



# PAPUA NEW GUINEA NATIONAL AGRICULTURAL RESEARCH INSTITUTE



**Contributing to Improved Welfare of  
Farming and Rural Communities in PNG**



## **STRATEGY AND RESULTS FRAMEWORK 2011-2020**



**A Strategic Contribution to Realising  
PNG Vision 2050**



**DROUGHT  
RESPONSE:  
ON-FARM COPING  
STRATEGIES**

Compiled by Debbie Knight, Sandra Farley, Claire Kuhn and Bruce Hume  
May 2007  
PUBLISHED BY NARI  
0900-0000-0000-0000



**CORPORATE DOCUMENT NO. 8  
2011**

*Promoting Excellence in Agricultural Research for Sustainable Development*





**PAPUA NEW GUINEA  
NATIONAL AGRICULTURAL  
RESEARCH INSTITUTE**

**Contributing to Improved Welfare of Farming  
and Rural Communities in PNG**

**STRATEGY AND RESULTS  
FRAMEWORK  
2011-2020**

**A Strategic Contribution to Realising  
PNG Vision 2050**

**The National Agriculture Research Institute (NARI)** was established by an Act of National Parliament of Papua New Guinea (PNG) in July 1996 as a public funded, statutory research organisation, to conduct and foster applied and adaptive research into:

- i) any branch of biological, physical and natural sciences related to agriculture;
- ii) cultural and socioeconomic aspects of the agricultural sector, especially of the smallholder agriculture; and
- iii) matters relating to rural development and of relevance to Papua New Guinea.

Besides, NARI is responsible for providing technical, analytical, diagnostic and advisory services and up-to-date information to the agriculture sector in PNG.

The Institute's purpose (strategic objective) is to accomplish enhanced productivity, efficiency, stability and sustainability of the smallholder agriculture sector in the country so as to contribute to the improved welfare of rural families and communities who depend wholly or partly on agriculture for their livelihoods. This is intended to be accomplished through NARI's mission of promoting innovative agricultural development in Papua New Guinea through scientific research, knowledge creation and information exchange.

In its vision for PNG, NARI sees "Prosperous PNG Agricultural Communities".

### **NARI Logo**



The letters NARI are the initials of the National Agricultural Research Institute. The PEOPLE symbolise those included in the mandate of NARI such as farmers, researchers, extension agents, partners, NGOs etc, backed with BLUE to encompass the sky and the macro environment. The LEAF symbolises crops, backed with GREEN to depict the crop environment. The PIG and CHICKEN heads symbolise livestock. The RED background portrays the toil and sweat of the people.

### **ISBN 9980-932-75-9**

Copyright 2011 National Agricultural Research Institute (NARI). All rights reserved. Reproduction and dissemination of material in this report for educational or other non-commercial purposes are authorised without any prior written permission from the copyright holders provided the source is fully acknowledged. Reproduction of material for resale or other commercial purposes is prohibited without written permission of:

Director General, NARI, Sir Alkan Tololo Research Centre, P.O. Box 4415, LAE 411, Morobe Province, Papua New Guinea. Email: [naripng@nari.org.pg](mailto:naripng@nari.org.pg)  
Website: <http://www.nari.org.pg>

## Table of Contents

Foreword .....	iii
Executive Summary .....	v
Acronyms and Abbreviations .....	xi
1. The Institute .....	1
2. Agricultural Research for Development .....	2
2.1 Agriculture - the Development Focus in PNG .....	2
2.2 Agricultural Research for Development (AR4D) .....	3
2.3 A Strategy and Results Framework .....	4
2.4 Pathways to Development Impact .....	6
2.5 NARI SRF Planning Process .....	7
3. NARI Strategy and Results Framework .....	8
3.1 Goal and Strategic Objective .....	8
3.2 Development of Institute Strategies .....	9
3.2.1 Major threats and constraints to productivity of the sector .....	10
3.2.2 Opportunities for Development of the Sector .....	12
3.3 Programme Strategies .....	13
3.3.1 Programme - Agricultural Systems .....	14
3.3.2 Programme - Enabling Environment .....	17
3.3.3 Programme - Information and Knowledge .....	19
3.4 Cross-cutting issues .....	20
3.4.1 Women .....	20
3.4.2 HIV/AIDS and potential impact on agriculture in PNG .....	21
3.4.3 Youths .....	22
4. Institutional Arrangements towards realising Impacts .....	23
4.1 Sub-programme- Human Talent Development and Management .....	24
4.1.1 Human talent mobilisation and development .....	24
4.1.2 Congenial working environment .....	24
4.1.3 Staff performance management review systems .....	25
4.2 Sub-programme- Partnerships, Networks and Client services .....	25
4.3 Sub-programme- Planning, Monitoring, Evaluation and Impact Assessment .....	25
4.4 Sub-programme- Resource Mobilisation .....	27
4.5 Sub-programme- Leadership and Governance .....	28
5. Way Forward .....	29
References .....	30
Annex 1. Agricultural Development Domains .....	32
Annex 2. NARI Results Framework .....	34
Annex 3. Complete list of Project Areas in Various Agricultural Development Domain (ADD) Clusters .....	39

### List of Tables

Table 1. Sub-programmes and indicative focus of project portfolios in Programme - Agricultural Systems .....	16
Table 2. Sub-programmes and indicative focus of project portfolios in Programme- Enabling Environment.....	18
Table 3. Sub-programmes and indicative focus of project portfolios in Programme- Information and Knowledge .....	19
Table 4. Key strategies for effective contribution to improved gender equality in PNG agriculture .....	21
Table 5. Key strategies in limiting the expansion of HIV/AIDS epidemic and supporting affected individuals and farming communities .....	22
Table 6. Major strategies creating opportunities for youths to effectively engage in agriculture .....	22
Table A1. Summary of major Agricultural Development Domain (ADD) clusters .....	33
Table A3.1 Project Areas in Programme - Agricultural Systems .....	39
Table A3.2 Project Areas in Programme - Enabling Environment .....	41
Table A3.3 Project Areas in Programme - Information and knowledge .....	42

### List of Figures

Figure 1. Agriculture and socio-economic development in PNG .....	3
Figure 2. Agricultural research for development and linkages to other sectors.....	5
Figure 3. Interconnected levels of operation in AR4D system .....	6
Figure 4. Pathways to development impact .....	7
Figure 5. NARI contribution to sectoral and national development.....	9
Figure 6. Contribution of development outcomes to development impacts - NARI Goal and Strategic Objective and indicators of success .....	10
Figure 7. Synergies and complementarities of NARI programmes.....	13
Figure 8. Agricultural Development Domain clusters in PNG .....	15
Figure 9. NARI Planning, Monitoring and Evaluation system .....	26
Figure 10. Organisational structure for implementation of SRF.....	28

## Foreword

Agricultural research and innovative agricultural development are fundamental contributors in socio-economic development of PNG. The PNG National Agricultural Research Institute (NARI) with its mandate of research on all aspects of agricultural development is well placed to make a major contribution to improving the welfare especially of smallholder farmers and rural communities.

NARI in its short history has a proud record of delivering on a range of technologies and innovations to the sector. However, in recent years concerns have been expressed nationally and internationally on the effectiveness of agricultural research in contributing to development given the stagnant and often backward trends of development among rural communities. These concerns presented a necessary opportunity for NARI to assess and review its planning and implementation processes and develop strategies to enhance the Institute's effectiveness in better serving its major clients, the smallholder farming and rural communities.

NARI adopted Agriculture Research for Development (AR4D) as its guiding paradigm that is also increasingly adopted internationally as a new approach of breaking the stubborn grip of poverty, hunger, malnutrition and environmental degradation prevailing in many developing countries. A key to AR4D is the recognition and following of the development pathways that are often complex and involve interactions of a range of different actors from within and outside the agriculture sector to achieve desired impacts.

NARI Strategy and Results Framework (SRF), an integral mechanism of AR4D, is intended to provide overall strategic direction to NARI's efforts so they are focussed along the research to development pathway in response to client needs, and consistent with current and medium term development priorities of target communities.

The core of the SRF is the results framework comprising of desirable results at the organisational goal and strategic objective level as well as at the level of thematic programmes and sub-programmes. These results are to be accomplished by NARI and its partners in its projects, programmes and, as an Institute, in response to constraints, opportunities and aspirations of smallholder farmers and rural communities in the country. Geographic information system (GIS) methods have been used to identify and depict spatial similarities and differences in agricultural development and classify the country into Agricultural Development Domains (ADD). Challenges and opportunities of farming communities in different ADDs formed the basis for deriving AR4D strategies.

The SRF takes a holistic approach encompassing not only the biophysical but also the socio-economic and cultural environment of the smallholder farmer sector including the cross-cutting issues of women, HIV/AIDS and youth. The results are planned so as to lead collectively to enhanced productivity, efficiency, stability and sustainability of the smallholder sector and eventually to contribute to an improved welfare of families and communities that depend wholly or partly on agriculture for their livelihoods. The consequent development impact is in realising PNG Vision 2050.

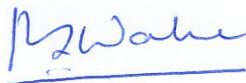
The SRF is to be implemented through two 5-year programme implementation plans that will contain detailed strategies and prioritised project portfolios for Programmes and sub-programmes including target ADDs or ADD clusters. The SRF is an evolving document

as the Institute has to remain flexible to accommodate the on-going changes in the internal and external environments within the Institute, country and overseas.

Successful implementation of the SRF will involve changes in mindsets and established approaches and challenge our scientists and partners to go beyond their traditional ways. It will require an increased resourcing of the sector and new and innovative resourcing mechanisms. Those are major challenges but as we learn, our understanding will grow and we, together with our clients, partners and stakeholders, will become even more effective.

We are confident that the SRF will provide articulated guidance and directions to NARI researchers, its partners and collaborators in further planning, prioritising and implementation of projects and activities.

We take this opportunity to convey our gratitude to all those that have supported and assisted NARI in developing the Strategy and Results Framework. Our recognition is due to untiring efforts by staff and management of the Institute. We wish to thank profoundly the Australian Government, for funding and advisory support through the AusAID sponsored Agricultural Research and Development Support Facility (ARDSF).



**Raghunath Ghodake**  
**Director General**



**John Kola**  
**Chairman**  
**NARI Council**



## Executive Summary

### NARI Vision, Goal and Purpose

In its Vision for PNG, NARI sees “Prosperous PNG Agricultural Communities” supported by the NARI Mission of promoting innovative agricultural development in PNG through scientific research, knowledge creation and information exchange. This is intended to be accomplished through the Institute’s purpose (strategic objective) of enhanced productivity, efficiency, stability and sustainability of the smallholder agriculture sector in the country so as to contribute to the improved welfare of rural families and communities who depend wholly or partly on agriculture for their livelihoods.

### Agriculture - the Development Focus

According to the World Development Report 2008 agriculture offers great promise for growth, poverty reduction, and environmental services. This is in particular so for



agriculture-based countries such as PNG where the majority of its population (>80%) earn their livelihoods in rural areas and depends on agriculture supported by fisheries and forestry for their food, income and employment and will do so for many more years to come. More than 90% of rural people are semi-subsistence smallholder farmers who produce crops for their own consumption and barter (subsistence) and sell for cash in markets. The agriculture sector in PNG has a large

untapped potential to assure food security, increase incomes and absorb much of the incoming labour force in gainful employment. Agriculture is therefore considered to be the primary focus for rural development and the most important means for economic growth and social improvement in the country.

### Agricultural Research for Development

Since its establishment in 1996, NARI developed rapidly into an Institute that is well recognised, both in the country and internationally, as a quality research institute of high development relevance for PNG and the Pacific. However, in recent years, concerns have been expressed nationally and internationally on the effectiveness of agricultural research in contributing effectively to development. These concerns presented a necessary opportunity for NARI to assess and review its planning and implementation processes and develop strategies to enhance the Institute’s ability in delivering on improved technologies and innovations to the smallholder farmers and rural communities in PNG. It was also an opportunity for the Institute to align its strategies with the PNG Government’s recently developed long-term development



strategy ‘Vision 2050’ (NSPTF 2009) and other key national planning documents including the DSP 2010-2030, MTDP 2011-2015 and NADP 2007-2016.

NARI adopted the Agriculture Research for Development (AR4D) paradigm, as the overarching approach for guiding its planning and implementation processes. This paradigm is promoting better integration and collective actions of all stakeholders to improve technologies, policies and institutions, involved in production, processing and marketing, so as to have development impact in terms of improved welfare of farming and rural communities in PNG.

### Pathways to Development Impact

NARI Strategy and Results Framework (SRF), an integral mechanism of AR4D, is intended to provide overall strategic direction to NARI’s efforts so they are focussed along

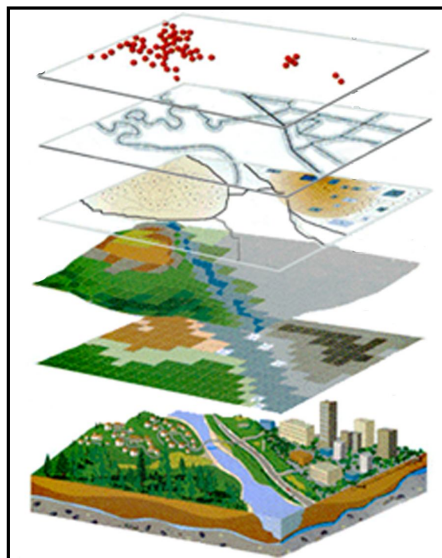


the research to development pathway in response to client needs, and consistent with current and medium term development priorities of target communities. The SRF outlines the results to be accomplished at different levels of implementation so as to lead collectively to enhanced productivity, efficiency, stability and sustainability of the smallholder sector and eventually to contribute to an improved welfare of rural families and communities that depend wholly or partly on agriculture for their

livelihood. NARI is committed to catalyze and effect changes in the lives of farming communities. The SRF reflects that the pathway to long-term development impact is very complex and not a linear process. Many sophisticated, synergistic, complementary and iterative processes are required to contribute effectively to development outcomes and impacts.

### SRF Planning Process

The SRF planning process involved a number of consultative workshops over the three year period from 2007 to 2010 with participation by a wide range of NARI staff and key stakeholder representatives from other agricultural research organisations, farmers, provincial extension officers, non-governmental organisations and universities. The core of the SRF is the Results Framework comprising of the organisational goal and strategic objective and thematic programmes and sub-programmes and their objectives. Geographic information system (GIS) methods have been used to identify and depict spatial similarities and differences in agricultural development and classify the country into Agricultural Development Domains (ADD). Challenges and opportunities of farming communities in different ADDs formed the basis for deriving AR4D strategies that the Institute will be focussing on.



## NARI Strategy and Result Framework

The NARI institutional Goal and Strategic Objective as stated in the NARI Act 1996 have been reaffirmed during the strategic planning process as follows.

**Goal:** *Improved welfare of rural families and communities who depend wholly or partly on agriculture for their livelihood*

**Strategic Objective:** *Enhanced productivity, efficiency, stability and sustainability of the smallholder agriculture sector*

NARI is focussing on enhanced food and nutritional security, increased cash income generation, increased gainful rural employment and a sustainable resource base as the



desired development impacts so as to contribute to improved welfare of rural families and communities. Based on the range of constraints and threats impacting on productivity and efficiency of the agriculture sector and smallholder communities in the different ADD clusters as well as consideration of opportunities, the programme level strategies have been defined. It is expected that the Institute Strategic Objective will be accomplished through the following major strategies represented as

programmes and sub-programmes.

### Programme - Agriculture Systems

**Strategic Objective:** *Productivity, efficiency and stability of agricultural production systems improved*

#### Major strategies

- Enhanced use of suitable quality planting materials, breeding stock and other farm inputs by smallholder farmers
- Marketing systems for priority crop and livestock products and enterprises improved
- Smallholder farming communities are better prepared to cope with abiotic stresses due to seasonal weather patterns, climate change and natural disasters
- Biotic agro-ecosystem threats are sustainably managed by smallholder farmers
- Farm mechanisation and availability of farm labour from smallholder farmers increased and more efficiently used





- Smallholder farmers effectively integrate crops, livestock and aquaculture systems

### **Programme – Enabling Environment**

*Strategic Objective: Enabling environment (policy, markets, institutions) for sustainable agricultural development influenced*

#### **Major strategies**

- Conducive socio-cultural environment influenced
- Marketing opportunities to agricultural commodities enhanced and utilised by smallholder farmers.
- Institutional arrangements improved and utilised by relevant clients and stakeholders.
- Income opportunities identified for and utilised by farming communities
- Access to socio-economic services for smallholder farmers improved
- Improved ability of farming communities to mobilize land for agricultural development.



### **Programme - Information and Knowledge**

*Strategic Objective: Use and sharing of information and knowledge in the agricultural sector effectively enhanced*

#### **Major strategies**

- Information effectively packaged and disseminated to NARI clients and stakeholders
- Information effectively managed by NARI
- Appropriate and effective information facilities used in NARI and assistance provided to partners and stakeholders
- Learning needs of smallholder farmers addressed



## Programme – Institutional Management and Development

*Strategic Objective: Efficiency and congenial institutional environment for effective AR4D enhanced*

### Major strategies

- Human talent capacities and competencies enhanced and effectively utilised as part of on-going learning in line with the changing needs of the clients and the Institute
- Effective development and management of networks, partnerships and collaborations and provision of efficient technical services to clients.
- Planning, monitoring, evaluation and impact assessment systems effectively implemented at all levels of the organisation and its activities.
- Financial and material resources adequately mobilised, managed, developed and used
- Effective and prudent leadership and stewardship incorporating the due mechanisms, processes and structures



### Cross-cutting issues

#### a) Women

##### Major strategies

- Interventions targeting women such as improving their knowledge and skills or strengthening collective action of women
- Mainstreaming of gender through appropriate workplace policies and gender analysis as part of PM&E to understand specific needs and potential barriers for women and men

#### b) HIV/AIDS and potential impact on agriculture in PNG

##### Major strategies

- Mainstreaming of HIV/AIDS in the workplace and in the AR4D agenda
- Agricultural interventions, e.g. the development and adaptation of labour saving technologies





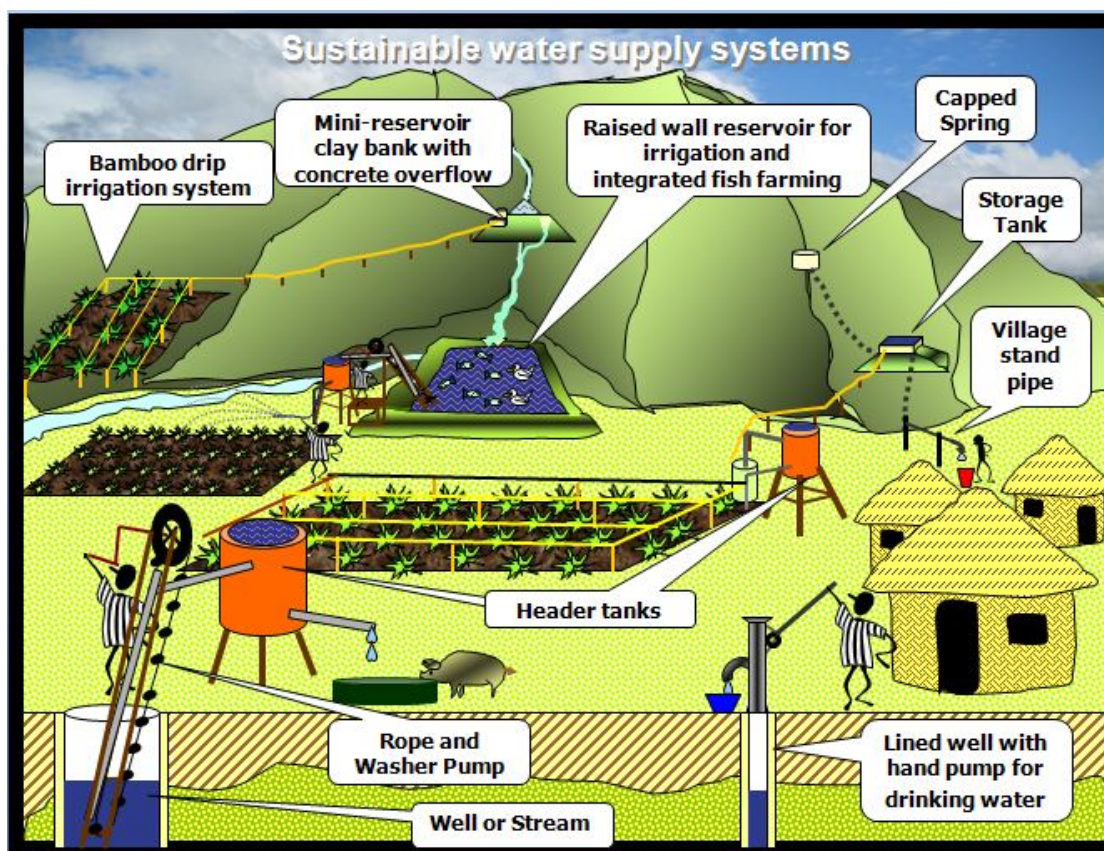
## c) Youths

## Major strategies

- Policy support to create a more enabling environment for youths to look at agriculture as a career choice
- Strategies to increase youth interest in agriculture e.g. by involving youth and schools in AR4D activities and interactions with farming communities
- Creating career development opportunities within the Institute for university graduates.

**Way forward**

The SRF is to be implemented through 2 Five-year Programme Implementation Plans that will contain detailed strategies and prioritised project portfolios for Programmes and sub-programmes including target ADDs or ADD clusters. The SRF is an evolving document as the Institute has to remain flexible to accommodate the on-going changes in the internal and external environments within the Institute, country and overseas.



## Acronyms and Abbreviations

ACIAR	Australian Centre for International Agriculture Research
ADD	Agricultural Development Domains
ARDSF	Agricultural Research and Development Support Facility
AR4D	Agricultural Research for Development
ASTI	Agricultural Science and Technology Indicators
AusAID	Australian Agency for International Development
CGIAR	Consultative Group on International Agricultural Research
DSP	Development Strategic Plan
EU	European Union
GDI	Gender Development Index
GDP	Gross Domestic Product
GIS	Geographic Information Systems
GoPNG	Government of PNG
HIV/AIDS	Human Immuno-deficiency` Virus/Acquired Immune Deficiency Syndrome
HT	Human Talents
M&E	Monitoring and Evaluation
MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MTDP	Medium-term Development Plan
NADP	National Agricultural Development Plan
NAIS	National Agricultural Information System
NARI	National Agricultural Research Institute
NARS	National Agricultural Research System
NCAIGS	National Competitive Agricultural Innovations Grant Scheme
NSPTF	National Strategic Plan Taskforce
PDR	Performance Development Review
PLWHA	People Living with HIV/AIDS
PM&E	Planning, Monitoring and Evaluation
PNG	Papua New Guinea
PNGSDL	Papua New Guinea Sustainable Development Ltd
R&D	Research and Development
SO	Strategic Objective
SPC	Secretariat of the Pacific Community
SRF	Strategic Results Framework
UNDP	United Nations Development Programme

# NARI Contributing to Improved Welfare of Farming and Rural Communities in PNG: Strategy and Results Framework

## 1. The Institute

The National Agricultural Research Institute (NARI) was established by an Act of National Parliament of Papua New Guinea (PNG) in July 1996 as a public funded, statutory research organisation, to conduct and foster applied and adaptive research into:

- (a) any branch of biological, physical and natural sciences related to agriculture; and
- (b) cultural and socioeconomic aspects of the agricultural sector, especially of the smallholder agriculture; and
- (c) matters relating to rural development of relevance to Papua New Guinea.



Besides, NARI is responsible for providing technical, analytical, diagnostic and advisory services and up-to-date information to the agriculture sector in PNG.

In its Vision for PNG, NARI sees “Prosperous PNG Agricultural Communities” through its Mission of promoting innovative agricultural development in PNG through scientific research, knowledge creation and information exchange. This is to be accomplished through the Institute’s Purpose (Strategic Objective) of enhanced productivity, efficiency, stability and sustainability of the smallholder agriculture sector in the country so as to contribute to the improved welfare of farming and rural communities who depend wholly or partly on agriculture for their livelihoods. NARI has eight guiding principles as below.

### NARI Guiding Principles

- **Mandate:** We have a national mandate and focus on the realisation of the Institute purpose of enhancing productivity, efficiency, stability and sustainability of the smallholder agriculture sector.
- **Client focused:** We are accountable to the wider community, in general, and to the smallholder semi-subsistence farming and rural communities, in particular, for responding to their needs and delivering quality services to them.
- **Scientific excellence and environmental integrity:** We promote excellence and rigor in scientific research and knowledge generation with due consideration to environmental integrity.



- **Creativity and innovation:** As a learning organisation we are committed to be creative and innovative to catalyse improved benefits for our clients.
- **Resource use and accountability:** As good corporate citizen, we are committed to be prudent and diligent in the use of limited resources and be transparent and accountable in all financial, business and technical operations.
- **Competitive advantage:** We focus on interventions, resources, products and commodities in which we have competitive and comparative advantages locally, regionally and globally.
- **Teamwork, partnership and collaboration:** Core elements of our operations are teamwork, partnership and collaboration within NARI and with our clients, stakeholders and national and international partners.
- **Human talent development and utilization:** We are committed to provide an enabling environment for personal and professional development to our employees, stakeholders and clients.

## 2. Agricultural Research for Development

### 2.1 Agriculture - the Development Focus in PNG

According to the World Development Report 2008 (World Bank 2007) agriculture offers great promise for growth, poverty reduction, and environmental services. Evidence from



other countries such as India, Ghana or Latin America shows that growth in agriculture GDP is at least twice as effective in reducing poverty as GDP growth in other sectors. This is in particular true for agriculture-based countries such as PNG where there is little evidence of any significant contribution of the mineral and petroleum sector to improvements in rural living standards despite its importance in the national economy. In PNG, the majority of its population (>80%) earns their livelihoods in rural areas

and depend on agriculture supported by fisheries and forestry for their food, income and employment and will do so for many more years to come. More than 90% of rural people are semi-subsistence smallholder farmers who produce crops and livestock for their own consumption and barter (subsistence) and sell for cash in markets. A small percentage engages in fully commercial activities. Some, on the other end of the spectrum, are considered true subsistence farmers, mostly in isolated areas in the country. Agricultural systems are highly diverse and closely adapted to the wide range of agro-ecological zones.

The agriculture sector in PNG has still a large untapped potential to assure food security, increase incomes and absorb much of the incoming labour force in gainful employment. As depicted in Figure 1 outcomes from other sectors contribute in short term to outcomes of the agricultural sector. However, if focused as the central agenda for development,

arising outcomes from agriculture can contribute not only very substantially but also sustainably in long-term to the outcomes of other sectors, thus creating positive multiplier impact by utilising synergies and complementarities among various sectors. Agriculture is therefore considered to be the primary focus for rural development and the most important means for economic growth and social improvement in the country.

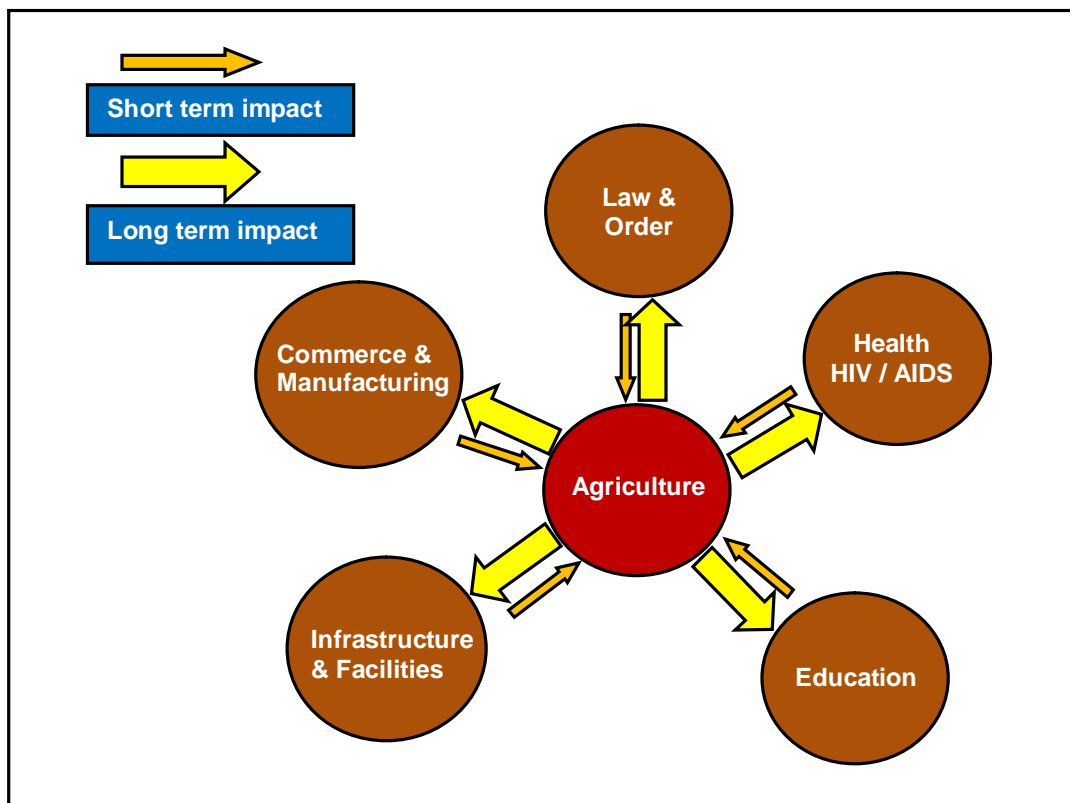


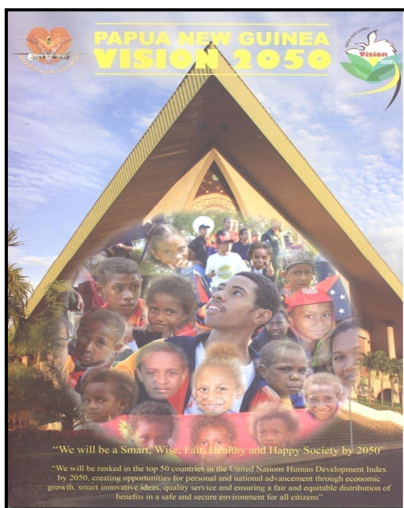
Figure 1. Agriculture and socio-economic development in PNG

## 2.2 Agricultural Research for Development (AR4D)

Since its establishment in 1996, NARI developed rapidly into an Institute that is well recognised, both in the country and internationally, as a quality research institute of high development relevance for PNG and the Pacific. Over the past 13 years, the Institute has released 24 new technologies and technology packages that have been well received by stakeholders. NARI developed a Strategic Plan in 2006 to guide institutional research programme and project portfolios for the immediate period of 10 years. It was based on the Institute mandate arising from the NARI Act 1996, the NARI Corporate Plan, the medium-term development context in PNG, NARI's internal environment and resources and medium-term research priorities developed over the period from 2001 to 2004 (NARI 2004).

However, in recent years concerns have been expressed nationally and internationally on the effectiveness of agricultural research in contributing effectively to development. These concerns presented a necessary opportunity for NARI to assess and review its planning and implementation processes and develop strategies to enhance the Institute's ability in delivering on improved technologies and innovations that are effective in terms of development impacts for the smallholder farmers and rural communities in PNG.

It was also an opportunity to align the strategies with the PNG Government's recently developed long-term development strategy 'Vision 2050' (NSPTF 2009). As an important strategy to drive the development agenda for the country, the Vision has identified the need to shift from the current reliance of the economy on the mining and energy sectors to broad-based economic growth dominated by agriculture, forestry, fisheries, eco-tourism and manufacturing. It envisages for a 70:30% reorientation of the structure of the economy towards a renewable resource base. This message is reflected through to other key national planning documents including the DSP 2010-2030 (DNPM 2010b), MTDP 2011-2015 (DNPM 2010a) and NADP 2007-2016 (MAL 2006).



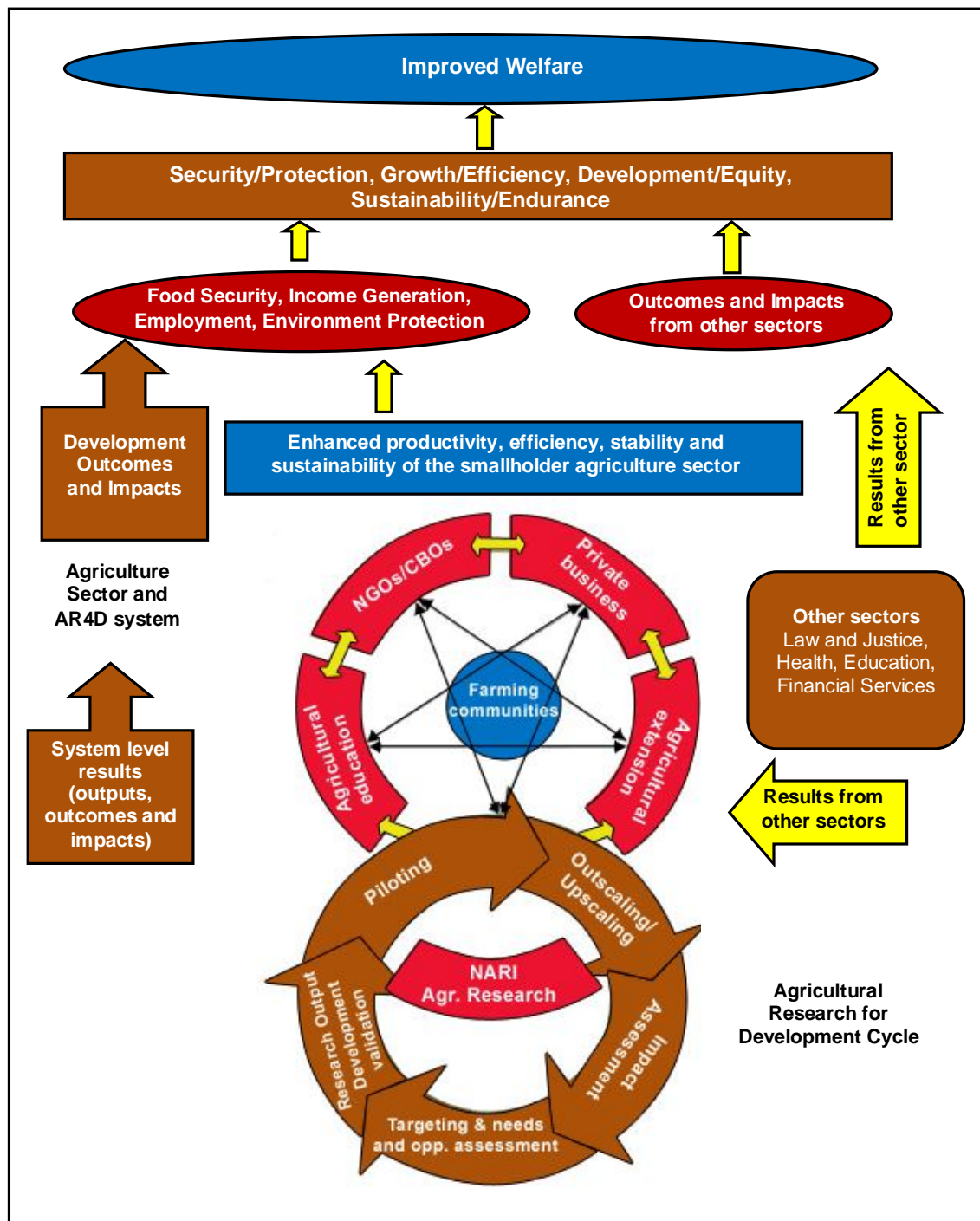
Therefore, NARI adopted the Agriculture Research for Development (AR4D) paradigm, as the over-arching approach for guiding its planning and implementation

processes. AR4D is embedded within the agricultural innovations system framework (Mbabu and Ochieng 2006; Rajalahti et al. 2008; Anandajayasekeram and Gebremedhin 2009). It is gaining momentum globally such as its application in the CGIAR reform process (CGIAR 2011). The importance of agricultural research based on science and technology, knowledge creation and information exchange for development is undisputed. However, there is a growing sense that 'business as usual' in agricultural research, i.e. the linear model of 'generation, transfer and adoption of technology' is not achieving the desirable results in catalysing agricultural change to impact on the lives of smallholder farming and rural households. It requires integrated and collective actions of all stakeholders to improve technologies, policies and institutions involved in production, processing and marketing. Figure 2 depicts AR4D as part of a wider system where a variety of outcomes from different sectors need to be generated in order to improve livelihoods of people.

## 2.3 A Strategy and Results Framework

Within a broad strategic planning framework, the chosen AR4D paradigm shapes the vision, mission, outcomes and impacts of an organisation. The challenge for public funded institutions such as NARI under this paradigm is to reform its organisational arrangements and processes in such a way that it changes from a supplier of technologies and knowledge to a facilitator of innovation. This is the approach in which all types of knowledge (including scientific knowledge and technology) are applied to achieve desired social and economic outcomes (Daane et al. 2009). This requires an adjustment of the scope and scale of an organisation to include the various dimensions of agricultural research covering social and economic aspects that integrate technological, institutional and policy solutions and various disciplines.





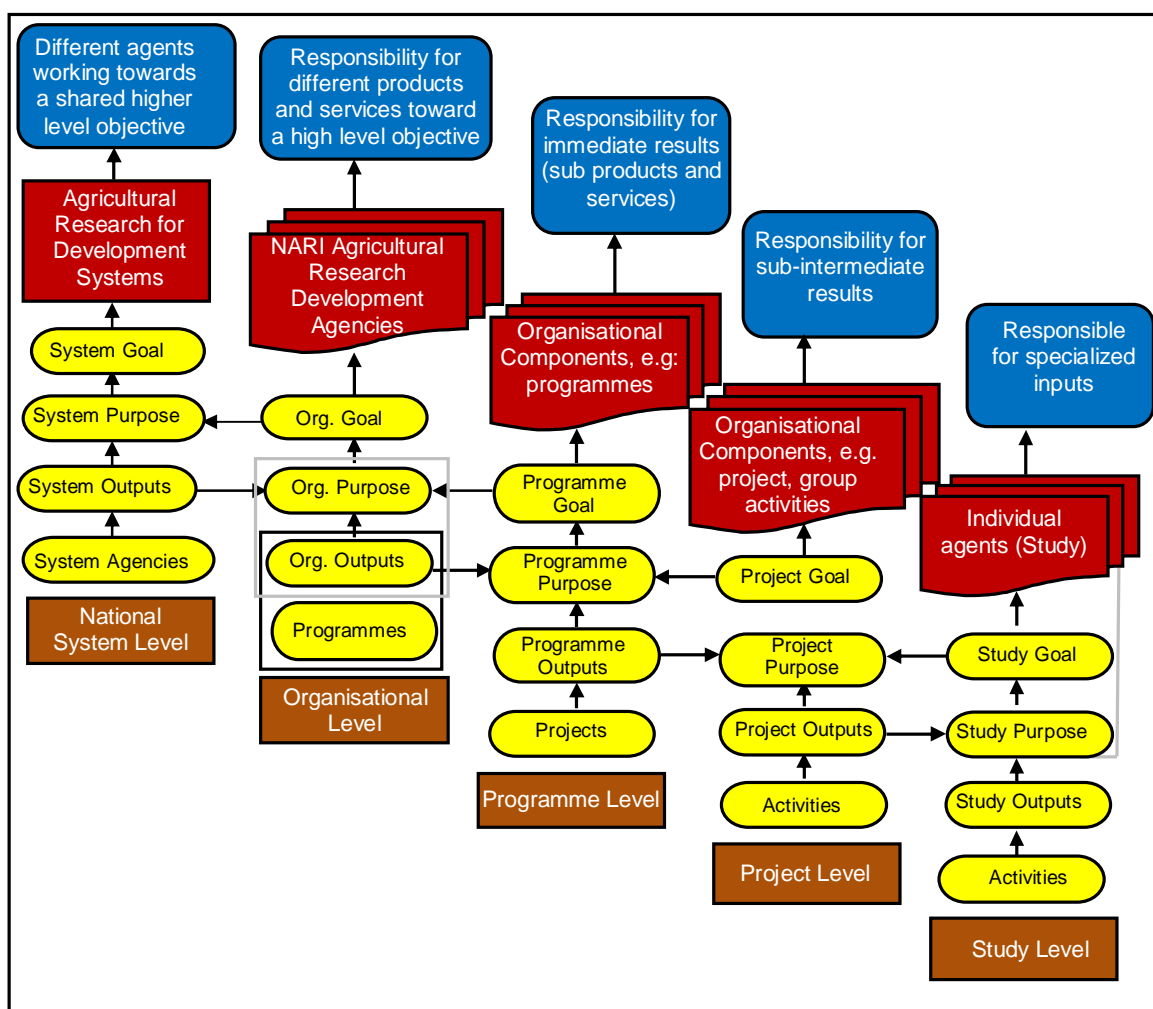
**Figure 2. Agricultural research for development and linkages to other sectors**  
(Komolong et al. 2011)

It is also important to align the organisation's strategic objectives with sub-sector, sector and national development goals and to ensure adequate linkages between short-term projects and medium-and long-term development objectives within the organisation (Mbabu and Ochieng 2006). The cascading logic has been used by the Institute throughout its strategic planning process and also in developing a Strategy and Results Framework (SRF) as a tool to develop those linkages (Figure 3).



## 2.4 Pathways to Development Impact

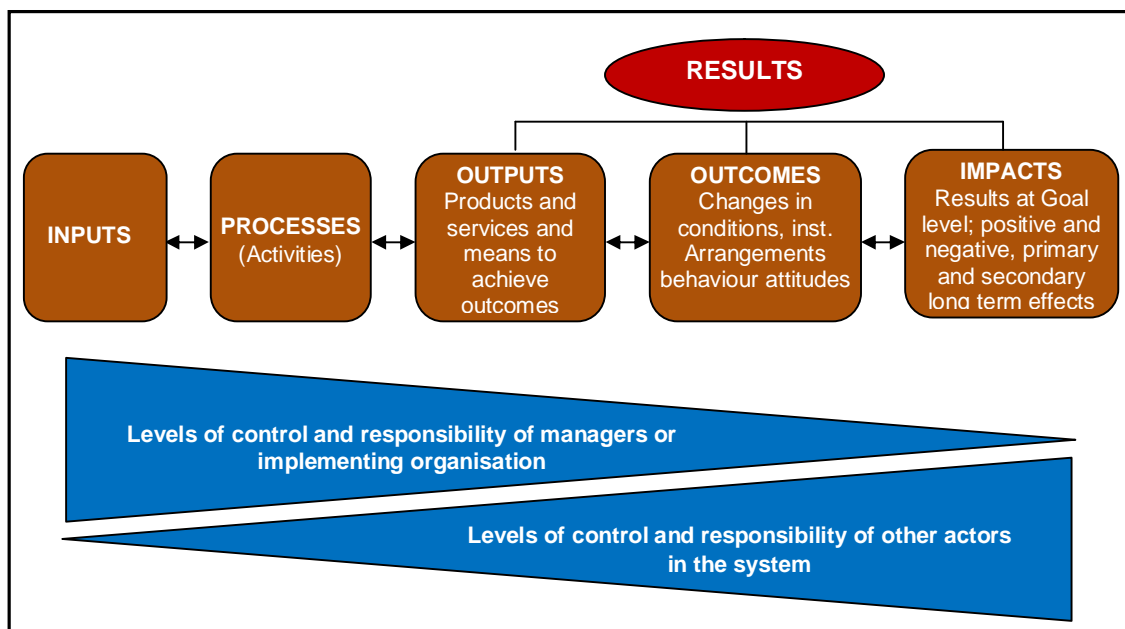
NARI Strategy and Results Framework (SRF), an integral mechanism of AR4D, is intended to provide overall strategic direction to NARI's efforts so they are focussed along the research to development pathway in response to client needs, and consistent with current and medium term development priorities of target communities. Results-based management (UNDP 2002) is the driving force behind NARI's institutional culture and practice in order to improve management effectiveness and accountability. The SRF outlines the results to be accomplished at different levels of the hierarchy in addressing constraints, opportunities and aspirations of smallholder farmers and rural communities in the country. The results are planned so as to lead collectively to enhanced productivity, efficiency, stability and sustainability of the smallholder sector and eventually to contribute to an improved welfare of families and communities that depend wholly or partly on agriculture for their livelihood.



**Figure 3. Interconnected levels of operation in AR4D system**

(adapted from Mbabu and Ochieng 2006)

As mentioned above, the SRF outlines the results at different levels to be accomplished by the Institute. Results in general include outputs, outcomes and impacts. A generalised pathway to development impact is depicted in Figure 4.



**Figure 4. Pathways to development impact**

The NARI SRF is based on the cascading logic (Figure 3). It is recognised that different types of outputs and associated outcomes and impacts are generated at various levels of the organisation. NARI is committed to catalyse and effect changes in the lives of farming communities but the pathway to long-term development impact is very complex and not always a linear process. Achievement of research outputs such as new or improved technologies, practices and knowledge, services, policy advice, capacity building, etc. are much under the control of NARI and its partners. However, the achievement of system-level outcomes and impacts requires the participation and contributions of target individuals, communities and the system in general (Figure 2 and 4). Many sophisticated, synergistic, complementary and iterative processes are required to contribute effectively to development outcomes and impacts (Figure 2).

## 2.5 NARI SRF Planning Process

The NARI SRF planning process involved five consultative workshops over the three year period from 2007 to 2010 with participation by a wide range of NARI staff and key stakeholder representatives from other agricultural research organisations, farmers, provincial extension officers, non-governmental organizations and Universities. A NARI Strategic Planning Taskforce took lead in the process to compile agriculture sector information, develop concepts, synthesize results coming from the different workshops and draft the Strategy and Results Framework document.

The core of the SRF is the results framework comprising of desirable results at the organisational goal and strategic objective level as well as at the level of thematic programmes and sub-programmes. It is considered that challenges and opportunities of farming communities are much influenced by their bio-physical and socio-economic environment which is highly diverse in PNG. Therefore, geographic information system (GIS) methods were used as part of the strategic planning process to identify and depict spatial similarities and differences in agriculture and classify the country into Agricultural Development Domains (ADD) (Omamo et al. 2006). Clusters of those domains were then used to conduct a constraints and objective tree analysis to identify possible areas of intervention by NARI through AR4D that will contribute to achieving NARI's mission in

line with its mandate and create impact at smallholder farming community level. Further information on the ADD approach in general and in the NARI context can be found in Omamo et al. (2006) and Komolong et al. (2011) and Annex 1.

Key indicators of success are defined at the different levels to monitor implementation of the SRF and to assess achievements of the strategic objectives at various levels such as system- and development-level outcomes and contribution to development impacts (Annex 2).

### 3. NARI Strategy and Results Framework

#### 3.1 Goal and Strategic Objective

Flowing from the NARI Vision and Mission, the NARI institutional Goal and Strategic Objective (SO) as stated in the NARI Act 1996 were reaffirmed during the strategic planning process.

##### **NARI Goal and Strategic Objective**

**Goal: Improved welfare of rural families and communities who depend wholly or partly on agriculture for their livelihood**

**Strategic Objective: Enhanced productivity, efficiency, stability and sustainability of the smallholder agriculture sector**

The NARI Goal and Strategic objective are well aligned with the sector and national long-term development objectives (as depicted in Figure 5).



The role and potential of agriculture in overall national development and the various broad-level constraints and opportunities faced by farming communities in PNG are recognised in the SRF. In this context, NARI is focussing on enhanced food and nutritional security, increased cash incomes, increased gainful rural employment and a sustainable resource base as desired development impacts so as to contribute to improved welfare of rural families and communities. The

key driver to achieve this will be the enhancement of productivity, efficiency, stability and sustainability of the smallholder agriculture sector as stated in the Institute's SO.

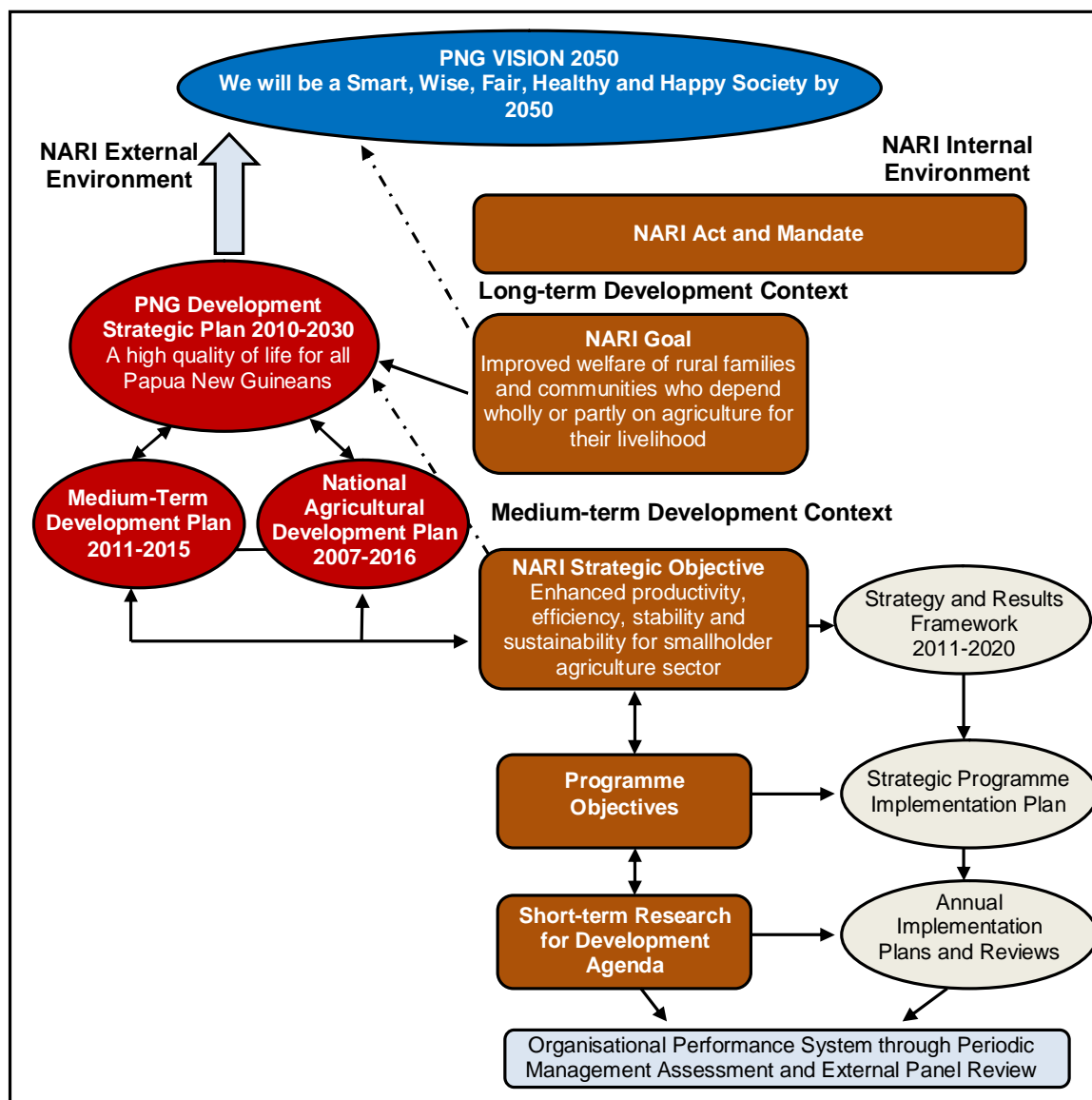


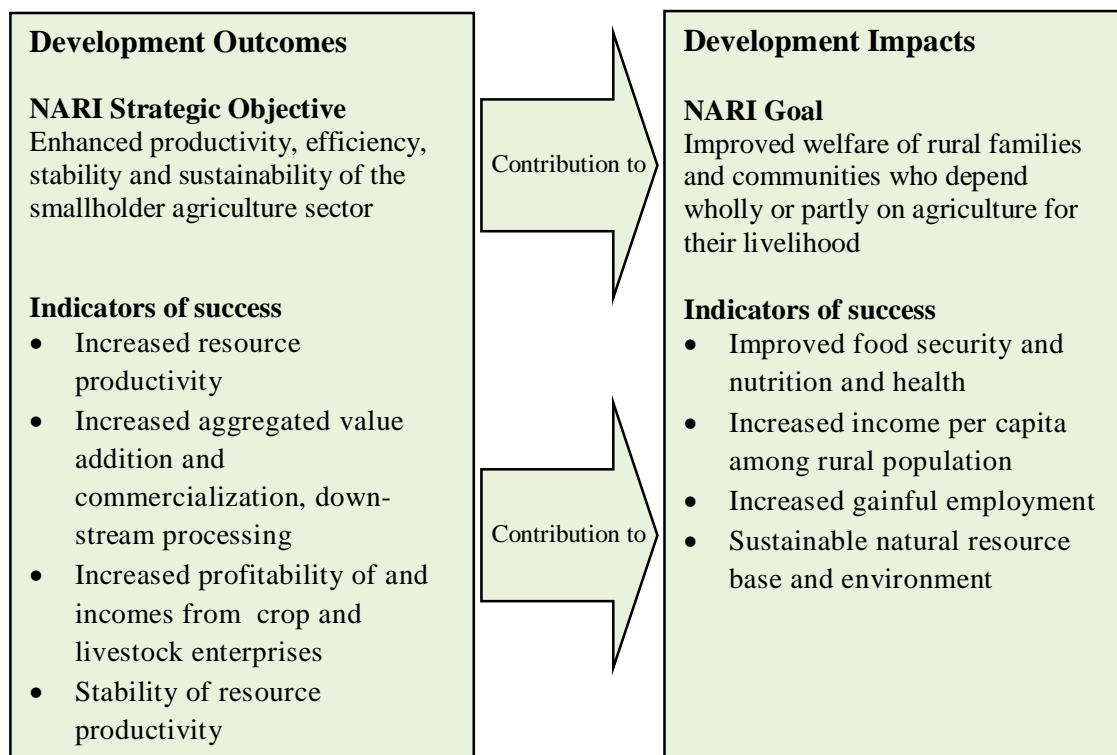
Figure 5. NARI contribution to sectoral and national development

### 3.2 Development of Institute Strategies

The institutional goal and SO constitute the first and second level of planning in the SRF. At these levels the Institute expects to generate important development outcomes for the sector contributing to the expected development impacts. Indicators of success for such outcomes and impacts at these levels are shown in Figure 6.

A key to enhancing productivity and efficiency of the sector and improving food security, income generation and employment in a sustainable manner requires a good understanding and recognition of the challenges and opportunities in the sector, especially those faced by smallholder farming communities. Major constraints, threats and opportunities affecting productivity of the sector were identified as part of the strategic planning process and are summarised below. Detailed information on the issues can be found in Komolong et al. (2011) and NARI (2010).

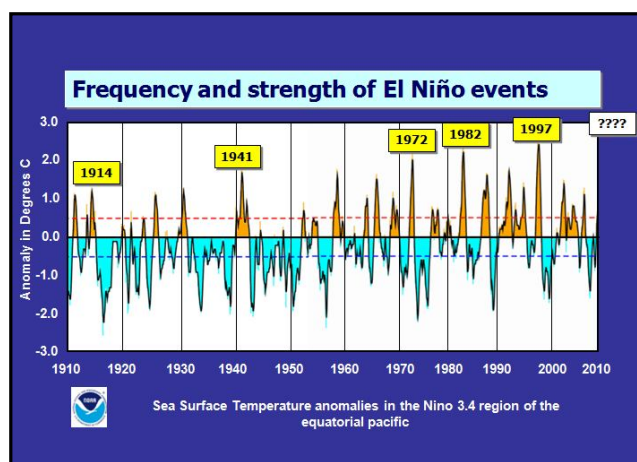




**Figure 6. Contribution of development outcomes to development impacts - NARI Goal and Strategic Objective and indicators of success**

### 3.2.1 Major threats and constraints to productivity of the sector

- Limitations to further expansion of arable land due to mountainous landforms and major limitations to soils (salinity, inundation, extreme stoniness, and anion fixation)
- Declining soil productivity due to shortening of fallow periods and low rate of replenishment under existing farming systems
- Inadequate ability of farmers to manage increasing occurrence of natural disasters such as prolonged drought, floods and threats; increased risk of saltwater inundation, excessive rainfalls and associated soil erosion; and effects on soil fertility from adverse and unpredictable impacts of global climate change
- Increasing incidence of complex and new pest and disease problems in crops and livestock



- Poor access to improved planting (seed) materials and breeding stocks
- Poor access to markets because of poor development and maintenance of agricultural infrastructure (roads, ports, markets, facilities, information, etc.)
- High losses and low profitability in marketing of traditional staple crops due to their perishable nature with a high weight/volume and low value
- High cost of and poor access to agricultural inputs, credits and supplies
- Low labour productivity, underemployment and low wages
- High degree of drudgery in performing daily tasks in agriculture especially for women
- Threats to labour productivity from serious level of malnutrition combined with the high incidence of communicable diseases such as Malaria, Tuberculosis, the growing HIV/AIDs epidemic
- Threats to labour availability in certain rural areas because of mining and petroleum projects
- Low institutional capacity, particularly in agricultural extension
- Inadequate access to information, knowledge and improved agricultural technologies and practices
- Lack of a conducive policy environment on health, education, community development, agricultural inputs, markets & promotion of alternate income generating opportunities
- Non-conducive policy environment on land use security and mobilisation of customary land for agricultural development
- Non-conducive cultural practices and values including gender imbalance in accessing benefits and participation in decision-making processes
- Low investment in agricultural research, innovations and wealth creation



### 3.2.2 Opportunities for Development of the Sector

- Huge potential to increase both the biological productivity and production capacity of most indigenous and staple crops, fruits and nuts, vegetables and livestock species through simple breeding and biotechnology methods
- Enhancing supply of agricultural commodities to urban and rural markets
- Domestication and commercialisation of indigenous nuts, fruits and other crop (e.g. galip, okari, pau, marita and pitpit) and livestock species and exploring niche markets for such indigenous products
- Exploring value-addition and product diversification of crops and livestock to expand market demand and profitability for many commodities and enterprises
- Primary source for expansion of future productive employment for the large number of youths entering the workforce
- Golden opportunity for investment of revenue from the LNG and other resource projects in developing the agriculture sector, in general, and innovative agriculture, in particular

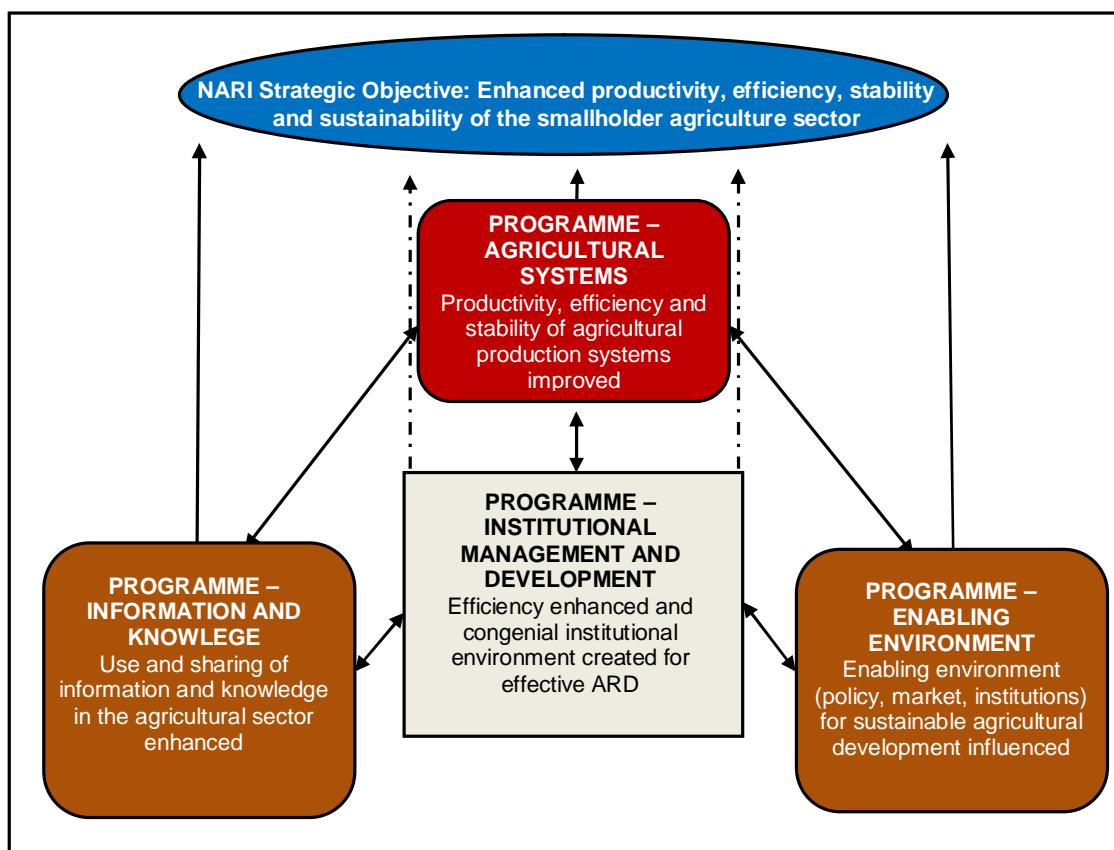


Based on the above considerations Institute level strategies were defined. In other words the Institute strategic objective will be accomplished through the following four major strategies.

- Productivity, efficiency and stability of agricultural production systems improved
- Enabling environment (policy, markets, and institutions) for sustainable agricultural development influenced
- Use and sharing of information and knowledge in the agricultural sector effectively enhanced
- Efficiency and congenial institutional environment for effective AR4D enhanced



These strategies are to be accomplished by NARI's major Programmes that the Institute will be focussing on in the medium-term to generate system-level outcomes and development impacts (Figure 2). Figure 7 shows how the four Programmes relate to and complement each other in contributing to the achievement of the Institute strategic objective.



**Figure 7. Synergies and complementarities of NARI programmes**

The four Programmes are considered necessary and sufficient to accomplish the Institute strategic objective but are mutually exclusive in delivering results independently towards the Institutional SO. However, there are also synergies and complementarities. The Institutional Results Framework including the indicators of success at various levels is presented in Annex 2.

### 3.3 Programme Strategies

This section provides details on the Programmes - Agriculture Systems, Enabling Environment and Information and Knowledge and their major strategies (represented as sub-programmes) that were identified in response to constraints and opportunities affecting agricultural productivity and development in various ADD clusters. Sub-programmes are themes encompassing one or more project area(s) that address more specific issues in one or a number of ADD clusters as determined in the strategic planning process (NARI 2010; Komolong et al. 2011). A full list of prioritized project areas for each programme and sub-programme is shown in Annex 3, while strategies for the Programme - Institutional Management and Development are presented in Section 4.



### 3.3.1 Programme - Agricultural Systems

**Strategic Objective:** *Productivity, efficiency and stability of agricultural production systems improved*

The Programme ‘Agricultural Systems’ represents the core business of NARI’s AR4D efforts. Productivity and efficiency of agricultural production systems in PNG is low both in relative and absolute terms. Recurring periodic food shortages in farming communities throughout the country show that access to and availability of food to farming communities is inconsistent and often uncertain.



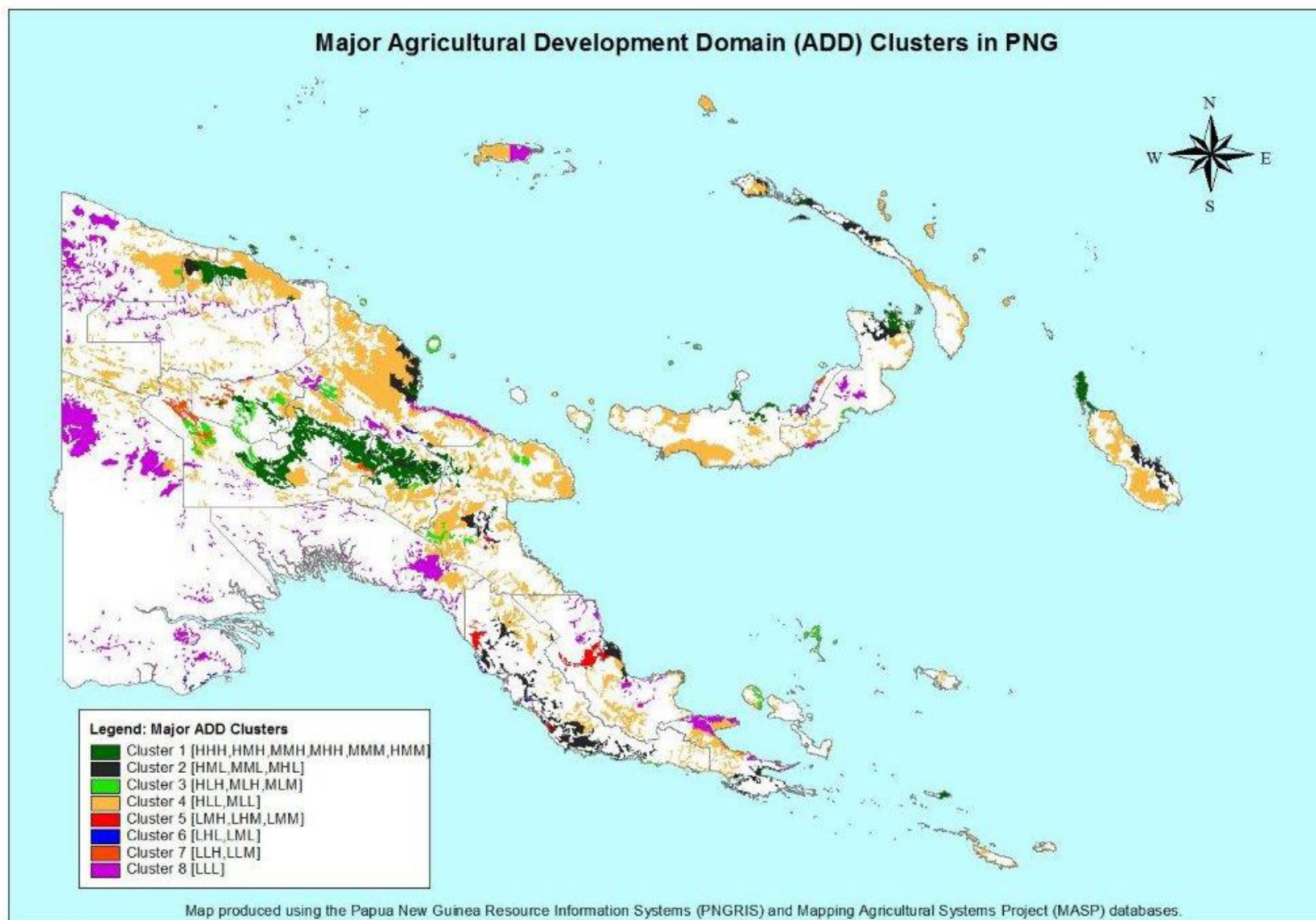
The constraints and opportunity analysis across eight ADD clusters (Figure 8<sup>1</sup>, Annex 2) has shown that the major causes for the low agricultural productivity include inadequate availability and access to improved planting materials, breeding stocks, farm inputs, poor marketing opportunities and efficiency, vulnerability of farming communities to external shocks (droughts, floods, natural disasters, effects of climate change), unsustainable land use and declining soil fertility, pest and disease problems and inefficient use of land and labour resources.



This Programme will help farming communities address critical issues to productivity, efficiency and stability of local production systems in their given biophysical and socio-economic environment. The Programme focuses on seven major sub-programmes that have been identified as key strategies to address priority constraints and opportunities across the eight ADD clusters (Figure 8 and Annex 1). Table 1 shows the sub-programmes and their

objectives (see also Annex 2 and 3) and indicative focus of project portfolios within sub-programmes.

<sup>1</sup> Agricultural potential (H, M, L) was based on soil quality, rainfall availability and landscape context (degree of sloping). Access to services (H, M, L) was based on the time it took individuals from given locations to reach service centres, while rural population density (H, M, L) ranged from zero to over 100 persons/km<sup>2</sup> using the 2000 census data corrected for growth to 2009 at 2.7% per annum.



**Figure 8. Agricultural Development Domain clusters in PNG**

**Table 1. Sub-programmes and indicative focus of project portfolios in Programme - Agricultural Systems**

<b>Sub-programme</b>	<b>Indicative focus of project portfolios</b>
1. Increased use of suitable quality planting materials, breeding stock and other farm inputs by smallholder farmers <sup>2</sup>	<ul style="list-style-type: none"> <li>• Management of generic resources improved (collection, conservation, evaluation of plant and livestock genetic resources)</li> <li>• Improved crop varieties developed (breeding of important selected crops using conventional breeding and biotechnology methods supplemented by molecular technologies)</li> <li>• New appropriate crop species and varieties and livestock breeds introduced, evaluated and adapted</li> <li>• Formal and informal seed systems established or improved for priority crops and breeding centres for livestock</li> <li>• Price support systems for farm inputs (fertilizer, pesticides) explored and strategies implemented to increase production of local inputs</li> </ul>
2. Marketing systems for priority crop and livestock products and enterprises improved	<ul style="list-style-type: none"> <li>• Existing supply and value chains assessed</li> <li>• New promising enterprises commercialized</li> <li>• Postharvest practices for priority crops improved</li> <li>• Value addition and downstream processing of selected crops and livestock promoted</li> <li>• Collective action by farmers promoted for enhancing scale economies</li> <li>• Marketing networks and infrastructure improved</li> <li>• Appropriate mechanization of priority enterprises and supply chains</li> </ul>
3. Smallholder farming and rural communities are better prepared to cope with abiotic stresses due to seasonal weather patterns, climate change or natural disasters	<ul style="list-style-type: none"> <li>• Localized early warning systems for ENSO events established</li> <li>• Crop varieties and livestock breeds tolerant to drought, excess moisture, salinity and frost integrated into traditional production systems</li> <li>• Alternative crop and livestock species integrated into traditional production systems</li> <li>• Strategies for water harvesting and water management systems to increase farm water supplies and water productivity developed</li> </ul>
4. Smallholder farmers use improved and sustainable land and soil fertility management practices	<ul style="list-style-type: none"> <li>• Appropriate land use practices for farmers in areas with poor topography (especially steep slopes), inundation and other vulnerable landscapes developed</li> <li>• Crop rotations, fallow management systems, composting and other soil nutrient management practices improved</li> <li>• Strategies to improve fertilizer access and nutrient use efficiency implemented</li> </ul>
5. Biotic agro-ecosystem threats are sustainably managed by smallholder farmers	<ul style="list-style-type: none"> <li>• Integrated management strategies for economic pest and diseases including safe and appropriate use of pesticides but with emphasis on deployment of resistant crop varieties and livestock breeds, cultural and biological control methods implemented</li> <li>• Potential threats from exotic pests, diseases and weeds identified and appropriate strategies to manage incursions effectively developed and implemented</li> <li>• Diagnostic capacity for plant and animal pests and diseases increased</li> <li>• Innovative strategies designed to improve institutional capacity and the capability of smallholder farmers to manage livestock</li> </ul>

<sup>2</sup> Smallholder farmers include men, women and youth.

Sub-programme	Indicative focus of project portfolios
	pest and diseases
6. Farm mechanization and availability of farm labour from smallholder farmers increased and more efficiently used.	<ul style="list-style-type: none"> <li>• Suitable small to medium scale farm mechanisation assessed and adapted by farmers</li> <li>• Appropriate animal traction options assessed, adapted and promoted</li> <li>• Rural amenities improved and appropriate mechanical skills training provided to farm workers for increased efficiency</li> </ul>
7. Smallholder farmers effectively integrate crops, livestock and aquaculture systems	<ul style="list-style-type: none"> <li>• Profitable integrated systems of crops, trees, livestock and aquaculture for multiple benefits identified and promoted</li> </ul>

### 3.3.2 Programme - Enabling Environment

**Strategic Objective:** *Enabling environment (policy, market, institutions) for sustainable agricultural development influenced*

It has been recognised internationally that improved technologies will not necessarily improve yield on farmers' fields nor contribute to greater outcomes unless these are supported by appropriate policies, markets and institutions. The factors considered important are appropriate policies, extension and other services to disseminate the technologies; collective action institutions to enable smallholders to adopt technologies; and well-functioning markets to provide farmers with inputs and incentives for increased production (CGIAR 2011). Amongst a number of factors relating to institutions and markets that continue to constrain the development of the agriculture sector in PNG are poor infrastructure for value addition and storage; low investments in agriculture; land tenure and other land related issues; access to affordable farm inputs; lack of marketing policies for agricultural produce; low opportunities for income diversification in communities; issues around trade, prices and subsidies; and lack of incentives for farmers to be innovative in developing new products to meet market demand, etc. These require interventions at the policy and strategy levels to develop appropriate systems and institutions.



This Programme aims to influence an enabling environment for sustainable agricultural development. This is to be achieved through a number of policies/strategies which include a conducive socio-cultural environment, improved marketing opportunities of agricultural commodities, improved land mobilisation for farming communities, improved access to socio-economic services, improved institutional arrangements and income opportunities. Table 2 shows the sub-programme objectives and indicative focus of project portfolios. It should be noted that this Programme operates both within the wider institute framework of NARI as well as at national level. Within the institute framework a number of sub-programmes will complement initiatives in Programme- Agriculture Systems while other



sub-programmes focus on issues of importance outside the Institute. Further information on the Results Framework and identified strategies can be found in Annex 2 and 3.

**Table 2. Sub-programmes and indicative focus of project portfolios in Programme-Enabling Environment**

<b>Sub-programmes</b>	<b>Indicative focus of project portfolios</b>
1. Conducive socio-cultural environment influenced.	<ul style="list-style-type: none"> <li>• Knowledge from new information/facts and enhanced receptiveness of the farming community (change in mindset and attitudes increased; recognised roles of gender in decision making, etc.) to new ideas/technologies/products</li> <li>• Improved accessibility of social and economic services which encourage uptake of innovative ideas / technologies / products improved</li> <li>• Improved awareness of drawbacks from non-progressive and obstructive socio-cultural practices</li> </ul>
2. Marketing opportunities for agricultural commodities enhanced and utilised by smallholder farmers	<ul style="list-style-type: none"> <li>• Appropriate macro policies/strategies on trade, subsidies, freight, taxation implemented and access to developed and new markets (domestic and export) improved</li> <li>• Access to infrastructure (market buildings, depots) by farming communities improved</li> <li>• Existing and alternative forms of marketing practices developed and effectively used by farming communities</li> <li>• Access to and utilisation of market information improved (different local and international markets, market parameters, comparative advantage of different crops and crop enterprises in different regions)</li> </ul>
3. Institutional arrangements improved and utilised by relevant stakeholders	<ul style="list-style-type: none"> <li>• Conducive policies and strategies on agricultural investment established and implemented, leading to increased investment in AR4D and wealth creation by GoPNG and development partners</li> <li>• Conducive policies and strategies on credits and allied inputs established and implemented</li> <li>• Conducive policies and strategies for gainful employment identified and promoted</li> <li>• Relevant and user friendly seed policies implemented</li> <li>• Effective policies, response strategies, processes and mechanisms for mitigating effects of natural disasters implemented</li> <li>• Appropriate policies/strategies on price support systems established, and implemented</li> </ul>
4. Income opportunities identified for and utilised by farming communities	<ul style="list-style-type: none"> <li>• Local agricultural enterprises and cottage industries promoted</li> <li>• Investment into agricultural enterprises by local and international investors increased</li> <li>• Demand for locally processed products improved through innovative development of products and marketing strategies</li> </ul>
5. Access to socio-economic services for smallholder farmers improved	<ul style="list-style-type: none"> <li>• Appropriate policies for development of socio-economic services established and implemented leading to increased investment in rural socio-economic services for agricultural development</li> </ul>
6. Improved ability of farming communities to mobilise land for agricultural development	<ul style="list-style-type: none"> <li>• Policies on mobilisation of customary and tribal land improved and strategies implemented</li> </ul>

### 3.3.3 Programme - Information and Knowledge

**Strategic Objective:** *Use and sharing of information and knowledge in the agricultural sector enhanced*

Using and sharing relevant agricultural information, technologies and innovations generated through research and appropriately packaged can make a major contribution to



increasing agricultural productivity and changes in the lives of rural farming communities. However, often these are not available or easily accessible to the farming communities and other intermediate stakeholders and partners in the AR4D system. Other constraints include a lack of effective extension service delivery mechanism and extension networks to provide the necessary access, sharing and use of agricultural information and knowledge. Farming communities

are therefore disadvantaged and miss out on the necessary opportunities.

In response to above mentioned constraints, this Programme's strategies focus on improving packaging and dissemination of information, improvement of information system and facilities, and improved access to and understanding of livelihood options and adult learning. Table 3 shows identified sub-programme objectives and indicative focus of project portfolios. Portfolios of sub-programmes 1 and 2 are closely linked to portfolios in the other three NARI Programmes. These respond to more specific information and knowledge needs of farming communities in different ADDs as well as other stakeholders in the agriculture sector including NARI research managers, scientific experts (e.g. NARI and partner researchers in other national and international organisations), development agents, extensions agents, policy makers and the general public.

**Table 3. Sub-programmes and indicative focus of project portfolios in Programme - Information and Knowledge**

Sub-programmes	Indicative focus of project portfolios
1. Information effectively packaged and disseminated to NARI clients and stakeholders	<ul style="list-style-type: none"> <li>• Information appropriately packaged</li> <li>• Access to information improved</li> <li>• Responses of Farming Communities improved</li> </ul>
2. Information effectively managed by NARI	<ul style="list-style-type: none"> <li>• Databases, archives and research management information systems established and used</li> <li>• Research, project, human resource, finance, library, databases, websites and other information created, linked, managed and used</li> <li>• Capacity to access, store, and manage information from different internal and external sources for different purposes enhanced</li> </ul>
3. Appropriate and effective information facilities used in NARI and assistance provided to partners and stakeholders	<ul style="list-style-type: none"> <li>• Existing information and communication facilities in all NARI centres upgraded and maintained</li> <li>• Policy guidelines on the standard and level of information facilities for NARI developed and implemented</li> <li>• Assistance and support to selected stakeholders and partners provided by setting up of basic facilities e.g. information centres,</li> </ul>

Sub-programmes	Indicative focus of project portfolios
	resource centres, etc. and training of personnel to manage such facilities • Partnership and networks established to share and utilise existing partner resources and enhance information flow to and from stakeholders
4. Learning needs of smallholder farmers appropriately addressed	• Promising farmer learning models identified, evaluated, and adapted • Farmer learning needs identified and learning events on agricultural skills and knowledge facilitated • Partnerships for facilitation and encouragement of further education facilitated, especially for women and girls, to improve literacy levels in target communities

### 3.4 Cross-cutting issues

#### 3.4.1 Women

In PNG, men outlive women – this is usually a symptom of discrimination against women. Women have less access to land, food, health care, education and other economic



resources and less autonomy in decision making (Dugue 2004). In some rural areas women have 85% illiteracy rate. On the other hand they are largely responsible for homework and nurturing children. They also play a key role in food production (work in the garden and fishing) as well as collecting firewood, fetching water, selling at the market and many other obligations. There are very few women in management, leadership, and decision making roles in the

workplace (NSPTF 2009). The Gender Development Index (GDI) ranks PNG at 124<sup>th</sup> place out of 177 countries (UNDP 2008).

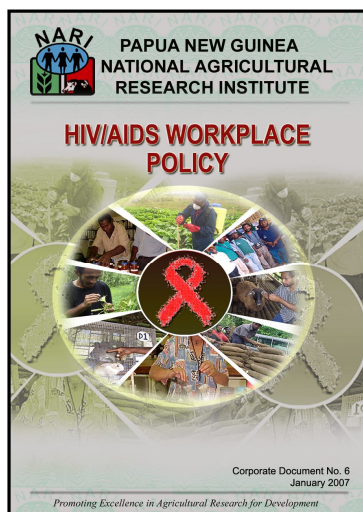
Gender equality has been proven worldwide to be an important factor in reducing poverty and achieving sustainable development. Countries that have higher gender equality have higher economic growth (AusAID 2007). NARI recognises the significance of gender equality and will focus on the following strategies to contribute effectively to improved gender equality in PNG agriculture (Table 4).

**Table 4. Key strategies for effective contribution to improved gender equality in PNG agriculture**

Strategies	Interventions
Interventions targeting women	<ul style="list-style-type: none"> <li>• Focusing on improving the knowledge and skills of women in key areas of agricultural production and business in partnership with organizations such as PNGWiADF</li> <li>• Strengthening of collective action of women</li> <li>• Development of high value agro-enterprise options for women allowing them to combine with other household responsibilities</li> <li>• Increasing access by women to simple machineries to reduce the high levels of drudgery in their daily lives</li> </ul>
Gender mainstreaming	<ul style="list-style-type: none"> <li>• Adoption of a gender policy which would guide NARI employees and stakeholders in their roles and responsibilities</li> <li>• Effective integration and mainstreaming of gender related activities</li> <li>• Incorporating gender analysis as part of planning and monitoring of NARI programmes and projects to understand specific needs and potential barriers for women and men and target accordingly</li> <li>• Ensuring all policies, programmes and projects are sensitive to gender differences in roles and activities</li> </ul>

### 3.4.2 HIV/AIDS and potential impact on agriculture in PNG

It is now universally recognised that HIV/AIDS is not simply a health issue but a key development issue that requires a multi-sectoral approach. It has the potential to significantly undermine social and economic progress of PNG. It is estimated that 1.5% of the population is living with HIV/AIDS (NSPTF 2009; index mundi 2010). HIV/AIDS is perceived as an urban problem but there is an increasing trend of the HIV/AIDS epidemic spreading into rural areas. Scenario modeling indicates that rural prevalence rates will increase rapidly from 51,594 PLWHA in 2007 to almost 200,000 in 2012 (Grellier and Omuru 2008).



The major impact of HIV/AIDS is a loss of labour as most of the people living with HIV/AIDS are within the most physically active age group (15-49 years). In the agricultural sector this can lead to a substantial impact through loss of food and cash crop production and transfer of knowledge from one generation to another. Besides a shortage of labour through illness or death of the households head or spouse, affected households also require increased access to nutritious food to care for affected family members (Grellier and Omuru 2008).

HIVAIDS prevention can be challenging and controversial. An effective response will require innovative approaches. Hence, NARI is committed to working closely with important stakeholders to prevent the expansion of the epidemic and support individuals and farming communities already affected. Table 5 shows key strategies that NARI will be focussing on.



**Table 5. Key strategies in limiting the expansion of HIV/AIDS epidemic and supporting affected individuals and farming communities**

Strategies	Interventions
HIV/AIDS mainstreaming	<ul style="list-style-type: none"> <li>• Expansion of the HIV/AIDS workplace policy to guide NARI employees and stakeholders to effectively mainstream HIV/AIDS issues into the AR4D agenda of the Institute</li> <li>• HIV/AIDS analysis in communities to gain a better understanding of the risks, needs and opportunities of target communities in regards to HIV/AIDS</li> </ul>
Agricultural interventions	<ul style="list-style-type: none"> <li>• Development and adaptation of labour saving technologies</li> <li>• Improved production of nutritious food in close proximity to homesteads especially improved husbandry of small livestock</li> <li>• Improved conservation and storage of food stuff to reduce the need to visit gardens for food gathering</li> </ul>

### 3.4.3 Youths

PNG faces a daunting future if it does not seriously address the education and employment demands of an increasing youth population. Statistics show that young people under the age of 20 account for almost 50% (approximately 3 million) of the current total population in PNG. A large proportion of the youths will require productive employment opportunities in immediate future.



With most of the youth living in rural areas, agriculture has to be viewed as the major source of employment in the medium-term. However, misperceptions on the potential of the agriculture as a career choice are prevailing. At present, agriculture is only considered as something to fall back upon when everything else fails. There is an overall negative outlook on agriculture as business

opportunity because of low wages, high levels of drudgery and physical work, lack of awareness, information, skills and meaningful resources, and the general lack of services in rural areas (Spriggs and Chambers 2007; Kruijssen 2009).

A multi-sectoral approach is required to raise the profile of agriculture as a career opportunity among PNG rural youth. NARI through its various programmes and portfolios will emphasise the need to create opportunities for youths to effectively engage in agricultural activities (Table 6).

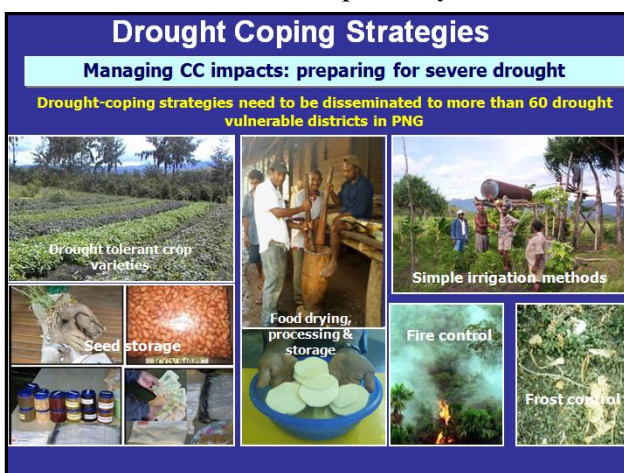
**Table 6. Major strategies creating opportunities for youths to effectively engage in agriculture**

Strategies	Interventions
Policy support	<ul style="list-style-type: none"> <li>• Appropriate policy in empowering youths to be innovative</li> <li>• Creating opportunities through enhancing their entrepreneurial skills</li> <li>• Influence policies to improve marketing opportunities and improving general access to services in rural areas</li> </ul>
Creation of youth interest in agriculture	<ul style="list-style-type: none"> <li>• Involvement of schools in rural areas in information dissemination and sites of AR4D activities</li> <li>• Encourage youth involvement in learning activities and other interactions with farming communities</li> </ul>

Strategies	Interventions
	<ul style="list-style-type: none"> <li>Curriculum development in schools, high schools and universities</li> <li>Customised training of youth in promising agricultural entrepreneurial skills and promoting suitable small businesses</li> </ul>
Career development	<ul style="list-style-type: none"> <li>NARI will continue to provide career development opportunities for young university graduates through its cadet development programme, industrial attachment training schemes in collaboration with academic institutions and other formal and informal capacity development initiatives</li> </ul>

#### 4. Institutional Arrangements towards realising Impacts

The adoption of the AR4D paradigm implies a paradigm shift not only in ‘what the Institute does’ but more importantly ‘how it does what it does’. This has been recognised



by NARI. The Institute promotes innovative thinking and aspires to become a ‘learning organisation’ that is flexible to respond effectively to the changing needs of its clients and stakeholders. This involves not only learning to cope with what is given but also to increasingly apply generative learning (new ways of looking at the world) to better understand clients and stakeholders and how to better respond to their needs and opportunities. This change is not an easy one as it involves

revolutionary changes in mindsets and attitudes and requires an ‘unlearning’ to first remove obstructive routines, processes and habits.

Programme ‘Institutional Management and Development’ is designed to support this transformation. The Strategic Objective of this programme is: *Efficiency enhanced and congenial institutional environment created for effective AR4D*. This Programme provides the necessary support to the other Programmes as well as the wider AR4D system (Figure 7). The following sub-programme objectives have been identified as strategies to achieve this objective (also see Annex 2 for the Results Framework).

- Human talent capacities and competencies enhanced and effectively utilised as part of on-going learning in line with the changing needs of the clients and the Institute
- Effective development and management of networks, partnerships and collaborations and provision of efficient technical services to stakeholders
- Planning, monitoring, evaluation and impact assessment systems effectively implemented at all levels of the organisation and its activities
- Financial and material resources adequately mobilised, managed, developed and used

- Effective and prudent leadership and stewardship incorporating the due mechanisms, processes and structures

#### 4.1 Sub-programme- Human Talent Development and Management

Human talents are recognised as the most important asset in a learning organisation. NARI aspires to implement human talent strategies that promote, nurture and develop human talents and align them towards the achievement of strategic objectives.



##### 4.1.1 Human talent mobilisation and development

There is a continuing need to enhance human talent capacities and competencies and effectively utilize them as part of on-going learning in line with the changing needs of the clients and the Institute. NARI has a pool of qualified scientific, technical and support staff. However, staff strength is not adequate yet to gain

critical mass comprising of necessary disciplines at strategic locations. There is also a need to address an imbalance between junior and senior ranks, gender gaps at scientists and management positions and lack or shortage of expertise and competencies in various disciplines. Capacity building and learning need to respond to the need to increase knowledge and skills, address attitudes and tap into aptitudes and talents. Focus needs to be on building capacity and competencies along the impact pathways. This can be done through formal and informal and short- to long-term training and career development opportunities, targeted selection and recruitment from the PNG open market and overseas as well as drawing on competencies and skills in partner institutions in-country and overseas.

##### 4.1.2 Congenial working environment

The Institute strives to establish, maintain and foster a congenial working environment within NARI. The aim is to make the Institute an 'employer of choice' in PNG. The concerted efforts in training, mentoring and professional development needs to be supplemented by implementation and ongoing revision of management policies, strategies and standards. Periodical reviewing and making adjustments to remuneration packages within the SCMC (Salaries and Conditions Monitoring Committee) terms are essential in responding to performance based rewards and awards.



Most NARI locations are in rural and isolated areas that lack social amenities, health facilities, schools for children, spouse employment opportunities and are exposed to law and order problems. Continuous efforts need to be made to develop NARI field centres to



create a supportive working environment including a fostering of relations with surrounding communities, development of staff amenities and other incentives to relieve staff of hardships encountered in difficult locations.

#### 4.1.3 Staff performance management review systems

Performance management review systems are important tools in effective management of human talents. They provide opportunity to reflect, assess and identify gaps in skills,



knowledge and attitudes that may hinder the achievement of expected results but also recognition of success and achievement. Necessary improvements on the well established

Performance Development Review (PDR) process are needed so it becomes results-oriented with clearly defined key results to be achieved by staff during the review period. As a support for the necessary cultural change in NARI towards a learning organisation, cultural values such as

interdisciplinary teamwork, partnership, knowledge sharing and innovation are to be recognized in the PDR, through awards and other incentives.

#### 4.2 Sub-programme- Partnerships, Networks and Client services

In the AR4D system agricultural research is only one of the components in an interacting system. Formation of formal and ad hoc partnerships and collaborations is at the core of AR4D. NARI will be drawing on a wide range of partner organisations in-country and abroad. Those already established will be maintained, fostered and expanded. More importantly is the brokering of strategic multi-sectoral and multi-stakeholder alliances as part of building innovations platforms for effective AR4D. Action research based on a cycle of planning-action-observation-reflection by clients and stakeholders becomes the preferred *modus operandi* for NARI.



NARI is also providing important services to its clients and partners.

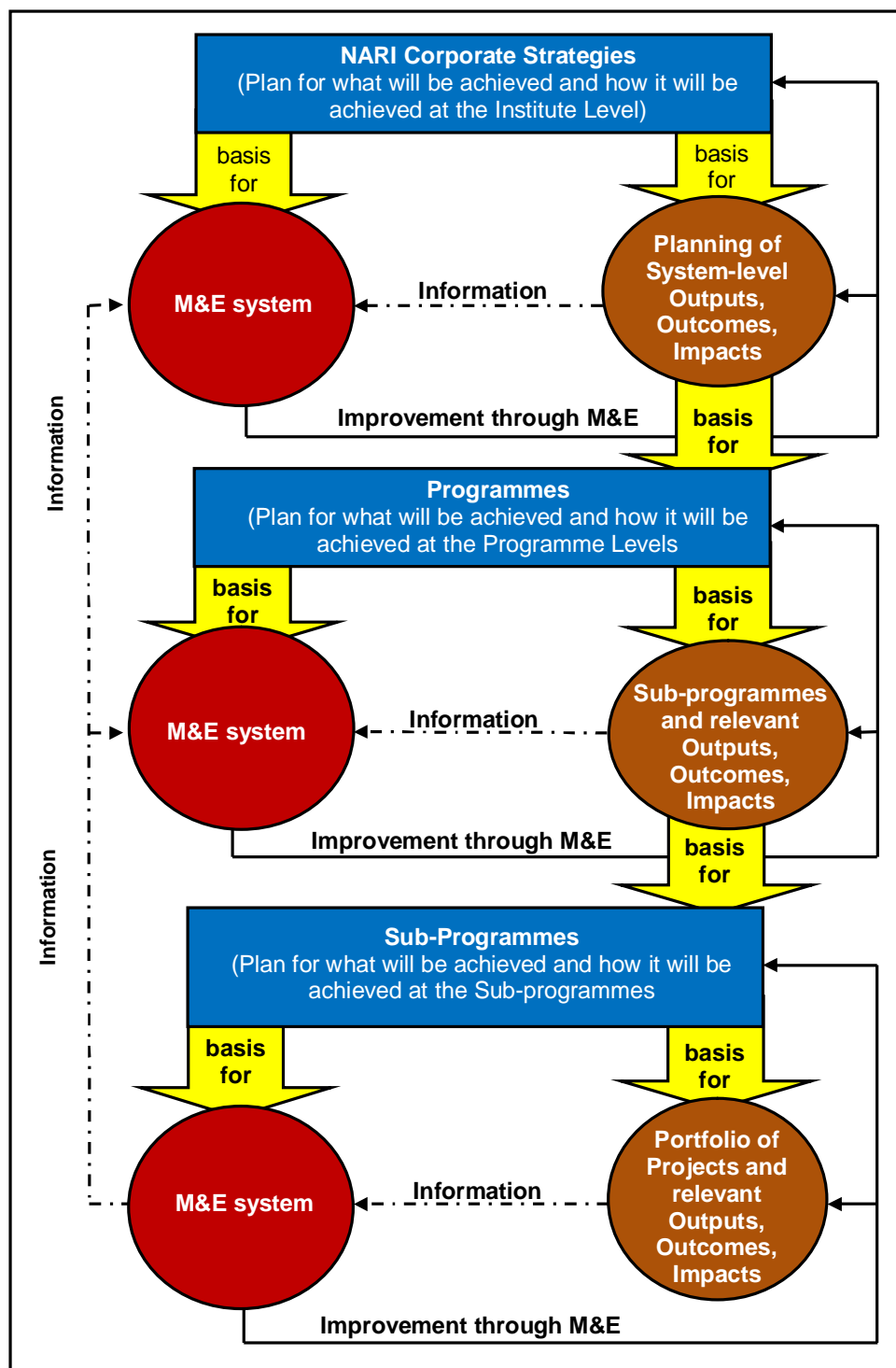
These include chemical analysis for soils, plant, food and water, GIS and pest and disease identification. These services are to be maintained, improved and provided in an affordable and cost-effective way.

#### 4.3 Sub-programme- Planning, Monitoring, Evaluation and Impact Assessment

Planning, monitoring and evaluation (PM&E) systems are important tools towards the Institute becoming a learning organisation and improving its performance. It will be



necessary to develop and implement a planning, monitoring and evaluation system based on the results framework and containing measurable performance indicators at all levels of the organisation (Figure 9).



**Figure 9. NARI Planning, Monitoring and Evaluation system**

Impact assessments (both *ex-post* and *ax-ante*) are important to better account for the impacts of investment by NARI and its partners and to provide important feed-back into

the AR4D planning cycle. A particular focus will be to develop capacities in this area including *ex-ante* impact assessment to improve on targeting and priority setting.

There needs to be an emphasis on generation and collection of socio-economic data as part of PM&E from baseline surveys and impact assessments. Data will be detailed and disaggregated by gender and other social equity criteria. Establishment of relevant databases will improve further planning and implementation processes in NARI.

#### 4.4 Sub-programme- Resource Mobilisation

The mobilisation of adequate resources especially financial resources to support AR4D efforts in NARI will be crucial for successful implementation of the SRF. Traditional



sources of funding include annual grants and project-based grants from GoPNG. The Institute has also been supported by the Australian Aid Programme since 1998 in developing institutional capacity, initially through advisory inputs and contributions to support infrastructure development and training activities and lately through direct budgetary support from the ARDSF. In recent years, NARI has been very successful in mobilising project funding for collaborative

research from a range of national and international donors like ACIAR, EU, SPC, PNGSDL and many others. However, delivery of development impacts under the AR4D paradigm requires a substantial increase in funding. There is also a need to expand and attain a critical mass in terms of staff numbers, infrastructure and research facilities at all locations and implement more complex longer-term, impact-oriented programmes and project portfolios.

Current investment in AR4D in the country is inadequate to attain the kind of development impact that the nation envisions in its long-term strategies. According to the World Bank (2007) investment in agricultural development should be around 10% of agricultural GDP to move the nation from agriculture-based economies to transformed economies, i.e. >400 million Kina per annum using 2009 real agricultural GDP of around 4.6 billion Kina (Treasury 2010). Investment in agricultural research, science and technology should be 2% of agricultural GDP (i.e. 80 million Kina per annum). Current investment in the sector and AR4D is approx K140 million (or only 3% of the agricultural GDP) and less than 30 million Kina (only 0.6%) in agricultural research. Therefore, there is vast scope to attract additional investment in AR4D.

In the medium-term NARI will rely on government and donor grants for funding support. The Institute seeks to advocate and lobby for an increased investment by the government and donors into AR4D for a common purpose to catalyse agricultural development and by drawing on the support of its sister organisations in the PNG NARS. This also includes the advocacy for more flexible funding modes away from purely short-term project based funding to allow for longer-term programme-based funding. Such commitment is necessary for better harmonisation of a number of projects into a unified portfolio that effectively contributes to the Institute's strategic priorities and longer-term objectives. At

the same time the Institute continues to diversify its revenue sources through objective dialogue and consultation with key collaborating/funding partners such as ACIAR, AusAID, EU and others. NARI will increase its efforts to generate internal revenue from available Institute resources. A medium-term resource framework for the Institute is to be developed as part of 5-year programme implementation plans.

In the longer term, initiatives will have to be taken by NARI and other organisations in the PNG NARS to develop innovative alternate funding mechanisms, such as NCAIGS, supporting AR4D in the country. NARI needs to provide required research inputs to identify best options and contribute to necessary policy development.

#### 4.5 Sub-programme- Leadership and Governance

Implementation of the SRF is supported by a governance and management structure aligned to the delivery of results at the different levels of the Institute. The Director General of the Institute supported by the Deputy Director General and with oversight by the NARI Council has the overall responsibility for the implementation of the SRF and the achievement of the Institute SO. The four strategic programmes are to be managed by Programme Directors who are to be responsible for planning, co-ordination and implementation of identified sub-programmes and project portfolios under each of the programmes and delivery of results (Figure 10).

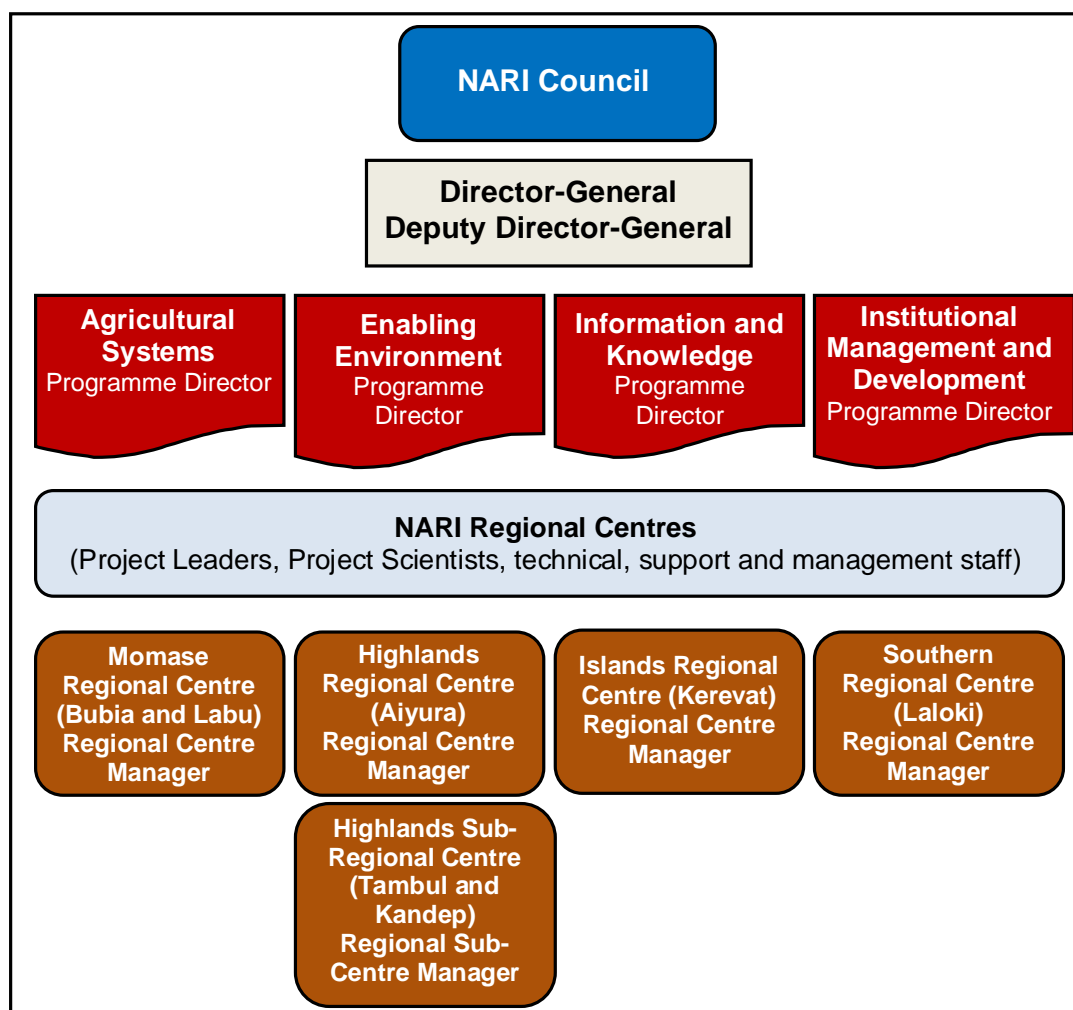


Figure 10. Organisational structure for implementation of SRF

Identified project leaders among the pool of NARI scientific staff are to deliver project outputs and outcomes and support the programme directors in realising the programme objectives.



Establishment of structures and management systems that enable strong vertical and horizontal communications and participation is an important strategy to support effective implementation of the Strategy and Results Framework.

The implementation of the SRF will be co-ordinated from NARI's nine establishments, comprised of Highlands Regional Centres at

Aiyura, Tambul and Kandep, Momase Regional Centre at Bubia and Labu, Islands Regional Centre at Keravat, Southern Regional Centre at Laloki, Head Office and Kilakila (Insectary and Chemistry Laboratory).

## 5. Way Forward

The SRF is to be implemented through 2 Five-year Programme Implementation Plans that will contain detailed strategies and prioritised project portfolios for Programmes and sub-programmes including target ADDs or ADD clusters. Programme and project portfolios are to be designed along the AR4D cycle.

The SRF outlines overarching strategies that the Institute deploys to deliver necessary results to accomplish Institute objectives over the next 10 years. However, the SRF is an evolving document as the Institute has to remain flexible to accommodate the on-going changes in the internal and external environments within the Institute, country and overseas.





## References

- Allen, B., Bourke, R. M. and Gibson, J. (2005). "Poor rural places in Papua New Guinea." *Asia Pacific Viewpoint* 46(2): 201-217.
- Anandajayasekeram, P. and Gebremedhin, B. (2009). *Integrating innovation systems perspective and value chain analysis in agricultural research for development: Implications and challenges*. Improving Productivity and Market Success (IPMS) of Ethiopian Farmers Project Working Paper 16. International Livestock Research Institute, Nairobi, Kenya.
- AusAID (2007). *Papua New Guinea – Australia Development Corporation Strategy 2006-2010*. Australian Agency for International Development, Canberra.
- Bourke, R. M. and Harwood, T., Eds. (2009). *Food and Agriculture in Papua New Guinea* ANU epress, The Australian National University, Canberra.
- CGIAR (2011). *A Strategy and Results Framework for the CGIAR*. Consultative Group on International Agricultural Research, Washington, DC.
- Daane, J., Francis, J., Oliveros, O. and Bolo, M. (2009). *Performance indicators for Agricultural Innovations Systems in the ACP Region*. Synthesis Report. International Expert Consultation Workshop. CTA, Wageningen.
- DNPM (2010a). *Medium-Term Development Plan 2011-2015*. Department of National Planning and Monitoring, Port Moresby.
- DNPM (2010b). *Papua New Guinea Development Strategic Plan 2010-2030*. Government of Papua New Guinea, Department of National Planning and Monitoring, Port Moresby.
- Dugue, M. 2004. *PNG: A Man's World?* Asian Development Bank.  
[http://www.adb.org/Documents/Periodicals/ADB\\_Review/2004/vol36\\_1/world.asp](http://www.adb.org/Documents/Periodicals/ADB_Review/2004/vol36_1/world.asp) (29 March 2011).
- Grellier, R. and Omuru, E. (2008). *The potential impact of HIV and AIDS on agricultural systems and nutrition in Papua New Guinea*. Final Report 711/ARDSF-GRM International, Port Moresby.
- index mundi. 2010. *Papua New Guinea*. Index Mundi.  
[http://www.indexmundi.com/papua\\_new\\_guinea/](http://www.indexmundi.com/papua_new_guinea/) (29 March 2011).
- Komolong, B., Maro, J., Ryan, J. and Ghodake, R. D. (2011). *Development of strategic priorities for Agricultural Research for Development - PNG National Agricultural Research Institute*. National Agricultural Research Institute, Lae, Papua New Guinea.
- Kruijssen, F. (2009). *Youth Engagement in Agricultural Research for Development. A focus on Sub-Sahara Africa*. Wageningen International. Wageningen University and Research Centre, Wageningen, The Netherlands.
- MAL (2006). *National Agriculture Development Plan 2006-2016*. Independent State of Papua New Guinea, Ministry of Agriculture and Livestock, Port Moresby.

- Mbabu, A. N. and Ochieng, C. (2006). *Building an Agricultural Research for Development System in Africa*. International Food Policy Research Institute, Washington, USA.
- NARI (2004). *Medium-Term-Research-Priorities of the National Agricultural Research Institute*. NARI Corporate Document No. 1. National Agricultural Research Institute, Lae, Papua New Guinea.
- NARI (2010). *NARI Strategic Planning: Strategy and Result Framework Workshop*. National Agricultural Research Institute, Lae.
- NSPTF (2009). *Papua New Guinea Vision 2050*. Government of Papua New Guinea, National Strategic Plan Taskforce, Port Moresby.
- Omamo, S. W., Diao, X., Wood, S., Chamberlain, J., You, L., Benin, S., Wood-Sichra, U. and Tatwangire, A. (2006). *Strategic Priorities for Agricultural Development in Eastern and Central Africa*. IFPRI, Washington.
- Rajalahti, R., Janssen, W. and Pehu, E. (2008). *Agricultural Innovation Systems: From Diagnostics toward Operational Practices*. Agriculture and Rural Development Discussion Paper No. 38. World Bank, Washington, DC.
- Spriggs, J. and Chambers, B. (2007). *Improving the marketing system for fresh produce in the highlands of PNG*. Final Project Report. ACIAR, Canberra.
- Treasury (2010). *Economic and Development Policies. Volume 1*. Department of Treasury, Government of Papua New Guinea, Port Moresby.
- UNDP. 2002. *Results based Management: Concepts and Methodology. Technical Note: 2000*.  
<http://www.undp.org/evaluation/documents/RBMConceptsMethodgyjuly2002.pdf>  
(1 March 2011).
- UNDP (2008). *United Nations Country Programme Papua New Guinea 2008-2012*. United Nations Development Programme, Port Moresby.
- World Bank (2007). *Agriculture for Development. World Development Report 2008*. Worldbank, Washington DC.

## **Annex 1. Agricultural Development Domains**

Challenges and opportunities of farming communities are much influenced by their bio-physical and socio-economic environment which is highly diverse in PNG. Therefore, geographic information system (GIS) has been used to identify and depict spatial similarities and differences in agriculture and delineate the country into various Agricultural Development Domains (ADD) (Omamo et al. 2006). Clusters of those domains are then used to conduct a constraints and objective analysis to identify possible areas of intervention through AR4D that will contribute to achieving NARI's purpose in line with its mandate and create impact on smallholder farming and rural communities. Further information on the ADD approach in general and in the NARI context can be found in Omamo et al. (2006) and Komolong et al. (2011).

A total of eight ADD clusters have been identified (Figure 8). Table A1 shows a summary of the ADD clusters, percentage of total rural population, percentage of total cultivated area per domain and provinces with the highest share of population in a particular domain.

As seen Table A1 over 50% of the rural population and more than 80% of the cultivated land are located in areas with low access to markets and services. Most of that land also has a low to medium potential with one to several major constraints to production. Almost 40% of the population live on 18% of cultivated land area in domains with good and medium agricultural potential and within four hours travel time to the nearest service centre or regional centre. Demographic trends over the past 30 years are likely to continue over the coming decade. People from low agricultural potential and access to services domains will migrate into ADDs with high/medium agricultural potential and high/medium access to services (Allen et al. 2005; Bourke and Harwood 2009).

**Table A1. Summary of major Agricultural Development Domain (ADD) clusters**

<b>ADD Clusters<sup>1</sup></b>	<b>ADD contained in Clusters</b>	<b>% of total rural population</b>	<b>% of total cultivated land area</b>	<b>Major provinces represented in the ADD<sup>2</sup></b>
<b>Cluster 1: HHH</b>	HHH	2.92	0.38	ENB (100%)
	MHH	4.1	0.61	WHP (58%), EHP (27%), Madang (15%)
	MMH	19.3	4.2	EHP (25.4), Simbu (24.0), SHP (15.5)
	HMH	6.3	1.6	WHP (63%), SHP (24%)
	MMM	6.1	2.6	ESP (30%), EHP (23%)
	HMM	0.2	0.12	EHP (100%)
	<b>Sub-total</b>	<b>38.9</b>	<b>9.5</b>	
<b>Cluster 2: HHL</b>	HML	0.4	0.4	Morobe (90%)
	MML	6.0	6.3	Central (30%), NI (17%)
	MHL	0.5	0.4	ENB (65%), Central (35%)
	<b>Sub-total</b>	<b>6.9</b>	<b>7.1</b>	
<b>Cluster 3: HLH</b>	HLH	1.3	0.3	Madang (83%), Morobe (15%)
	MLH	5.5	1.3	SHP (47.0)
	MLM	3.5	1.6	Enga (36%), Morobe (23%)
	<b>Sub-total</b>	<b>10.3</b>	<b>3.2</b>	
<b>Cluster 4: HLL</b>	HLL	1.4	1.8	ARB (40%), Simbu (35%), Milne Bay (16%)
	MLL	28.4	41.7	Morobe (21%); Madang (13%), ESP (10%), WSP (9%)
	<b>Sub-total</b>	<b>29.8</b>	<b>43.5</b>	
<b>Cluster 5: LHH</b>	LMH	0.3	0.1	Morobe (65%), Central (35%)
	LHM	0.2	0.1	Central (100%)
	LMM	1.6	0.8	Oro (68%), Central (25%)
	<b>Sub-total</b>	<b>2.1</b>	<b>1.0</b>	
<b>Cluster 6: LHL</b>	LHL	0.04	0.05	Central (100%)
	LML	0.3	0.3	Western (43%), Central (38%)
	<b>Sub-total</b>	<b>0.34</b>	<b>0.35</b>	
<b>Cluster 7: LLH</b>	LLH	1.3	0.3	SHP (58%), Simbu (31%)
	LLM	1.8	0.9	SHP (43%), Enga (39%)
	<b>Sub-total</b>	<b>3.1</b>	<b>1.2</b>	
<b>Cluster 8: LLL</b>	LLL	8.5	34.3	Gulf (22%), Western (21%)
	<b>Sub-total</b>	<b>8.5</b>	<b>34.3</b>	
	<b>Total</b>	<b>100</b>	<b>100</b>	

<sup>1</sup> Agricultural potential (based on slope, rainfall and soil quality; Access to services: low – 4-8 hours to reach provincial capital or urban centre (more than 1000 people); moderate – 1-4 hours to a provincial capital or larger urban centre (>2000 people); high – less than 1 hour to major regional centre; Population Density- low: 0 - 60 persons/km<sup>2</sup>; moderate: 61 – 100 persons/km<sup>2</sup>; high: 101 – 713 persons/km<sup>2</sup>

<sup>2</sup> e.g. MMH domain - 25.4% of the population in this domain is located in EHP



## Annex 2. NARI Results Framework

Goal and Strategic Objective	Indicators of Success	Means of Verification	Key Assumptions
<b>Institute Goal:</b> Improved welfare of rural families and communities who depend wholly or partly on agriculture for their livelihood	<ul style="list-style-type: none"> <li>Improved food security and nutrition and health</li> <li>Annual growth rate of household income in rural areas from agricultural activity</li> <li>Increased gainful employment</li> <li>Improved agricultural environment parameters</li> </ul>	National statistics, BPNG reports, international databases and information; Income and expenditure surveys, Sample survey reports and studies; nutritional surveys; M&E reports; impact assessment reports	Partners, stakeholders, key Government agencies contribute effectively
<b>Institute Strategic Objective:</b> Enhanced productivity, efficiency, stability and sustainability of the smallholder agriculture sector	<ul style="list-style-type: none"> <li>Increased resource productivity at aggregate level</li> <li>Stability of resource productivity and income</li> <li>Increased aggregated value addition and commercialisation, down-stream processing</li> <li>Increased profitability of crop and livestock enterprises</li> <li>optimal resource use and conservation</li> </ul>		Partner agencies and stakeholders appreciate and contribute to the improvement of the smallholder agriculture sector

### Output 1: Programme - Agriculture Systems

Strategic Objective	Indicators of Success	Means of Verification	Key Assumptions
Productivity, efficiency and stability of agricultural production systems improved	<ul style="list-style-type: none"> <li>Increased productivity of targeted production systems per unit of limiting resource</li> <li>Improved quality of crop and livestock products</li> <li>Increased production of crop and livestock products</li> <li>Improved stability of production and income of crop and livestock farmers over time and space</li> </ul>	Surveys and Impact Assessment Reports; GoPNG statistics and information; Programme M&E reports	<ul style="list-style-type: none"> <li>AR4D capacity available in the wider NARS for appreciation of the role of NARI and roles of other partners</li> <li>Positive response by farmers/stakeholders in up-taking technologies</li> </ul>

Key Strategies	Indicators of Success	Means of Verification	Key Assumptions
Activity 1.1 Increased use of suitable quality planting materials, breeding stock and other farm inputs by smallholder farmers	<ul style="list-style-type: none"> <li>Enhanced yield and quality of crops in target clusters</li> <li>Increased number and production of livestock per farm household</li> </ul>	NARI M&E reports, Impact Assessment reports; stakeholder and enterprise surveys	<ul style="list-style-type: none"> <li>Community support and participation in technology development, piloting, up-scaling and out-scaling</li> <li>Appropriate funding support available</li> <li>Other external factors are congenial for adoption</li> </ul>
Activity 1.2 Marketing systems for crop and livestock products improved	<ul style="list-style-type: none"> <li>Increased and consistent supplies of agricultural products to markets</li> <li>Increase in sales of agro-enterprises</li> <li>Increased value addition of local produce</li> </ul>		
Activity 1.3 Smallholder farming and rural communities are better prepared to cope with abiotic stresses due to seasonal weather patterns, climate change or natural disasters	<ul style="list-style-type: none"> <li>Farming communities apply strategies and technologies (water management, crops, livestock, food processing skills, etc) to respond to abiotic stresses</li> <li>Consistent supply of food at household level throughout the year</li> </ul>		
Activity 1.4 Smallholder farmers use improved and sustainable land and soil fertility management practices	<ul style="list-style-type: none"> <li>Consistent and increasing yield of crops</li> <li>Land productivity maintained and improved</li> <li>Change in soil loss from watershed</li> </ul>		
Activity 1.5 Biotic agro-ecosystem threats are sustainably managed by smallholder farmers	<ul style="list-style-type: none"> <li>Reduced crop and livestock losses</li> <li>Improved quality of produce</li> </ul>		
Activity 1.6 Farm mechanisation and availability of farm labour from smallholder farmers increased and more efficiently used	<ul style="list-style-type: none"> <li>Increased labour productivity in target production systems</li> <li>Reduced drudgery of household and farm tasks</li> <li>Increased land area farmed in target clusters</li> </ul>		
Activity 1.7 Smallholder farmers effectively integrate crops, livestock and aquaculture systems	<ul style="list-style-type: none"> <li>Improved use of farm resources</li> <li>Increased total production of crop and livestock per farming household</li> </ul>		

**Output 2: Programme - Enabling Environment**

<b>Strategic Objective</b>	<b>Indicators of Success</b>	<b>Means of Verification</b>	<b>Important Assumptions</b>
Enabling environment (policy, markets, institutions) for sustainable agricultural development influenced	<ul style="list-style-type: none"> <li>• Gender equity and empowerment</li> <li>• Favourable policy environment created</li> <li>• Increased marketing and trade options available to farmers</li> <li>• Coalitions built for shared policy objectives and vision</li> <li>• improved investment in the agriculture sector</li> </ul>	M&E and impact assessment reports; GoPNG policy and planning documents; GoPNG and donor budget allocations; G-PNG Department records and statistics	<p>Policy makers respond positively to and incorporate recommendations into sectoral and national policies</p> <p>Relevant and appropriate partners willing to form coalitions and work together</p>
<b>Key Strategies</b>			
Activity 2.1: Conducive socio-cultural environment influenced	<ul style="list-style-type: none"> <li>• increased gender equality in access to resources and decision making</li> <li>• reduced importance of obstructive cultural practices and beliefs in decision-making</li> </ul>	<ul style="list-style-type: none"> <li>• M&amp;E and impact assessment reports; GoPNG policy and planning documents; GoPNG and donor budget allocations; GoPNG Department records and statistics</li> </ul>	<ul style="list-style-type: none"> <li>• Policy makers respond positively to and incorporate recommendations into sectoral and national policies</li> <li>• Relevant and appropriate partners willing to form coalitions and work together</li> <li>• reasonably well developed AR4D capacity to address issues and implement programmes and projects</li> <li>• willingness of communities to share cultural values, beliefs and practices</li> </ul>
Activity 2.2: Marketing opportunities for agricultural commodities enhanced and utilised by smallholder farmers	<ul style="list-style-type: none"> <li>• Increased numbers of emerging agricultural enterprises</li> <li>• Farmers engaging innovative marketing strategies to remain competitive</li> </ul>		
Activity 2.3 Institutional arrangements improved and utilised by relevant stakeholders	<ul style="list-style-type: none"> <li>• Increased investment in AR4D</li> <li>• Increased use of farm inputs and award of credits</li> <li>• Farming and rural communities receiving adequate assistance during and after natural disasters</li> </ul>		
Activity 2.4: Income opportunities identified for and utilized by farming communities	<ul style="list-style-type: none"> <li>• Increased numbers of rural enterprises and cottage industries in operation</li> <li>• Increased demand for local products</li> </ul>		
Activity 2.5: Access to socio-economic services for smallholder farming communities improved	<ul style="list-style-type: none"> <li>• Increased numbers of farmers and/or communities engaging in meaningful social and economic activities</li> </ul>		
Activity 2.6 Improved ability of farming communities to mobilize land for agricultural development	<ul style="list-style-type: none"> <li>• Increased registration of customary land</li> <li>• Increased land use intensity for agriculture</li> </ul>		

**Output 3: Programme – Information and Knowledge**

<b>Strategic Objective</b>	<b>Indicators of Success</b>	<b>Means of Verification</b>	<b>Important Assumptions</b>
Use and sharing of information and knowledge in the agricultural sector effectively enhanced	<ul style="list-style-type: none"> <li>• Increased demand for improved agricultural technologies and practices</li> <li>• Increased agricultural innovations by stakeholders</li> <li>• enhanced national and international image of NARI</li> </ul>	Stakeholder survey reports; reports from national and international media, M&E and impact assessment reports	Partners, Stakeholders demand for information
<b>Key Strategies</b>			
Activity 3.1: Information is effectively packaged and disseminated to NARI clients and stakeholders	<ul style="list-style-type: none"> <li>• Better understanding and use of information</li> <li>• Increased knowledge of farmers</li> <li>• Improved food production and better management of resources</li> </ul>	Stakeholder survey reports, M&E and impact assessment reports	Partners, Stakeholders demand for information
Activity 3.2: Information is effectively managed by NARI	<ul style="list-style-type: none"> <li>• Quick and efficient decision making and reporting</li> <li>• Easy access to information by NARI and stakeholders</li> <li>• Loss or damage to information minimized</li> </ul>		
Activity 3.3: Appropriate and effective information facilities used in NARI	<ul style="list-style-type: none"> <li>• Efficient information and communication flow between NARI and stakeholders</li> <li>• Better capacity to store and manage information, data</li> <li>• Improved safety of important information, data</li> </ul>		
Activity 3.4: Learning needs of smallholder farmers appropriately addressed	<ul style="list-style-type: none"> <li>• Farmer literacy level improved</li> <li>• Improved understanding of information and knowledge and their application by smallholder farmers</li> </ul>		



**Output 4: Programme - Institutional Management and Development**

<b>Strategic Objective</b>	<b>Indicators of Success</b>	<b>Means of Verification</b>	<b>Important Assumptions</b>
Enhanced efficiency and congenial institutional environment for effective AR4D	<ul style="list-style-type: none"> <li>• Responsive AR4D portfolio developed and implemented</li> <li>• Effective AR4D service delivery by NARI</li> <li>• Improved AR4D capacity</li> </ul>	HT and financial audit and assessment reports, M&E and impact assessment reports, council minutes, R&D portfolio	<ul style="list-style-type: none"> <li>• Explicit concept of visionary leadership articulated and adopted at all levels of the organisation</li> <li>• Appreciation and support by financing agencies</li> </ul>
<b>Key Strategies</b>			
Activity 4.1: Human talent capacities and competencies are enhanced and effectively utilised as part of on-going learning in line with the changing needs of the clients and the Institute	<ul style="list-style-type: none"> <li>• Well distributed quality and quantity of human talents in relation to institutional strategic objective</li> <li>• Human talents area allocated to priority client needs</li> </ul>	NARI RMIS data, audits and assessments; Records (reports, MoAs, MoUs) of partnerships; minutes of Management Committees and Council meetings; corporate reports and documents	Quality human resources available for recruitment
Activity 4.2: Effective development and management of networks, partnerships and collaborations and provision of efficient technical services to stakeholders	<ul style="list-style-type: none"> <li>• Increased flow of information to and from NARI</li> <li>• Improved AR4D results</li> <li>• Increased customer base and satisfaction for technical services</li> </ul>		Partners and stakeholders appreciate and recognise their partnership roles and responsibilities
Activity 4.3: Planning, monitoring, evaluation and impact assessment systems effectively implemented at all levels of the organization	<ul style="list-style-type: none"> <li>• Results-oriented plans responding to client needs</li> <li>• Improved knowledge on research performance</li> </ul>		
Activity 4.4: Financial and material resources adequately mobilised, managed and developed	<ul style="list-style-type: none"> <li>• Resource allocation aligned to client and institutional needs</li> </ul>		GoPNG and donors respond positively to finding needs of the Institute
Activity 4.5: Effective and prudent leadership and stewardship incorporating the due mechanisms, processes and structures	<ul style="list-style-type: none"> <li>• Enabling internal institutional policy environment created</li> </ul>		Partners and other agencies (incl. GoPNG agencies) deliver their services and contributions efficiently

### Annex 3. Complete list of Project Areas in Various Agricultural Development Domain (ADD) Clusters

The following Tables A3.1 to A3.3 show a complete list of identified project areas in response to agricultural productivity and development constraints and opportunities prevalent in ADD clusters in the NARI strategic planning process (NARI 2010) for Programmes Agriculture Systems, Enabling Environment and Information and Knowledge (conceptualization of Programme Institutional Management and Development followed a slightly different approach – see (NARI 2010; Komolong et al. 2011). Related Project Area objectives were consolidated as sub-programme objectives. The last column shows the priority ranking after an internal NARI prioritization exercise. Major criteria used include considerations of the macro environment, human and physical environment and national importance, impact and feasibility. Details of the prioritisation criteria and process applied are described in Komolong et al. (2011). Future planning exercises to develop Programme Implementation Plans and project portfolios will involve further prioritisation in regards to potential impact (potential benefits, adoption likelihood) and feasibility (scientific potential, research capacity).

**Table A3.1 Project Areas in Programme – Agricultural Systems**

Programme Strategic objective	Sub-programme objective	Project area objectives and targeted ADD clusters	Prioritization ranking
Productivity, efficiency and stability of agricultural production systems improved	1. Increased use of suitable quality planting materials, breeding stock and other farm inputs by smallholder farmers <sup>3</sup>	• Access to suitable quality planting materials and breeding livestock by smallholder farmers improved – C1,3,4,6,7	1
		• Farm inputs are more affordable for men and women smallholder farmers – C1	7
		• Access to and appropriate use of farm inputs for crop and livestock production increased – C4	12
		• Management and production of depleting Sago stocks improved – C4	17
	2. Marketing systems for crop and livestock products improved	• Marketing of and value addition opportunities for crop and livestock products improved – C1-7	1
	3. Smallholder farming communities are better prepared to cope with abiotic stresses due to seasonal weather patterns, climate change	• Improved capability of men and women smallholder farmers to manage periods of water shortage and water excess (incl. high rainfall, sea water inundation) – C1-7	1
		• Smallholder farming communities and institutions can effectively respond to natural disasters with agricultural rehabilitation – C1	10
		• Men and women smallholder farmers are better prepared to manage impacts of frost and excessive cloud cover – C4,7	11

<sup>3</sup> Smallholder farmers include men, women and youth

Programme Strategic objective	Sub-programme objective	Project area objectives and targeted ADD clusters	Prioritization ranking
	or natural disasters	• Opportunities explored to produce low altitude crops in high altitudes with increasing temperature due to climate change – C7	18
	4. Smallholder farmers use improved and sustainable land and soil fertility management practices	• Men and women small holder farmers use improved and sustainable land and soil fertility management practices – C1, 2-8	4
	5. Biotic agro-ecosystem threats are sustainably managed by smallholder farmers	• Smallholder farmers experience reduced crop losses due to pests, diseases and weeds – C1-4, 6-7	5
		• Smallholder farmers experience reduced livestock and production losses due to pests and diseases – C1-4, 6-7	6
	6. Farm mechanization and availability of farm labour from smallholder farmers increased and more efficiently used	• Adequate energy input into agricultural production - C1	8
		• Availability of farm labour increased – C2, 5-7	14
	7. Smallholder farmers effectively integrate crops, livestock and aquaculture systems	• Improved integration of crops, livestock and fisheries - C2, 5-6	9
		• Adapted low maintenance livestock and fishery options integrated in LLL communities – C8	13
		• Alternative low input crop options and improved varieties integrated into sago and sweet potato-based production systems	15
		• Adequate cultivable land/ reduced land pressure – C3, 7	16

**Table A3.2 Project Areas in Programme - Enabling Environment**

Strategies	Sub-programme objectives	Project area objectives and targeted ADD clusters	Prioritization ranking
<b>Strategic objective:</b> Enabling environment (policy, markets, institutions) for sustainable agricultural development influenced	1. Conducive socio-cultural environment influenced	• Conducive socio-cultural environment (1) C1,2,4-7	1
	2. Marketing opportunities for agricultural commodities enhanced and utilised by smallholder farmers	• Access to infrastructure (market buildings, depots) by farming communities improved – C1,5,7	2
		• Access to developed and new markets improved (creating knowledge on markets) – C1	3
		• Effective marketing and trade (barter) for remote (LLL) communities – C 8	12
	3. Institutional arrangements improved and utilised by relevant stakeholders	• Investment in AR4D and wealth creation increased by GoPNG and donor agencies – C4	4
		• Access to agricultural and allied inputs (especially credit) improved – C3,5,6	5
		• Relevant and user friendly seed policies implemented – C5	6
		• Effective policies, response strategies, processes and mechanisms for mitigating effects of natural disasters implemented – C8	7
		• Adequate price support systems established – C5	9
		• Improved access to affordable transport options to remote (LLL) communities – C8	16
		• Optimised access to border trading – C6	18
		• Adequate social security at community level (with regards to access to opportunities	19
	4. Income opportunities identified for and utilised by farming communities	• Increased employment opportunities – C2	8
		• Alternate income earning opportunities (agro-tourism) – C2, 3, 8	13
	5. Access to socio-economic services for smallholder farming communities improved	• Improved access to basic socio-economic services (health, education, roads, bridge, communications) – C2-5	10
		• Effective and improved communication and allied infrastructure – C3	15
		• Increased investment in social service infrastructure – C8	17
	6. Improved ability of farming communities to mobilise land for agricultural development	• Improved access to land (include peri-urban) – C4,6	11
		• Efficient use of deforested and mine impacted land (rehabilitation) – C4	14

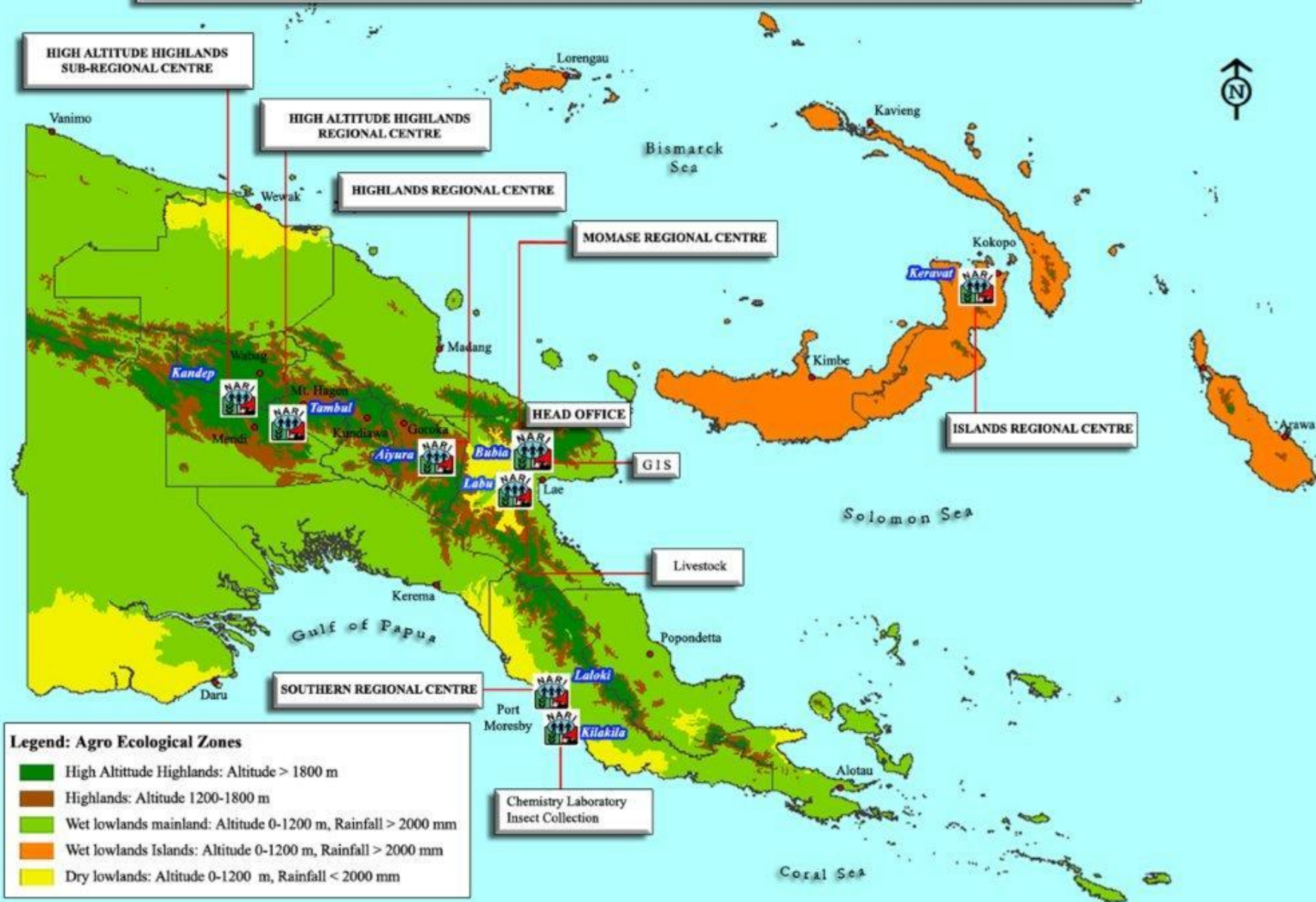
Table A3.3 Project Areas in Programme – Information and knowledge

Strategies	Sub-programme objective	Project area objectives and targeted ADD clusters	Prioritization ranking
<b>Strategic objective</b> Use and sharing of information and knowledge in the agricultural sector effectively enhanced	1. Information is effectively packaged and disseminated to NARI clients and stakeholders	Information appropriately packaged	Not prioritized as PAs are closely linked to P1 3 and 4
		Improved access to information	
		Improved responses of farming communities	
		Improved access to information on livelihood options	
	2. Information is effectively managed by NARI	• Improved information management system established	1
	3. Appropriate and effective information facilities developed in NARI and assistance provided to partners	• Appropriate and effective Information facilities developed in NARI and assistance provided to partners	2
	4. Learning needs of smallholder farmers identified and appropriately addressed	• Appropriate extension models identified	3
		• Farmers learning facilitated	4
		• Improved understanding of appropriate livelihood options	5





# NARI REGIONAL COORDINATION CENTRES FOR RESEARCH AND TECHNICAL PROGRAMMES





**For Copies Contact:**

Programme Director-Information and Knowledge  
National Agricultural Research Institute  
Sir Alkan Tololo Research Centre  
Bubia, Ten Mile  
P.O. Box 4415, LAE 411  
Morobe Province  
Papua New Guinea.

Telephone: (675) 475 1444, Fax: (675) 475 1450

Email: [naripng@nari.org.pg](mailto:naripng@nari.org.pg) Website: <http://www.nari.org.pg>