but also China, India, Bangladesh, South East Asia, Africa, Europe and many other parts of the developed and developing world.

NOVEL SCIENCE

Members of this program have made significant contributions to the analysis of agricultural industries and rural economies. The Agricultural and Resource Economics group within the University have made leading contributions to the analysis of farm economies, agricultural markets, the valuation of environmental resources, bioeconomic modeling, and agricultural extension. The Human Geography group has conducted cutting edge research on the linkages between agriculture and rural economic development, the spatial structure of rural economies, social and demographic change, and rural services and infrastructure. A number of other social scientists working in Anthropology and History have provided novel insights into the cultural and political values associated with natural resources and agricultural landscapes. All of these groups have postgraduate and honours students working within them on issues related to rural economies, policy and development.

OUTCOMES

SCIENTIFIC

The program is providing important empirical and theoretical insights into the economic, social and political aspects of rural economies at geographical scales ranging from the farm through to the region. The program has also contributed to a better understanding of the linkages between agricultural industries and wider processes of social and economic development.

COMMERCIAL/INDUSTRY/COMMUNITY

Members of the program actively work with farmers, government agencies and community groups to enhance the economic and social conditions in rural areas. Important outcomes in this regard include: understanding the economics of agricultural systems and natural resource use; improved data on rural economic and social conditions/trends; risk assessment; and the analysis of agricultural and rural policy.

PROGRAM 5 - EDUCATION, OUTREACH AND TECHNOLOGY EXCHANGE

Leaders: Professor Kadambot Siddique and Mrs. Christine Richardson

OBJECTIVE

The Education, Outreach and Technology Exchange program has the following objectives:

- To attract and train outstanding undergraduate and post-graduate students in a range of scientific disciplines leading to careers in agriculture and natural resource management;
- To provide professional training to people already in the workforce to augment their skills to better serve the agricultural and natural resource management industries;
- To facilitate opportunities for technology exchange & knowledge transfer to industry & the rural community
- To communicate the role of the University of Western Australia in education, training and technology exchange to farmer groups, agribusiness, collaborators(national and international), funding bodies and potential students, highlighting the benefits contact with UWA may bring; and
- To raise public awareness and understanding of the significance of agriculture and natural resource management to WA and national economy

BACKGROUND

The Institute of Agriculture is the University of Western Australia's gateway to education, training and research in agriculture and natural resource management. Established in 1938, the Institute coordinates the teaching, graduate and post-graduate training, research and agri-business activities of the University. The Institute is based within the University's Faculty of Natural and Agricultural Sciences and integrates the Faculty's activities with those of other groups in the University with interests in agriculture, land and water management, rural economy, policy and development, food and health.

The Institute is committed to high quality undergraduate and postgraduate teaching in agriculture and natural resource management through the Faculty of Natural and Agricultural Sciences. The Faculty has approximately 180 full time equivalent undergraduate students and more than 125 higher degree students in agriculture and natural resource management. Flexible three and four year Bachelor of Science degrees are offered and these can be combined with degrees in Arts, Commerce, Economics, Education,

Engineering and Law. Degrees offered include Bachelor of Science in Agriculture and Bachelor of Science with programs and majors as diverse as Animal Science, Genetics and Breeding, Soil Science, Conservation Biology, Land Rehabilitation, Viticulture and Oenology, Horticulture and Agricultural.

The Institute, through FNAS and its 4 schools, is positioned to provide exceptionally strong postgraduate research programs in agriculture and natural resource management through the breadth of interests of its academic staff and this is demonstrated through the 125+ enrolled doctoral (Ph D) students. A range of other post-graduate programs are offered including Graduate Diplomas and Master of Science (by Coursework or by Coursework and Dissertation or by research).

The Institute of Agriculture aims to strengthen the University's linkage to rural communities and the Institute is already home to the Grower Group Networks (GGA and LFGN), Soil Health Extension and the Western Australian No Till Farmers Association (WANTFA).

CHALLENGES FOR THE INDUSTRY

Challenges for the industry in Education, Training and Technology Exchange include:

- A shortage of talented undergraduate and post-graduate (especially Australian resident) students to undertake agricultural and natural resource management studies.
- A shortage of qualified and well trained agricultural researchers and extension specialists to serve the industry.
- The small size of the research community and its physical isolation from the major Australian and international research groups which makes it difficult to attract talented researchers and significant new funding to WA, and may slow the transfer and adoption of new technology.

RESPONDING TO THE CHALLENGE

The Institute recognizes that attracting and retaining students is critical to providing expertise for the rural industries in the future and strategies to attract and retain students include:

- Attracting students with a rural background into agriculture studies
- Emphasising the role of agriculture in human and environmental welfare
- Highlighting the international career opportunities offered by agriculture and natural resource management

- Providing opportunities for undergraduate and post graduate students to participate in the activities of the Faculty from their first entry to the University
- Increasing the number of scholarships to promote close interaction with industry
- Including both classical and new technologies in undergraduate training

The small size of the research and advisory communities and relative remoteness of rural Western Australia mean that it is often difficult for established professionals to keep abreast of the latest technical developments. The Institute has the expertise, either in-house, or through its national and international contacts to address this issue and will promote and develop innovative training opportunities and industry workshops for research and industry staff in key areas of agriculture and natural resource management.

Strategies to provide professional development include:

- Establishing a mechanism to identify professional development needs
- Partnering with other organizations (AIAST, WANTFA, AAAC) to organize professional development
- Using Institute contacts/resources to bring international experts to Western Australia to participate in training opportunities

The rapid adoption of new technology has characterised the Australian rural industries in the past and will be equally critical in the future. The Institute will facilitate opportunities for technology exchange & knowledge transfer to industry & the rural community.

Strategies to strengthen technology exchange include:

- Facilitation of participatory research and development activities with farmer groups and industry-linked projects.
- Provision of information through public forums, the Institute Website, press-releases and other educational products, on agriculture and natural resource management developments at UWA.

EXPERTISE

The Institute has access to highly qualified and internationally recognized researchers and teachers (in a range of disciplines) based in its various schools and Centres. Several groups and individuals have excellent contacts and connection with the industry. Modern laboratory, glasshouse, lecture theatres and other field facilities are also available.

OUTCOMES

SCIENTIFIC

Rapid adoption of new technology developed either at the University or elsewhere. This Program's role is to stimulate technology awareness and exchange and to facilitate access to the knowledge that will enable the rural industries to evaluate and adopt technology

COMMERCIAL/INDUSTRY

Agricultural graduates and post-graduates with modern scientific, analytical, communication and entrepreneurial skills will enable agribusiness to effectively serve the agricultural and natural resource management industry.

Agricultural and natural resource management professionals trained in recent developments in agricultural and natural resource management technologies will serve their clients more effectively.

Through participatory research and development initiatives farmers will be able to evaluate new technology and provide feedback to directly influence the direction of research.