

# Tertiary Irrigation Technical Assistance (TIRTA)

## Design Document



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# ***Tertiary Irrigation Technical Assistance: TIRTA***

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## ***Tertiary Irrigation Technical Assistance: TIRTA***

### ***Acronyms***

ADB	Asian Development Bank
ARF	Adviser Remuneration Framework
AIP-PRISMA	Australia Indonesia Partnership for Promoting Rural Income through Support for Markets in Agriculture
AIP-Rural	Australia-Indonesia Partnership for Rural Economic Development
ANTARA	Australia Nusa Tenggara Assistance for Regional Autonomy
BME	Benefit monitoring and evaluation
BPN	National Land Agency
CAVAC	Cambodia Agricultural Value Chain Program
DAS	District Agricultural Services
DCED	Donor Committee for Enterprise Development
DFAT	Australian Government Department of Foreign Affairs and Trade
DINAS	Dinas Pertanian dan Peternakan = Agricultural and Livestock Service Office
DISIMP	Decentralized Irrigation System Improvement Project
DTW	Deep tube well
ETESP	Earthquake and Tsunami Emergency Support Project
GDP	Gross Domestic Product
GOI	Government of Indonesia
ha	Hectares
HIPPA	Himpunan Petani Pemakai Air
HVC	High value crops
IMRP	Irrigation Management Reform Program
IED	Independent Evaluation Department
ISF	Irrigation service fee
JICA	Japan International Cooperation Agency
JIDES	Jaringan Irigasi Desa
JITUT	Jaringan Irigasi Tingkat Usaha Tani
KIIF	Kabupaten Irrigation Improvement Funds
km	Kilometers
KUD	Village cooperative unit
l/s	Litres per second
L-RED	Local and Regional Economic Development
LCB	Local Capacity Building
MD	Man days

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m	Meters
m <sup>2</sup>	Square meters
m <sup>3</sup>	Cubic meters
MDP	Management Development Program
M&E	Monitoring and evaluation
MoPW	Ministry of Public Works
NGO	Non-Government Organisation
NTB	Nusa Tenggara Barat
NTT	Nusa Tenggara Timur
NTTLDP	NTT Livestock Development Project
NTTIADP	NTT Integrated Area Development Project
O&M	Operation and maintenance
PDO	Project Development Objective
PIM	Participatory irrigation development and management
PWRS	Provincial water resources service
R&U	Rehabilitation and upgrading
SADI	Smallholder Agribusiness Development Initiative
SRP	Strategic Review Panel
STW	Shallow tube well
TTS	Timor Tengah Selatan
TTU	Timor Tengah Utara
WRISM	Water Resources and Irrigation Sector Management Program

## **1 Executive Summary**

The Australian Government's Department of Foreign Affairs and Trade (DFAT) has been supporting rural development, mainly in eastern Indonesia, for several decades. Its latest program, AIP-Rural (Australia-Indonesia Partnership for Rural Economic Development), represents a break from previous rural development programs: it is more focused on smallholder farmer incomes and competitiveness, more comprehensive in its coverage of agricultural constraints, and more market-oriented in finding sustainable solutions that impact large numbers of farmers.

Strengthening the agriculture sector is one of the most effective ways of reducing poverty and promoting economic growth in developing countries. Agriculture provides livelihoods for millions of workers in Indonesia, particularly in rural areas, and underpins food security and nutrition. AIP-Rural supports the Australian Government's commitment to improve agricultural productivity and address barriers to market access for rural communities in Indonesia. The Program works across key agricultural commodities of relevance to smallholder male and female farmers such as maize, cassava, vegetables and beef. It also supports key cross-cutting sectors critical to increasing agricultural productivity, including irrigation, access to finance and applied research and innovation.

Irrigation has a significant impact on farmer incomes. When compared with other inputs like fertilizers and seeds, its typical net income gain is up to three times greater. The rationale for this support is compelling: in Indonesia as elsewhere land and water resources are coming under competing pressure not only from agriculture but from industry, growing urban and rural populations and the impacts of climate variability. AIP-Rural aims to increase access to and help both male and female farmers better manage water resources.

The Government of Indonesia, along with multilateral and bilateral donors, regard irrigation as a priority for rural economic development and have been investing in irrigation for decades. Most of the larger and more easily developed irrigation schemes have been supported across eastern Indonesia. But many of these schemes are not operating effectively, and suffer from accumulating maintenance deficits. Several multilateral projects have been designed to improve the operations and maintenance of these systems but still a little over one third of all irrigation areas are officially classified as "poor or ruined". A US\$300 million project funded by the World Bank (WRISM) is addressing this issue at a national level. Although AIP-Rural shares common objectives with WRISM, measurable impact on AIP-Rural's target groups in eastern Indonesia as a result of a potential DFAT contribution to this project could not be assured.

In the 1990s the government planned to hand the management of irrigation over to water user associations under the Irrigation Management Transfer program, but in practice the management of almost all government constructed schemes remains under national, provincial or district Departments of Public Works. Water user associations (WUAs) or Himpunan Petani Pemakai Air (HIPPAAs) are responsible for tertiary irrigation systems at the extremities of irrigation networks.



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Given the relatively small amount of resources available to AIP-Rural and its aim of seeing short term impact on farm incomes, AIP-Rural has decided to focus exclusively on the tertiary irrigation sector. The management of tertiary irrigation is dominated by 41,000 HIPPA's throughout the country. These are bodies that are registered at the district level and sometimes receive support from national or district budgets. While there are cases of successful HIPPA's, the vast majority of them are underperforming because of: poor management; deficit cash flows that leads to low maintenance and diminishing area coverage; and, above all, the lack of investment finance that is needed to break this cycle. Money and management training however are not the solution.

In the course of investigating the constraints to this sector AIP-Rural consultants were directed to a HIPPA in the Tuban District of East Java. The HIPPA had recently been recognized for the quality of its management. The intention of the visit was to see how this success story could be replicated. It was learnt during these interviews that this irrigation scheme, of close to 400 hectares (ha), had for 10 previous years, been jointly managed by a local investor and the HIPPA. In fact, the HIPPA's managing committee had learned their irrigation management skills from this investor and had eventually graduated or bought out the investor after 10 years of mutually beneficial collaboration. In subsequent discussions with the irrigation section of the Dinas Pertanian dan Peternakan (DINAS) it was learnt that this model had been initiated by an enterprising DINAS staff member as far back as 1974 and that by the mid-90s there were between 10 to 20 other similar schemes operational in the Tuban area. Subsequent detailed case studies of some of these schemes have shown return on investment levels of 25% or higher; with individual farmers, at the same time, increasing their incomes upwards of 60%. Moreover these schemes were operationally sustainable and self-sufficient.

Based on these successful cases, the aim of the TIRTA project is to facilitate commercial investment in the provision of irrigation services to small male and female farmers in eastern Indonesia. It will do this by initiating and then expanding its project operations from the Tuban District to the neighboring districts of Bojonegoro and Lamongan where there are approximately 200 HIPPA's. In all, for the 42 month duration of the project, 35 facilitated investments are foreseen for these three districts as well as for other districts in East Java, Nusa Tenggara Timur (NTT) and Nusa Tenggara Barat (NTB) provinces. The average minimum planned scheme size is 100 hectares, serving the needs of between 2-300 farmers each.

The project will not directly invest in these schemes, rather it will stimulate the demand for investment by local investors and HIPPA's by demonstrating the mutual benefits to farmers and investors. During the design of this project several of the HIPPA's visited expressed an interest in inviting a local investor to upgrade their irrigation services, but they were unsure as to how to make this happen. Similarly more than one investor expressed an interest in commercial irrigation. The value addition of the project is found in its ability to accelerate the dissemination of this opportunity and reduce investment risks by: identifying potentially viable sites through satellite imagery, field surveys, stakeholder and social impact mapping, and then by working with local investors and HIPPA's on technical and commercial business plans, reduce the risks associated with investment. The aggregated outreach of these schemes is anticipated to be 10,000 small farmers with income increases of at least 60%.

### ***Tertiary Irrigation Technical Assistance: TIRTA***

TIRTA will be managed as a separate project under the AIP-Rural umbrella. This means that it has the same overall goal of increasing farmer incomes, and it will have the same results measurement and reporting system, namely the Donor Committee for Enterprise Development (DCED) Results Measurement Standard. It will also operate in eastern Indonesia with its first phase concentrating in East Java, NTT and NTB provinces.

## 2 Background

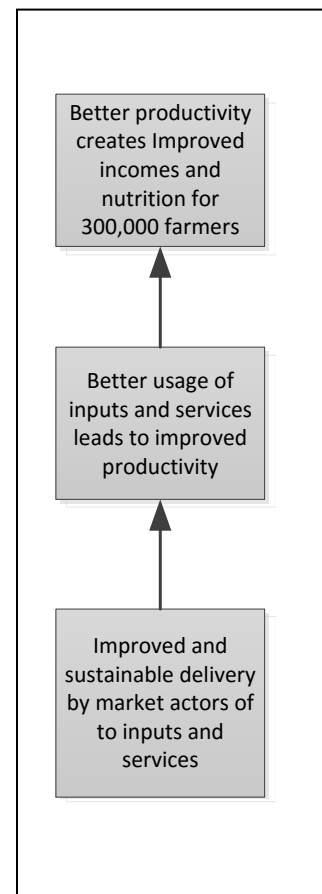
DFAT has a long history of rural development in Indonesia. There have been two main predecessors to AIP-Rural: ANTARA (2005-2010) with a budget of AUD30 million for five years in NTT province; and SADI (2006-2010) also with a budget of AUD30 million for four years for NTT, NTB and Sulawesi provinces. DFAT's most recent program, AIP-Rural, has been designed as a 10 year program ending in June 2022. The program's 1<sup>st</sup> Phase, ending in June 2017, has a budget of AU\$ 112 million and is aimed at increasing, by at least 30%, the agricultural incomes of 300,000 small farmers living in five provinces of eastern Indonesia: NTT, NTB, East Java, Papua and West Papua.

The rationale for support for agriculture in Indonesia is that the sector is typically estimated to be up to three times more efficient in reducing poverty compared to other major economic sectors in developing economies. Agriculture is also a key sector in achieving stable economic growth and achieving food security for Indonesia's growing population.

The theory of change underpinning AIP-Rural is based on market-led agricultural systems development. At the core of this approach is the theory that all people living in communities trade goods and services with one another to meet their needs – so they are already engaging in markets. AIP-Rural aims to grow markets for commodities that are likely to increase the incomes of poor farmers by working with private and public sector market actors, to expand or enhance farmer access to change-inducing inputs, know-how and public services. If more farmers understand the impact of, and have access to, improved assets, technology, inputs and services, they will increase their competitiveness and incomes (see **Error! Reference source not found.**). The key strategies that AIP-Rural will use to improve access to these assets, technologies, inputs and services are to:

- identify agricultural commodity sectors like (maize, beef, cocoa etc.) or cross cutting sectors (mechanisation, irrigation, technology, finance), that are most relevant to generating pro-poor outcomes in the selected provinces; and then,
- analyse these sectors, to assess the systemic or binding constraints that are most important to increased farm incomes, and then
- design 80+ sustainable and market driven interventions which generate “scaleable” impact and outreach to small farmers for whom these sectors are relevant in these provinces.

AIP-Rural will consist of several sub-projects:



**Figure 1 Theory of change summary**

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- Promoting Rural Income through Support for Markets in Agriculture (PRISMA), commissioned in November 2013, will concentrate its interventions mostly in selected commodity sectors,
- A tertiary irrigation project will boost agricultural productivity through improving farmer access to water,
- A financial inclusion project will work through micro-finance organisations to address small farmer access to credit and micro-insurance,
- An agricultural research and innovation project will improve farmer access to new processes and technologies, and
- A small regional economic development project will improve the local competitive or enabling environment for agriculture in selected districts.

Each of these projects has the same overall goal of increasing farmer incomes. The program will be delivered through a series of 100+ interventions with partners from the private, public and civic sectors of the economy. The Government of Indonesia's executing agency for PRISMA project is Bappenas. At the time of completing this draft of the design document discussions are being held with two separate ministries (Public Works and Agriculture) to become the responsible partner for the project on the side of the Gol. To maintain the coherence of five separate AIP-Rural projects, each of them will use the same results measurement system called The Donor Committee for Enterprise Development (DCED) Results Measurement Standard. This system is designed to provide "real time" feedback loops to management on: impact, outreach and value for money. To understand how the TIRTA project fits within the overall structure of AIP-Rural the reader should refer to Section 9 of this document on project governance.

### **2.1 AIP-Rural's approach to rural development**

Conventionally, rural development programs have tended to be public-sector focused, with an emphasis on agricultural extension and research, food security, infrastructure and rural livelihoods. Reviews such programs have shown that they have frequently been unable to ensure the sustainability of benefits to the poor once program funded activities cease. AIP-Rural supports a progressive move for DFAT in Indonesia towards a "market systems" or a "making markets work for the poor" approach. This approach has emerged as one of the preferred approaches to smallholder farmer development for many bi-lateral donor agencies over the last decade, and has been successfully applied in other rural situations in other countries (including DFAT's Cambodia Agricultural Value Chain Program (CAVAC) in Cambodia and Management Development Program (MDP) project in Fiji and Timor L'Est). The approach uses conventional analysis to identify key farmer constraints, but once these constraints have been identified it looks for "market actors" that have a vested interest in overcoming these constraints. In the case of tertiary irrigation these market actors are mainly local investors that see a commercial opportunity in sustainably delivering water to farmers who are interested in significantly boosting their productivity. This win-win in irrigation is explained in more detail in following sections.

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### **2.2 Gender and Social Inclusion**

Empowering women is a core objective of the Australian aid program. AIP-Rural's approach to promoting social inclusion is based on the recognition that women, poorer men, the young or elderly, people with disabilities, and ethnic minority groups in the community often lack access to opportunities and resources which impact on their lives. This approach also recognises that greater social inclusion makes economic sense. Across many agriculture sectors in Indonesia women commonly play primary roles in on-farm production, but they are largely excluded from membership of key decision making forums. Women are generally not members of farmer associations, for instance, and therefore often lack access to training and information. International experience shows however that ensuring broader access can increase market efficiency.

As a market development program AIP-Rural will not implement specific gender activities but mainstreams its support for women's economic empowerment through its core activities. Thus stakeholder analysis across each of AIP-Rural components – including TIRTA – will focus on women's roles and the nature of barriers to their participation, as a central part of program planning, design and implementation. Capacity building measures for farmers will be based on a profound understanding of gender roles in production.

At design, TIRTA's approach to promoting social inclusion is necessarily confined to high level strategies. Since the nature of support required will vary from district to district, across agricultural commodities and between different project modalities, it is not feasible to elaborate detailed strategic plans before implementation commences. Rather, strategies to promote social-inclusion will be developed once specific business opportunities have been identified. If and where appropriate, special attention and assistance will be provided under TIRTA to support the role of women in the administration and management of WUAs to increase their involvement.

### **2.3 The scope of TIRTA**

In Indonesia irrigation is managed at three levels: the national and provincial level which handles large schemes and primary canal systems (from 1,000 to 3,000 ha), and the district level that manages smaller schemes (<1,000 ha). Even smaller schemes at the village level are called "tertiary" and are managed by farmers. This project will focus exclusively at the tertiary irrigation level (including village systems), where some of the systemic failures are most evident.

This project, with a clear geographic coverage of eastern Indonesia in this phase, will limit itself to the provinces of East Java, NTT and NTB. Out of these three provinces the initial focus will be on East Java and within East Java, three districts (Tuban, Bojonegoro and Lamongan) have been chosen for the first phase of the project's duration. Analysis and preparations to extend the project to NTT and NTB will commence in the second year of

Because of AIP-Rural's orientation to finding market based solutions to constraints in agriculture, TIRTA's core approach to supporting tertiary irrigation will be to find and work with willing and competent market actors. Within these geographic, methodological and time bound parameter's, the project aims to reach approximately 10,000 small male and female farmers

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with attributable agricultural income increases of 60% through the facilitation of approximately 35 locally financed and sustainable irrigation schemes of about 100 hectares each.

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### **3 Country/region and sector issues**

Indonesia's population was 246 million in December 2012, growing at around 1.5% per year. The population is also becoming more affluent, with GDP growth rates averaging around 6% per year in real terms since 2007. GDP per capita now exceeds US\$ 1,700 nominal and \$4,300 expressed in purchasing power parity.

Despite rapid growth in recent years, reducing poverty remains challenging. According to Bureau of Statistics (BPS) data 28 million people were classified as poor earning less than the poverty line income of IDR 9,000 per day in March 2013. While poverty has declined (from US\$ 37 million in 2008) the number of people earning less than US\$ 2/day increased to 49%. The 20% of households categorised as near-poor (families who are vulnerable to social economic shocks) has steadily increased and further shocks could potentially send these people into poverty. As 63% of Indonesia's poor live in rural areas, agriculture remains critical to their pathway out of poverty. Unless urban job creation accelerates significantly, the agriculture sector will continue to employ more than two-thirds of the labour force for at least the next five years. A more profitable agriculture sector will significantly assist in poverty reduction efforts since a 1% growth of rural agriculture Gross Domestic Product (GDP) can change rural poverty by 2.9% and urban poverty 1.1% (ADB, 2006). Rajah and McCullough conclude that "rural agriculture is the most important pathway out of poverty rather than a trap from which the poor need to escape." For agriculture to deliver sustained impact on income in a growing and increasingly open Indonesian economy, it will need to become more competitive.

#### **3.1 The importance of irrigation to agriculture in Indonesia**

Irrigation offers the potential to (i) increase production and profitability per hectare per crop (ii) increase cropping intensity (iii) allow production of higher value non-rice crops in the dry season, and (iv) reduce the risks of failed crops, which can be catastrophic for small-holders with limited resources and reserves. It can therefore allow many farmers to move from subsistence to small-scale commercial production

Water resources management and irrigation play a very important role in Indonesia's socio-economic development in terms of food security. Irrigated agricultural land produces 85% of national rice production and 95% of Indonesian people consume rice as a staple. Irrigation has been shown to have three times more impact on farm productivity compared to other agricultural inputs like seed varieties and fertilizers<sup>1</sup> (Prasteyo Nuchsin).

Productivity increases, as a result of irrigation, are not only caused by per hectare yield increases but also due to differences in cropping intensity<sup>2</sup>. Generally, cropping intensity of rice

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<sup>1</sup> Irrigation (16%), fertilizer (4%) and improved varieties (5%).

<sup>2</sup> Cropping intensity or cropping frequency is the term used to describe the number of crops that can be produced off the same area in one year. A cropping intensity of 100% is one crop per year. A cropping intensity of 200% is two crops produced off the same area in one year.

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in irrigated areas is more than 155%, sometimes reaching 250% in some areas (Virmillion, D. et al). In contrast the average cropping intensity in non-irrigated or rainfed areas is around 100% per year. Cropping intensity therefore has a strong relationship with the availability of water and its improved control and management.

Though Indonesia is in general a water rich country, spatial and seasonal variation of water availability poses high risks for water security for domestic, municipal, industrial and agricultural uses. Population growth, urbanization, economic development, and the impacts of climate change place increasingly high pressure on land and water resources and will only increase the importance of irrigation to agriculture.

### **3.2 A short history of irrigation in Indonesia**

A succinct history of irrigation in Indonesia is captured in the paper *Time for Innovation in Indonesia's Irrigation Sector*, presented at the Sustainable Water Management for Food Security policy dialogue in Indonesia in 2011.<sup>3</sup>

Over the past decades, Indonesia's water resources and irrigation sector has gone through a transformation from a centralized development and investment program to a decentralized system of service delivery in which more efficient use of resources and service quality are emphasized.

Between 1969 and 1989 significant investment in irrigation and agricultural development occurred. This development focused on achieving and maintaining self-sufficiency in rice after a period of serious food shortages. In the course of five consecutive five-year plan periods commencing 1969, some 2.5 million hectares of irrigation areas were rehabilitated and 1.7 million hectares of new areas were developed. River basin management was mainly seen as a requirement for securing irrigation supply and flood protection. Such efforts were supported by the massive expansion and farm input programs, leading to self-sufficiency in rice in 1984.

The government, however, could not maintain rice self-sufficiency after that. One of the main reasons was the lack of attention to and funding for the operation and maintenance of the newly rehabilitated and developed irrigation systems.

In 1987, the Government adopted an irrigation operation and maintenance policy. This included efforts to ensure adequate funding for operation and maintenance, the introduction of irrigation service fees (ISF), better management of large irrigation systems, and management transfer to WUAs for schemes of less than 500 hectares.

It is believed that inadequate participation of WUAs and local governments in this policy led to unsatisfactory results (Virmillion, D. et al). Also, arrangements for technical and institutional guidance and support services were unclear and poorly funded. Operation and maintenance budgets were allocated in accordance with average per ha amounts rather than actual needs per system. Approximately 60 to 85% of operation and maintenance budgets were used for staff costs and urgent repairs and rehabilitation, leaving little for routine maintenance. The ISF failed because the funds were directed to regional revenue offices not to irrigation systems, and

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<sup>3</sup> Virmillion, D et al, 2011.



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farmers were therefore reluctant to pay. In the late 1990s it became clear that such a supply driven approach led to both the unsustainable use of water resources and poor cost recovery.

In 1999 the Government issued the decree for the Irrigation Management Reform Program (IMRP) and in 2001 it issued Government Regulation No. 77, both of which mandated reforms that were based on the principles of participatory irrigation development and management. The IMRP placed the district in the position of the primary actor for planning and financing irrigation management and development through the establishment of multi-stakeholder Irrigation Commissions. Water users were to collect irrigation service fees for their own associations. In 2003 the Ministry of Finance issued a Ministerial Regulation that authorized setting up Kabupaten Irrigation Improvement Funds (KIIF) at the district and provincial levels to oversee the allocation of funds for minor repairs and improvements based on joint investments between the government and water users associations.

### **3.3 Water Law 7/2004**

A major water resources reform occurred in 2004 (Water Law 7/2004) which is still in effect today. It has implications for the design of TIRTA because the law gives local communities a greater responsibility in the management of the irrigation system. The responsibility of different parts of the irrigation system is split between the public and private sectors.

The public sector is responsible for operating, maintaining and building the main irrigation network, i.e. the primary (dams, reservoirs, etc.) and the secondary (rivers, channels, canals, etc.) systems that bring water to the farm. Farmers, through Water User Associations (WUA), are responsible for operating, maintaining and developing the tertiary system, i.e. the irrigation channels that flow through the farmland. Subject to mutual agreement with the responsible irrigation service, WUAs can also be partners in operation and maintenance of the main network. As a result of the law, WUAs are increasingly assuming operations and maintenance tasks over larger parts of the water system.

In larger irrigation schemes (>3,000 ha), the central government (Director General (DG) Water Resources of the Ministry of Public Works (MoPW)) is now responsible for the main network in strategic basins and irrigation systems. The provincial government has jurisdiction over the management of the main network with a command area of between 1,000 and 3,000 ha and across district systems. Finally, the district level manages irrigation systems smaller than 1,000 ha.

In terms of funding, at the central level the Ministry of Public Works funds the operations and maintenance, and rehabilitation of its networks through the national budget, and transfers funds to assist provincial irrigation services for operations and maintenance. Provincial systems are also partly funded by the provincial budget and the deconcentration fund, which is not exclusively earmarked for irrigation. At the district level, the operations and maintenance budget comes from the district budget. This may include a small amount of funding from the DG Water Resources for the WUAs, as well as from the province to conduct maintenance activities.

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<sup>4</sup> This section is reproduced from the OECD Review of Agricultural Policies; Indonesia, 2012.



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The direct involvement of central government agencies in carrying out irrigation investment projects decreased after 2006, because of an increase in funding transferred to the regions. The funds for irrigation are earmarked to provincial and district governments for capital expenditure, to deepen investment in rehabilitation and expand irrigation coverage, and cannot be used for operation and maintenance activities.

### **Box 1 Government Support, JITUT and JIDES**

Since 2005, the Ministry of Agriculture has provided financial support to WUAs for rehabilitation works on farm level irrigation channels through the Farm Level Irrigation Network (Jaringan Irigasi Tingkat Usahatani, JITUT) and the Village Irrigation Network (Jaringan Irigasi Desa, JIDES) programs. While the work carried out under the programs is the same, the source of water is different. JITUT supports the rehabilitation of irrigation channels connected to the main network system while JIDES supports those that are supplied by water collected and stored at the village level. Approximately 70% of water used for irrigation is supplied through the main networks and 30% through village level schemes. Assistance is paid out at the rate of IDR 700,000/ha under JITUT and IDR 1 million/ha under JIDES. Factors considered when allocating funding among WUAs requesting assistance include the current state of the irrigation channels, the proposed rehabilitation work, the anticipated production increase and the management capability of the applicant.

*Source: OECD Review of Agricultural Policies; Indonesia 2012*

*Note: The districts of Bojonegoro, Tuban and Lamongan, receive approximately 4 - 6 JIDES grants each per year. Two of these are provided by the central government and the rest is funded by provincial and district governments. It is estimated that the total JIDES grants will increase for 2014 to approximately 10 per district. There are approximately 200 HIPPAAs adjacent to the Bengawan Solo River across the three districts.*

### **3.4 Tertiary irrigation and WUAs**

As previously stated, farmers are responsible for the management of tertiary irrigation systems. Tertiary irrigation systems can be either the 'last mile' of delivery infrastructure in larger, more complex government schemes where the government is responsible for managing primary and secondary infrastructure, or they can be stand-alone village based irrigation schemes which are often relatively small (<1,000 ha)<sup>5</sup>.

Farmers within tertiary irrigation systems coordinate themselves by forming a WUA<sup>6</sup>. Modern WUAs have important financial responsibilities; they include, generally: repayment of any small loans for the execution of the works, operation and maintenance costs, and the establishment of a reserve fund for administrative costs. They receive some government policy and financial support (see Box 1).

Across Indonesia, there are approximately 40,917 WUAs<sup>7</sup>. In East Java, there are approximately 6,651 WUAs. The TIRTA project, in the first phase, will be looking to focus on

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<sup>5</sup> Water sources can vary from tube wells, pumping from rivers, small gravity fed reservoirs.

<sup>6</sup> WUAs in East Java are called HIPPAAs (Himpunan Petani Pemakai Air). Nationally WUAs are called P3A (Perkumpulan Petani Pemakai Air).

<sup>7</sup> OECD Review of Agricultural Policies: Indonesia 2012.

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village based tertiary irrigation systems along the Bengawan Solo River within the districts of Bojonegoro, Tuban and Lamongan in East Java. This will be discussed in greater detail in the next sections of the report.

Table 1 below presents a summary of data for WUAs/HIPPAs located adjacent to the Bengawan Solo River in the three main districts of the project. There are nearly 200 potential WUAs for the project to work with, serving the needs of approximately 85,000 farmers with a farmer average plot size of 0.56 ha. Further analysis will be undertaken to confirm the number and role of female farmers and agricultural workers who may be engaged in WUAs but are under-represented in formal records.

**Table 1 Number of WUAs Tuban, Bojenogoro and Lamongan Districts adjacent to Bengawan Solo River**

Districts	Nos Villages (WUAs)	Nos Farmer Groups	No. of Farmers			Total Area (Ha)	Plot size per farmer (ha)
			Men	Woman	Total		
Tuban	54	254	33,077	3,211	36,288	16,386	0.45
Bojenogoro	90	253	31,607	1,381	32,988	21,288	0.65
Lamongan	54 <sup>8</sup>	154	15,620	12	15,632	10,056	0.64
<b>Total</b>	<b>194</b>	<b>661</b>	<b>80,304</b>	<b>4,604</b>	<b>84,908</b>	<b>47,730</b>	<b>0.56</b>

*Source: Field notes and analysis of district farmer group data*

Field interviews carried out in the potential TIRTA project districts indicate that many of these HIPPAs exist 'in name only' while others are fully functioning and managing their tertiary irrigation schemes. Even the ones that are functional however, are operating well below their full capacity to serve their farmer members. Based on a rapid definition of success being a combination of cropping intensity (number of crops per yearly cycle) and command area efficiency (the number of hectares served compared to number of hectares available to the scheme) an analysis of these field interviews with 7 HIPPA has suggested that the key factors for the more successful HIPPAs include: a history of a 5-10 year engagement with a private sector partner that invested in pumping equipment, civic works then undertook responsibilities of operations and maintenance, a well-functioning management committee that provided vision and can resolve conflict, and a reasonable reserve of funds to handle both operations and maintenance as well as shocks like floods. On the other hand the less successful HIPPAs exhibited dysfunctional management (committee members responding differently to questions, and the inability to either present any figures on paper or even provide verbal estimates of costs and revenues), no operating reserves for even the most basic maintenance and because of poor performance in serving the needs of many of its farmers, conflict between those that received water and those that did not. Within a two-hour interview it was not difficult for the design consultants to categorise which HIPPAs had immediate potential and which ones were in serious trouble.

<sup>8</sup> Actual WUA numbers were unavailable. The figure is an estimate based on land size and farmer groups.

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### **3.5 Current state of irrigation infrastructure**

Given the efforts of the government, supported by donors over past decades, few large areas of contiguous irrigation remain to be developed. Where land and water resources are adequate, virtually all potential schemes have already been developed. Future improvements in Indonesia's irrigation sector will be dependent on rehabilitation followed by effective operations and maintenance.

The command area of official government irrigation systems in Indonesia is estimated at 7.3 million ha with management responsibility defined by the 2004 Water Resources Law (see Table 2 below).

**Table 2 Area of irrigation systems by responsibility level**

<b>Management responsibility</b>	<b>Area (million ha)</b>	<b>Scale</b>
<b>Districts</b>	3.2	<1000 ha
<b>Provinces</b>	1.4	1000 - 3000 ha and schemes crossing district boundaries
<b>Central government</b>	2.7	> 3000 ha and crossing provincial boundaries.
<b>Total</b>	<b>7.3</b>	

*Source: Arief, S.S. and Murtiningrum, 2011*

Even though district governments are responsible for delivery structures in smaller irrigation schemes (<1,000 ha) they are in fact responsible for almost 45% of the 7.3 million ha of irrigation in Indonesia.

Based on data from the Ministry of Public Works in 2010, nearly a third of irrigation schemes under district government management were considered to be in a poor or ruined condition (

Table 3 below). Based on field interviews, it is highly likely the poor status of irrigation infrastructure identified by the MoPW is a conservative estimate at best.

**Table 3 Condition of irrigation systems in Indonesia**

<b>Authority</b>	<b>Area ('000 ha)</b>	<b>Number of systems</b>	<b>Condition ('000 ha)</b>				<b>Proportion %</b>	
			<b>Good</b>	<b>Fair</b>	<b>Poor</b>	<b>Ruined</b>	<b>Good/fair</b>	<b>Poor/ruined</b>
Central government	2,683	244	1,455	342	752	113	67%	33%
Provincial government	557	349	220	69	203	65	52%	48%
District government	443	3,338	215	88	89	52	68%	32%
<b>Total</b>	<b>3,683</b>	<b>3,931</b>	<b>1,889</b>	<b>498</b>	<b>1,044</b>	<b>231</b>	<b>65%</b>	<b>35%</b>

*Source: Ministry of Public Works, 2010*

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There have been numerous projects focused on improving the efficiency and effectiveness of irrigation schemes and their management. Many lessons can be learned from these past projects that provide guidance for the TIRTA project in design and delivery. The key lessons that have been noted in the design of this project are that: tertiary irrigation management is complex and good practices seldom emerge spontaneously; inadequate attention to sustainability has led to a “saw tooth” graph showing the sporadic distribution of public investment (the high) followed by years of deterioration (the low) and then, if fortunate, another burst of public investment (another high). The whole process is costly and inefficient. Further details and lessons on past projects can be found in Annex 5.

The approach of TIRTA aims to replace the former approach of periodic, externally financed, rehabilitation projects by a system with incremental improvement, whereby the WUAs can implement smaller, modular improvements on a year-to-year basis, with partial assistance from WUA, government funds or other financing arrangements, particularly those in the private sector. This is fully in line with Water law 7 of 2004.

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## **4 Design Rationale**

### **4.1 The problem**

Effective operation and maintenance of irrigation schemes is highly dependent on the level of ISF collected from farmer members. At the same time the farmers’ ability to pay the ISF is directly linked to their ability to increase production through their efficient use of irrigation water. When properly managed, this cycle of collecting irrigation service fees to maintain and operate a scheme so that the scheme can continue to supply adequate irrigation water to increase production/profitability, is sustainable.

Quite often, however, the HIPPAAs that are responsible for collecting ISFs from farmer members reduce the ISF to a point where these groups can no longer sustainably operate the scheme, let alone expand services adequately to farmers at its tail end.

Some of the reasons for inadequate ISF collection by HIPPAAs include: a lack of financial and technical management skills to align maintenance requirements with fee collection rates; the inherent conflict of interest that exists between farmers who are executive members of the HIPPA setting fees for fellow farmers to pay; and, the farmers’ own lack of capacity to convert irrigation water supplied into increased levels of production and profitability.

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The typical response from HIPPAAs to a reduction in funds is to defer scheme maintenance in the hope that the following year(s) are more profitable. In rare cases some HIPPAAs are fortunate enough to receive support from donor or government programs to rehabilitate their degrading infrastructure. This, however, is an “ad hoc” and unsustainable approach to irrigation management. Without a change in current water delivery management, the cycle of HIPPAAs inadequately managing ISF collection and the resultant degradation of infrastructure, is likely to continue.

For HIPPAAs to counter the decline in irrigation infrastructure they need to source a capital injection for upgrading. While the HIPPAAs are a legal entity with registered bank accounts, they are either unable or highly reluctant to secure capital from traditional lending institutions to upgrade their schemes. Moreover banks find agriculture too risky and lending to un-commercial HIPPAAs even more risky. At the same time even the more effectively managed HIPPAAs appear quite reluctant to take on debt on behalf of farmer members.



**Picture 1 Abandoned pump and motor on Bengawan Solo River**

There are, nevertheless, examples of another approach to injecting capital into degrading irrigation schemes and effectively managing ISF collection. Local entrepreneurs have invested (at today's value) up to AU\$ 100,000 in pumping infrastructure and water management for HIPPAAs in various sub-districts along the Bengawan Solo River in East Java. These local investors are frequently traders who, through their entrepreneurial skills, have acquired the capital to invest in other financially attractive projects. Since 1974 approximately twenty of these schemes have been started along the Bengawan Solo River in Tuban and neighboring districts.

Based on recent case studies of tertiary irrigation in East Java (presented in the supplementary *TIRTA Irrigation Design Case Studies* report<sup>9</sup>) local investment in irrigation can be profitable for both the investor (approximately 25% annual return on assets) and a 60% increase in farmer income (approximately IDR 7 million per dry season rice crop of 0.5 ha<sup>10</sup>). Local pumping investors mitigate their financial risk by actively managing the pumping asset in order to adequately supply water to farmers, thereby ensuring a return on their investment through sufficient ISF collection. The farmers and HIPPAAs both appear comfortable with this arrangement as the ISF charged is linked to production. If the seasons are poor they pay less to the investor. If the seasons are favourable they share the gains.

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<sup>9</sup> Higgins, S., Tomecko J., Purwanto, Y. and Yohannes K, 2013. TIRTA Irrigation Design Case Studies. Prepared for DFAT Australian Aid. February 2013.

<sup>10</sup> Average net profit from rainfed rice from the case studies is IDR 3-4 million per 0.5 ha per year. Farmers with sufficient water to irrigate two dry season rice crops can return up to IDR 14-16 million per year. More than four times the profit of rainfed.

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Unlike traditional lending institutions<sup>11</sup>, local pumping investors charge a percentage (normally 1/5<sup>th</sup> to 1/6<sup>th</sup>) of the total production from farmers irrigated fields. The agreements are normally for a period of five years with a clause that affords the HIPPA the right to buy out the local investor after five or ten years. (See a sample of this type of agreement in the *TIRTA Irrigation Design Case Studies* report)

Long term agreements to effectively manage irrigation schemes along the Bengawan Solo River between local investors and HIPPA's are not a novel concept. There is at least one example of a partnership forming as far back as 1975 (see Box 4 in the *TIRTA Irrigation Design Case Studies* report). These agreements between the HIPPA's and investors of which there are between 10-25 in Tuban and Bojonegoro Districts (see a sample agreement in Appendix 7 of the case studies) are negotiated and discussed openly at the village level. They are **not** notarized legal documents but they are witnessed by Sub-District Head and the Village Head and have been honored by both sides because they continue to be mutually beneficial. They are consistent with the Water Law 7 of 2004 because farmers are not charged for water rather they are charged on a share of the results of farmer access to water provided by the investor.

Looking in greater detail into the evolution of one of the HIPPA's from the case studies provides further insight into how these partnerships can form, what the advantages and disadvantages to all parties are and more importantly how the relationships can evolve over time.

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<sup>11</sup> It is interesting that this model of financing is close to Islamic banking where, in principle, the financial institution takes on a portion of the risk with the borrower.



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### **4.2 The local investor model**

The HIPPA Tirto Tinoto is an example of how one HIPPA in desperate need of a capital injection, following a natural disaster, approached a local investor and then over a 10 year period made the successful transition from the partnership with a local investor to eventual full HIPPA ownership and management achieving a current return on assets of around 7-10%.



**Picture 1 HIPPA Tirto Tinoto executive meeting**

The Tirto Tinoto irrigation scheme was established in 1993 with assistance from the Government of Indonesia and a Japan International Cooperation Agency (JICA) project to install pumps on the Bengawan Solo River to irrigate approximately 460 ha for two crops per annum of dry season rice for 1,364 farmers.

Unfortunately, the scheme didn't function for too long before the pump stations were damaged by flood waters in 1996, rendering them unserviceable. The JICA project had ceased by this time and funds from the government were unavailable to repair the flood damage. The HIPPA explored their options for raising capital by approaching several local investors to rehabilitate the pumps and supply water to the farmer members.

In 1997, a member of the local government Agriculture and Livestock Office (DINAS) facilitated an agreement between the Chairman of the Village HIPPA Karangtinoto and Herry Hendarto, a successful local business man with interests in maize trading. The original agreement was for the local investor to rehabilitate the pumps and irrigation equipment (initial capital investment of approx. IDR 60 million) and manage the provision of water to the farmers for a period of five years, with an option to renew for a further five years.

For the services provided, the farmers agreed to produce two dry season rice crops and allocate 20% (1/5<sup>th</sup>) of their yield to the local investor. The HIPPA was to receive 10% of the total funds paid to the local investor for management and savings.

In 2003 the HIPPA's institutional structure was revised and over the next four years the HIPPA was able to generate sufficient funds from their 10% allocation from the irrigation service fee and bought out the original local investor for IDR 150 million in 2007.

The HIPPA Tirto Tinoto has maintained full ownership and management of the irrigation scheme since 2007, albeit with a reduced area of 326 ha and farmer members (932). The irrigation service fee has reduced from 1/5<sup>th</sup> under local management to a stated 1/6<sup>th</sup> under HIPPA management.

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The HIPPA has recently invested off farm in a local organic fertilizer facility and purchases inorganic fertilizer in bulk on behalf of its members. Their financial position is strong, with fixed assets of IDR 2 billion, with IDR 1.3 billion cash reserves. Recently the HIPPA was recognized by the provincial Department of Agriculture for their achievements in irrigation and institutional management.

### **4.3 Farmer profits from irrigation**

The HIPPA Tirto Tinoto as an organization has been successful and its farmer members have been equally successful. Farmers without irrigation in the region achieve yields in the vicinity of 6 tonnes/ha and net profits in the order of IDR 3-4 million per 0.5 ha only once per year. They often run the risk of heavy crop losses due to flooding.

The majority of farmer members in the HIPPA Tirto Tinoto no longer produce wet season rice, instead focusing on producing two crops of dry season rice. Average yields are approximately 8 tonnes/ha with a combined total net profits from the two crops in the vicinity of IDR 16 million per 0.5 ha. Farmers have also begun adopting elements of SRI<sup>12</sup> production techniques and are claiming yields upwards of 10 tonnes per ha.

While farmer yields and net profits in the HIPPA Tirto Tinoto are high, they are not an isolated case caused by a champion leader or set of circumstances that cannot be repeated. In another irrigation case study along the Bengawan Solo River in Tuban district, a HIPPA partnered with a local investor back in 1995. In this arrangement the HIPPA still pays 1/5<sup>th</sup> of production as the ISF to the local investor and it has not 'bought out' or assumed water management control of the scheme. Yields and net profits to farmers from this partnership equal those from the HIPPA Tirto Tinoto.

Monocropping two dry season rice crops can increase the incidence of pests and disease along with declines in soil fertility. These production constraints can be managed with the introduction of an irrigated dry season palawija<sup>13</sup> crop of soybeans. Case study analysis showed that irrigated soybeans have the potential to be equally as profitable as dry season rice.

### **4.4 Farmer costs from irrigation**

Farmers are often unable to transition to a production system which offers increased net profits due to a lack of available funds at the start of the season to pay high upfront investment and production costs. One advantage of local investors purchasing pumping infrastructure and charging an ISF (1/6<sup>th</sup> of production) is that the ISF is charged at the end of the cropping season. Based on the case study analysis, input costs for irrigated rice when compared to rainfed rice appear to increase only marginally at the start of the season with increases of between 3-20%. This is reflected in increased land rental costs (rainfed to irrigated) and marginal changes in input and labour costs. The costs associated with water supply and harvesting (increased yields) in irrigation on the other hand are reasonably high at 50-100%

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<sup>12</sup> System of rice intensification. Every one of the managing committee members of this HIPPA is using SRI methods in their rice production.

<sup>13</sup> Palawija literally means the second crop and is often the second leguminous crop in a rice based production system.



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more than rainfed production. These are not insignificant but most importantly they are deferred to a time when funds are available to the farmer.

### **4.5 HIPPA and local investor costs from irrigation**

Based on case study analysis, diesel fuel for pumping along with pump repairs and maintenance often represents 50% of total ISF collection for HIPPA and local investors. The remaining 50% is generally allocated to HIPPA management or local investor operations along with village and community obligations. Irrigating dry season rice has been shown to be quite profitable; however, extracting water from lower levels in the river tends to push pumping capacity and efficiency to the limit (see Picture 2). This leads to an increase in fuel consumption for the same volume of water pumped and increased wear and tear on motors and pumps. There are, however, quite simple and cost effective design changes that can be made to pump placement on river banks to minimize maintenance costs and maintain pumping efficiency during the dry season (see Picture 3).

If provided with the knowledge, local investors and HIPPA's managing their own water supply could make considerable savings (30%) in fuel and maintenance costs making more irrigation schemes attractive for investment or freeing up additional funds to allocate to the maintenance of delivery infrastructure.



**Picture 2 Pumps located high on Bengawan Solo River bank**



**Picture 3 Example of pump and motor on floating pontoon (Cambodia)**

### **4.6 Conclusions**

Whilst the four case studies analysed, to support the design document, possess different structures and histories, a number of general observations about the local investor model can be made that underpin the rationale for the project design:

- Where local investment has occurred, the HIPPA's are generally in a stronger financial or infrastructure position. For farmer-run HIPPA's, infrastructure is generally degraded and in need of maintenance/redesign.

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- Most HIPPAAs and local irrigation investors would benefit from engineering support to better design pumping systems and infrastructure to reduce operating costs and improve the reliability and efficiency of delivery of water.
- What most HIPPAAs state they are collecting as their ISF differs markedly from the actual ISF collected. This impacts on the funds available to invest back into the scheme and allowance should be made for this when calculating the financial viability of irrigation schemes.
- Many HIPPAAs have identified new areas for expansion that offer potential for good productivity returns. Some of these present challenges such as re-lifting water or building channels under roads. Finance is required if any of these developments are to occur.
- Transitioning from rainfed rice to only one crop of dry season rice will nearly double net profits for farmers. If water is available in the peak dry season, producing two dry season rice crops is four times more profitable than one crop of rainfed rice.
- Some HIPPAAs choose to irrigate (and charge an ISF) for wet season rice production. The increases in net profit over rainfed are in the vicinity of only 10-20%, however, risk of a crop failure due to a dry finish is mitigated.
- The minimum number of years for a HIPPA to become 'self-reliant' following an injection of capital by a local investor will depend on the state of the scheme and the corresponding level of investment required, but is typically five to ten years.

### **4.7 Market failure to overcome**

Despite the advantages of sharing risk and the potential high returns for both parties, there are impediments for local investors and HIPPAAs to engage and form long term agreements.

The market failure appears to be:

- A lack of awareness on both sides of the opportunities for local investors to partner with HIPPAAs and vice versa.
- The capacity of both parties to make investment decisions with any degree of confidence is severely lacking and inhibiting their ability to enter into a long term agreement.
- The inability of both the HIPPAAs and local investors to access the reliable technical and financial information required to make an informed decision before entering an agreement.
- The complete lack of any public support for a facilitation function to match HIPPAAs with local investors.

While local investors have funds available for investment, quite often their key skill set is not agriculture and it certainly is not irrigation feasibility and investment analysis. Currently they rely on their general business acumen to identify an opportunity. HIPPAAs on the other hand have the ability to coordinate farmers and an understanding of water requirements and production potential but often lack the ability to effectively manage, on their own, the collection of fees and

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the complex maintenance of pumping infrastructure. The project rational will therefore place its emphasis on “facilitating investment” in commercial irrigation schemes that deliver benefits to both farmers and investor/managers. There are sufficient successful pilot schemes to demonstrate that this type of model works. The aim of the TIRTA will be to scale up the application of this model so that it becomes a workable standard for sustainable tertiary irrigation, at least in the provinces of AIP-Rural.

TIRTA's facilitation function will a critical part of its value added to the stimulation of sustainable new tertiary irrigation schemes. The critical elements of this facilitation will include:

- The identification of viable sites for development. This will provide a basis for deciding which HIPPA's are occupying some of the more potential land for irrigation. This identification will be done through satellite or drone imagery and then confirmed with on-site visits to confirm potential viability. This third part verification of sites should engender trust on both sides.
- The preparation of rapid technical (including environmental) and commercial viability assessments. Up to now most investors have made their investment decision “on the back of an envelope”. This has resulted in poor technical design and over or underestimates of costs and revenues, all of which hamper transparent negotiations.
- The preparation of stakeholder mapping assessments. The purpose of these assessments will be to increase understanding of the social, economic and political context of potential new irrigation schemes, in order to understand: 1) the impact of new irrigation schemes on different stakeholders and rural communities, with a particular focus on female farmers and agricultural workers and poor (or smallholder) farmers; and 2) the viability of new irrigation schemes from a socio-political perspective, ie the constraints and opportunities presented by existing stakeholder relationships, including legal arrangements and the role of government.
- Agreement negotiations between HIPPA's and local investors. The key ingredient of this process is to transparently present both parties with the core elements of an agreement without taking on any responsibility for the outcome.
- Capacity development of stakeholders. This component of the facilitation function adds small incentives to both parties in order to mitigate their some of their risks. In the case of the HIPPA's this includes management capacity building and training for farmers on the optimization of irrigation services while on the part of the investor this includes enhanced technical capacity on the configuration of the investments in order to reduce operational costs.

# **5 Goals and Objectives**

TIRTA has the same goal as the overall AIP-Rural program, namely increased farmer incomes. In this project farmer incomes are improved through their increased their access to tertiary irrigation services.

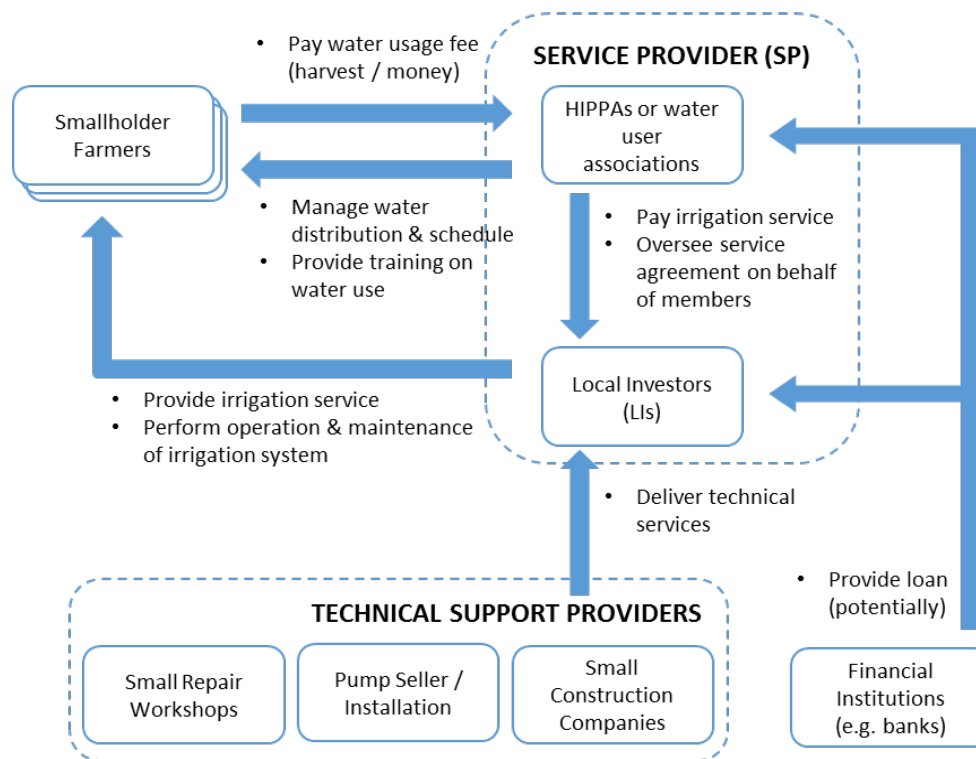
## **5.1 Tertiary irrigation models**

The model around which most of this design document focuses is the one in which farmer groups come together to form water user associations or HIPPA's and then enter into agreements with local private investors who then invest in diesel engines, pumps and canal infrastructure which then permits them to supply water to farmers in return for a portion of their crops. This is not a new model, but it is a model with significant potential for reaching scale. All of the schemes, observed by the TIRTA design team, that are using this model, (see *TIRTA Irrigation Design Case Studies*) involve, or have involved in the past, a local investor either pumping water from a borehole, or, as is the case with larger schemes, pumping water from a river. In the schemes that are operating well a strong commercial relationship exists between farmers, who understand the additional income benefits from purchasing water at a market rate, and a supplier that has the means and incentives to continue and expand this delivery.

Once the TIRTA project starts it could be anticipated that other possible models might emerge which would also be suitable for project support. Some of these models, for example, might include a lead firm supplying trickle irrigation to contract farmers; the optimization of springs or dams to supply irrigation services, etc. In the course of preparing this document, DFAT personnel and consultants visited another DFAT project in Cambodia, CAVAC. This project focuses on rehabilitating old and abandoned Khmer Rouge irrigation schemes. In this case it works with local governments and pump providers to construct diversion sluice gates and main canals of about 1 kilometer and then it facilitates business linkages between small private pump operators and farmers to supply water from this main canal to farmer fields. A portion of the pump providers' irrigation service fee is then paid to a water user association to maintain the capital costs of the sluice gate and main canal. Another market development project in Bangladesh (Katalyst) also worked in this sector. They achieved good outreach by working with pump manufacturers to increase the efficiency of their pumps and delivery pipes as a way to reduce irrigation costs to farmers.

Conditions and opportunities in each of these countries, however, are significantly different from what they are in Indonesia. Nevertheless the important lesson for TIRTA is that models will need to be developed and adapted and even though preliminary attention will be placed on the model found in and around Tuban, TIRTA will also be open to other models that work. The key principles to be maintained in the identification and application of these models are: sustainability, impact and scaleability. The generic business model presented in Figure 2 below illustrates the interdependence of the market actors in tertiary irrigation observed in East Java.

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### Notes:

- Each scheme/intervention may vary, depending on the service agreement between the HIPPA and the local investor

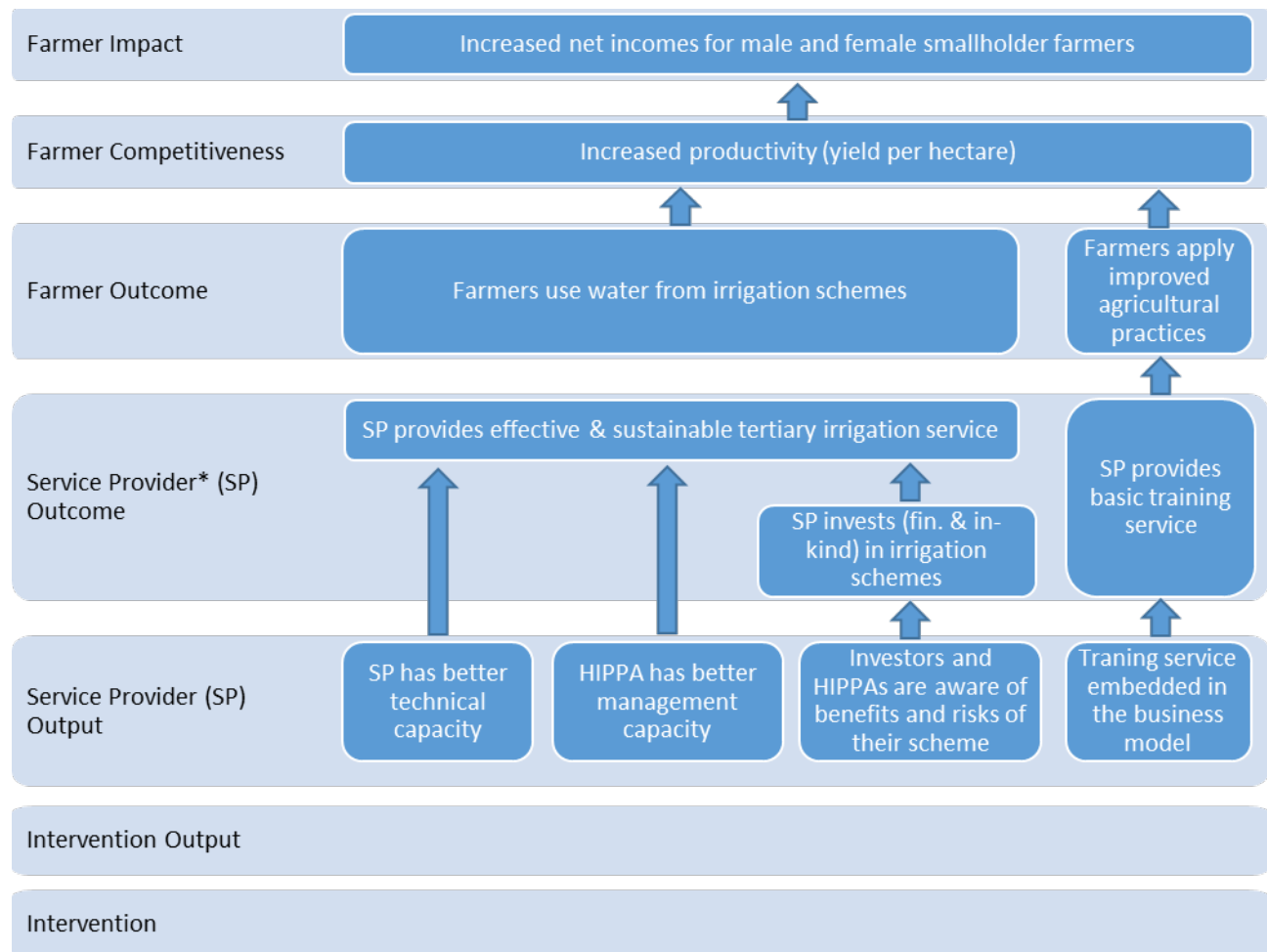
**Figure 2 Generic business models for TIRTA irrigation schemes**

## 5.2 TIRTA's causal model

Again, this is the same basic causal model for AIP-Rural but it has been adapted to irrigation. The logic of the model is that there is significant scope for either: increasing the efficiency of existing tertiary irrigation schemes or expanding their outreach or even starting new schemes. All three of these options will lead to more farmers being served with more water. In all of these situations the starting point involves investment in civic works and pumping configurations. Farmer groups do not have the resources to invest, local government can only provide small grants, and banks are reluctant to invest in water user associations without tangible collateral from individual association members. If local investors can be encouraged, as they have in the past, to team up with existing WUAs/HIPPAs to make these irrigation investments and if farmers make good use of this new access to irrigation through the application of improved farm practices then farmers will increase their overall land productivity. Because the local investor receives their irrigation service fee based on output they have an incentive to ensure that farmers use good practices. Because of this incentive, local investors will be encouraged to pay for a large portion of farmer productivity training.



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**Figure 3 TIRTA's impact logic/results chain**

In addition to the preparation of the causal model (Figure 3) the design mission put together an expanded logframe. The headline indicators for this are presented below in Table 4. A more complete version of this logframe is available in Annex 1: Project logframe and theory of change

Logframes are currently not a prerequisite in DAFT project designs, nevertheless they can be useful in helping designers to “think through” how a project might unfold. The logframe below clusters a series of suggested outputs around six core outcomes that project designers consider to be essential in reaching TIRTA’s goal.

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Table 4 Suggested headline indicators from project logframe

Desired Change	Indicators of Change	Means of Verification
Impact Goal: <b>More farmers in eastern Indonesia increase their incomes from agriculture</b>	10,000 farmers in selected districts of EI increase their agricultural incomes by at least 60% as a result of increased access to irrigation services, by December 2017	Before–and–After or Difference of Difference household surveys conducted by independent consultants
Farmer Competitiveness: <b>More farmers increase their annual agricultural productivity/profitability per hectare</b>	At least 10,000 farmers increase their productivity/yield by at least 30% within 3 cropping cycles of their scheme being completed	Before–and–After or Difference of Difference farm surveys conducted by independent consultants
Farmer Outcome: <b>More farmers are effectively using water from irrigation schemes.</b>	At least 10,000 farmers have increased their cropping frequency under full irrigation by at least 100% by the 3rd cropping cycle after their schemes are completed	Before–and–After or Difference of Difference farm surveys conducted by independent consultants
Service Providers Outcome: <b>More small tertiary irrigation schemes are effectively and sustainably providing irrigation services to farmers</b>	At least 35 project-supported schemes of ~100 hectares each, reaching 10,000 farmers, have increased farmer cropping intensity by at least 100% by December 2017	Survey conducted by independent consultants

## 6 Delivery Strategy

This section lays out a set of critical elements for how the project could address implementation while maintaining a clear focus to achieve impact at the farm level. An emphasis is placed on the sustainable operation of the tertiary irrigation schemes supported, and a more widespread systemic change through the popularization of the public-private model promoted by the project. The proposed sequencing of the project's delivery is presented below.

### 6.1 The selection of commercial and technically viable sites for irrigation

Identifying suitable HIPPA's and irrigation sites will be an important component of the delivery strategy. The initial primary area of focus for the project will be a 1-2 km wide corridor along either side of the 625 km Bengawan Solo River in these three districts. Potential irrigation areas located further from the river will be considered but with increased distance from the river comes the likelihood of higher pumping and delivery costs, reducing the technical and financial viability of the schemes.

High resolution satellite or drone imagery (0.5 m per pixel or equivalent) will be taken of the corridor adjacent to the river for the three districts selected for the first phase of this project. The high resolution images are far more detailed than google earth images and can be ordered on request, at a reasonable cost, during the dry season. The images will be digitized and used to

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identify potential HIPPAAs and commercially viable irrigation areas suitable for private investment. The images will also be used to inform the monitoring and evaluation component of the project along with the irrigation feasibility, planning and design support component for HIPPAAs and private investors.

While satellite or drone images are being collected and analysed, small survey teams will conduct a representative survey of HIPPAAs and private investors across the three districts. The aim of this exercise will be to ensure that project selection criteria match what is desirable and feasible from the HIPPAAs and local investors. The application process can then be put together accordingly. At the same time, a limited number of environmental impact assessments will be performed along various reaches of the Bengawan Solo River. The studies will focus on understanding the potential environmental impacts and any necessary mitigation measures resulting from the project potentially increasing irrigation water extraction rates up to 3,500 ha during the dry season.<sup>14</sup>

### **6.2 Stakeholder and social impact mapping**

Socio-economic and socio-political analysis of potential stakeholders – both individuals and groups – will be critical to inform project viability assessments. The purpose of this analysis will be to understand the roles, interests and constraints on different stakeholders impacted by irrigation in the project districts, with a particular focus on 1) the role of female and poor (or smallholder) farmers and agricultural workers in project districts and their representation in HIPPAAs; 2) the potential impact of new irrigation schemes on these farmers and workers; 3) appropriate measures (if any) the project can use to extend benefits to female and poor farmers, or at a minimum, ensure a ‘do no harm’ approach; and 4) the constraints and opportunities presented by existing stakeholder relationships, including government and the regulatory environment.

Stakeholder and social impact analysis in project districts will determine the nature and degree to which TIRTA focuses on social inclusion or gender specific activities. Initial analysis in Tuban HIPPAAs suggests very low proportion of female farmers currently engaged in HIPPAAs, however further information is needed to understand women's role in these associations, and what kinds of activities, if any, could be usefully conducted to support their participation.

### **6.3 Project approval**

Once the potential social impact, environmental risks and mitigation measures are identified, the project selection criteria will be defined, and the application process endorsed by relevant government officials. Following this the socialization of the project will commence. The project, together with relevant district officials, will be introduced to the communities in the 3 districts with the aim of making HIPPAAs, farmer groups and potential investors aware of the project's offer and also to explain the process of application.

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<sup>14</sup> Since the project is focusing on increasing rice cropping frequency on existing agricultural land, and the environmental risks associated with irrigating dry season rice are well understood in the region, it is felt individual environmental assessments for each project scheme is unnecessary.



## ***Tertiary Irrigation Technical Assistance: TIRTA***

Preliminary applications will be screened by the project. This will involve irrigation sites being visited and HIPPA capacity being assessed. Potential private investors will be interviewed as part of a due diligence process. Those applicants identified as best satisfying the project selection criteria will be invited to attend project demonstration sites established by the project.<sup>15</sup> During this phase HIPPA and private pumping investors will be introduced to each other by the project.

Based on participant performance and the level of compatibility displayed during the demonstration site visits, project applicants will be selected to participate in the detailed technical and commercial viability analysis.

A key element of the project's delivery strategy will be for the project to provide a service of independent technical and financial analysis to the HIPPA requiring capital, and to the local investors looking to invest in irrigation pumping infrastructure and management.

The technical analysis performed by the project will focus on the irrigation scheme and will be divided into two components that are closely interconnected. The first is providing information to private pumping investors on technical engineering issues (investment and delivery efficiencies). This covers investigating river heights and pump requirements, pump installation options and water delivery infrastructure requirements. The second technical component involves capturing agronomic information from the HIPPA in order to match the pumping infrastructure requirements with the agronomic requirements of the crop (maximizing productivity from extra water). For example, peak crop water use should be linked to pumping capacity, irrigation scheduling and canal delivery capacity with particular attention paid to understanding delivery losses and river flow rates during the peak dry season.

All engineering and agronomic technical feasibility studies, conducted with the involvement of HIPPA and investors, will be underpinned by stakeholder mapping and financial analysis. It is important to note that financial analysis is to be performed mainly by project staff and will be based on the information provided by the HIPPA and the local investors. The HIPPA may require due diligence to be performed on the financial capacity of the local investor. The local investor may wish to understand the management capacity of the HIPPA. The aim of the studies conducted through the project is to provide both parties with the information they require to make a sound decision before reaching any agreement. Samples of these agreements exist and one of these from an existing scheme has been translated and are presented in the attached case studies.

Information alone may not be enough to facilitate an agreement between a HIPPA and a local pumping investor. Stakeholder mapping may indicate the need for an agent. Based on past practice, the project sees this person as a respected and independent local with close links to the district and irrigation sector. The agent may be a staff member or a retired staff member of the DINAS for instance. The project, for example, could engage the agent on a consultancy basis with the expectation that this role could be sustained in the longer term through a commission on successful agreements made. There is a history of people playing such a role in the past in Tuban district (see *TIRTA Irrigation Design Case Studies*).

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<sup>15</sup> The project demonstration sites will be discussed in detail later.

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### **6.4 Stimulating additional investment**

The desire for HIPPAAs seeking capital is still very present today. During field interviews all HIPPAAs stated they would be interested in meeting with private investors and all private investors showed an interest in exploring potential irrigation areas. The above mentioned agent, supported by the project, could be best placed to initiate such introductions. It is possible that the agent could be introduced during the socialization phase so that the potential use of these agents could be explored in the early stages of the project. The aim of this early involvement would be to highlight that the agent provides more than just the role of someone who introduces both parties and helps them to negotiate an agreement but rather it is a service that includes a technical understanding of how these schemes are commercially and technically assessed so that both parties can optimize their investments.

The delivery strategy of TIRTA will focus on overcoming the impediments to creating agreements between the local private investors and HIPPAAs seeking a capital injection to upgrade their irrigation schemes. The project will apply multiple strategies to inform both parties of the investment opportunities as well as demonstrating how they can mitigate the risks associated with private pumping investment. The project will also focus on building the capacity of the local investors, HIPPAAs, farmers and pump installers and suppliers in order to achieve sustainability beyond the project cycle.

### **6.5 Building the capacity of stakeholders**

Information collected during early stakeholder, technical and financial feasibility studies will be used to inform the capacity building component of the project. A 'management capacity needs assessment' will be conducted on all HIPPAAs that reach an advanced stage in their application process. This will enable the project to target the technical assistance offered to HIPPA management. A key component of the capacity building strategy for HIPPA executives will be introducing the concept of the HIPPA eventually 'buying out' the local investor over period of 5 to 10 years. There are already a few examples of this occurring in the region. Wherever possible the project will support and encourage the sharing of information and experiences between HIPPA executives.

Improved farmer practices are a crucial element of irrigation scheme sustainability. The level of the ISF collected by the local investor is directly linked to farmer productivity. The project's stakeholder, technical and financial feasibility studies will also examine current farmer practices in agronomy and water management. The project will engage farmer to farmer learning principles by supporting the training of trainers in the delivery of best practices to farmers. To ensure farmer capacity building is maintained beyond the life of the project, the project will outline the business case to private investors to invest in ongoing farmer capacity building. Ideally an ongoing commitment to farmer capacity building would be included in any agreement between the private investor and the HIPPA.<sup>16</sup>

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<sup>16</sup> Since local investors collect a portion (usually 1/5) of crop production as their ISF, they have a commercial interest in the farmers, served by their scheme, increasing their productivity. The project will work with local investors to design simple and cost effective crop productivity modules which the investor can replicate.

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Even a casual observation of agriculture in eastern Indonesia leads to the conclusion that women are increasingly relevant to primary production in rural areas. A large part of this is because of the exodus of men to urban areas in search of higher paid jobs. Capacity building measures for farmers will therefore be based on a profound understanding of these changing gender roles in production. Specifically the project will address a) how to address the need for additional labor in the use of System for Rice Intensification methods, b) the move from rice to higher valued crops like vegetables where women play a proportionately higher role and c) the more active participation of women in the management of HIPPAAs and their sub-committees.

With increases in agricultural incomes comes the possibility of capital accumulation for investment in alternative livelihoods. Opportunities for organic fertilizer production (used extensively in SRI methods), food storage, tractor rental, etc are all complimentary businesses that can emerge with increased farm incomes. Capacity building measures can be targeted to rural youths in the vicinity of the new schemes as a way to diversify rural incomes and livelihoods. Such measures are not expensive because national capacity for this kind of training is already available. The project will explore when and how it makes most sense to integrate this type of training into its capacity building program.

There is another group of stakeholders in the irrigation sector that play a key role in the long-term sustainability of irrigation infrastructure. The project will aim to work with local pump installation and maintenance services providers. Repairs and maintenance of pumps is the “Achilles heel” of most irrigation systems - a system’s profitability is often primarily determined by the ability to keep it functioning under all operating conditions. Flooding and the incorrect installation of pumps and diesel engines is a common occurrence along the Bengawan Solo River.

While the specific interests and technical needs of this group was not assessed in detail during the preparation of this project, it is clear that it will not be enough to rely on the flow-on effects of profitable irrigation to stimulate an improvement in technical capacity to pump installation and maintenance. A cursory investigation of the technical configurations of the existing diesel engine-pump installation is sufficient to conclude that all of the existing schemes are operating well below their optimum. Part of this is because of the lack of investment in newer more efficient technologies, but even without much more investment, significant efficiency gains could be obtained by reconfiguring pump sizes, pipe diameters, and re-sighting the location of the diesel engines.

The project will deliver a pump installation and maintenance capacity building sub-component. While every irrigation system is unique, there are often only a few options for pump installation that are accepted by irrigators within particular regions. The replicability of pump station design can greatly facilitate more timely and more cost effective maintenance by service providers and scheme operators.

The project will first conduct a survey of existing pumping schemes along the Bengawan Solo River to assess the status of pumping configurations and pumping efficiency levels. Based on the information obtained from this survey, a series of demonstration sites (one per core district) will be developed or rehabilitated in conjunction with newly selected project clients (HIPPAAs and private investors). The demonstration sites will become learning centers, displaying ‘cost

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effective' and 'real life' pump/engine configuration options. The project will support other HIPPAAs, private pumping investors and irrigation service providers to attend the sites and participate in training. By integrating these sites into project supported schemes it is anticipated that they will become sustainable demonstration sites for others, and provide a quantum leap in pump configuration and efficiency even beyond the duration of the project. Similarly local service providers can then build on these best practices to make incremental improvement after the life of the project.

### **6.6 Exit strategy**

The exit strategy for the project is underpinned by four principles. The first is that much needed capital will be injected into the irrigation sector by local investors who are able to directly manage their investment risk and receive an adequate return on investment over the medium to longer term (5 to 10 years). The second is that local investors have strong commercial interests in maintaining the scheme and developing the productive capacity of farmers. The third is that the project will develop the capacity of HIPPAAs in financial management to enable (where appropriate), a transition from local investor ownership of pumping and water management to full HIPPA ownership and management after 5 to 10 years. And finally, the project will develop the capacity of irrigation service providers to improve the reliability and efficiency of irrigation schemes, thereby reducing input costs and the risks associated with catastrophic events such as flooding and major breakdowns.

By the end of year 1 the project will have developed a clearer understanding of the issues associated with the delivery strategy. If the model shows merit, the project will be well placed to apply the above mentioned principles to tertiary irrigation development across other provinces of eastern Indonesia. If however, at this time, there are not at least 10 promising tertiary irrigation investments at an advanced stage of negotiation, a decision may be made to end the project and reuse the money in other more promising avenues within AIP-Rural.

The ultimate aim of each AIP-Rural project is to stimulate "systemic change". Systemic change is induced when the farmer competitiveness-enhancing change is not only supplied sustainably to the initial target group but also, through demonstration, becomes standard practice for large numbers of farmers in comparable situations. In this case the systemic change is to "increase the use of local investors to start or upgrade tertiary irrigation sites so that more farmers can sustainably access better irrigation services".

Nationally there are close to 41,000 HIPPA. In the three initially selected districts there are approximately 200 HIPPAAs along the Bengawan Solo River serving the needs of approximately 85,000 farmers. Evidence collected during the scoping of this project strongly suggests that the vast majority of these are operating well below their potential, in terms of area coverage and in terms of technical and commercial efficiency. If a critical mass of commercially viable tertiary irrigation schemes can be demonstrated to be successful (say 20% of HIPPAAs in the 3 districts, or about 30-35 schemes) with more farmers receiving more water at the appropriate seasons, it can be expected that this model may be copied by many of these HIPPAAs even without much project support. TIRTA will actively support this replication. This model was originally conceived of and implemented by individuals within the irrigation department of the Ministry of Agriculture in the early 70s. The originator of this model still lives in Tuban and his son is in the same

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department as his father was at that time. The ministry currently support tertiary irrigation through small grants to HIPPAAs to upgrade their irrigation canals and in exceptional cases it grants them irrigation pumps. One possible scale up strategy would be to reorient these grants to a more facilitative role with part of the grants being allocated to private brokers to construct more sustainable deals between HIPPAAs and local investors. While it may be difficult to envision precisely what the route to scale will be for this project at the time of its design this should be possible by the end of year one at which time a go no-go decision will be made on the next phase of the project.

Furthermore if the project can demonstrate significant copying of this model in the three above mentioned districts, its task to disseminate this to other districts, that have significant river systems, will be made easier. At the same time, if the principle of animating local private sector investors to initiate tertiary irrigation schemes can be well documented and popularised, the scope for replication to the other four other provinces of AIP-Rural will be significant.

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## **7 Duration**

The project is designed to run for four years, starting in January 2015 and finishing in December 2018. The project will be independently assessed through a rapid assessment at the end of year one and mid-term review, towards the end of its second year of its operations and, if the results are promising and potentially cost effective, a second phase may be considered.

Sustainable business linkages between farmers and irrigation providers will be the hallmark of success for this project. These linkages are based on a clear understanding of: a) the benefits and risks to farmers and investors of this relationship and b) the incentives of both parties. The first year of the project will address these issues in some depth (see the Delivery Strategy section) and consequently the first batches of tertiary irrigation projects are likely to emerge in the latter part of year one and the early part of year two; after this DFAT will anticipate an acceleration of applications, with the bulk being completed in year three. Nevertheless by the time of the mid-term review (month 24) at least 10 schemes should have been financed and ready for operation, with another 20-30 schemes in the pipeline for completion in the third year.

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## **8 Location**

AIP-Rural's geographic mandate includes five provinces in eastern Indonesia: NTT, NTB, East Java, Papua and West Papua. PRISMA, the first and largest project of AIP-Rural, started in November 2013. It will take a phased approach to its geographic deployment; Phase 1 involves implementing interventions in NTT, NTB and East Java while investigating and designing interventions for Papua and West Papua and Phase 2 involves continued implementation of interventions in the first three provinces and at the same time initiating operations in Papua and West Papua. TIRTA will take a similar approach starting initially in three districts of East Java while investigating the potential for expansion first to NTT and NTB and eventually to Papua and West Papua. During the scoping mission for this project, in November 2013, three provinces were visited: NTT, NTB and East Java. The mission concluded that the opportunities project

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interventions in tertiary irrigation were greatest in East Java and that the first phase of operations should focus in this province. The intervention potential in NTT and NTB, because of its topography, was considered to be less. Nevertheless opportunities for the project's approach do exist particularly for smaller schemes. Because of time constraints, issues related to access, and the budget foreseen for the project, the scoping mission did not visit Papua or West Papua. Because of these limitations the project will take a three phased approach to its geographic coverage:

- Phase 1 (month 1-12): will involve a concentration on developing interventions in East Java, particularly in the districts of Tuban, Bojonegoro and Lamongan (see Figure 4 below). At the same time it will investigate, in more detail, the potential for interventions in both NTT and NTB provinces.
- Phase 2 (month 13-24): will involve continuation of interventions in East Java and the implementation of some schemes with good potential in the provinces of NTT and NTB.
- Phase 3 (month 25-42): will involve the continued implementation of schemes in East Java as well as in NTT and NTB and the investigation of potential interventions in the provinces of Papua and West Papua, with the expectation of a project extension by month 42 of the project.

The initial geographic focus of the project will be in the three districts of Tuban, Bojonegoro and Lamongan. There are two main reasons for this concentration.

- At the heart of the project's rationale is the development hypothesis that tertiary irrigation to large number of farmers is more sustainable when the private sector is involved in starting and managing the schemes. This hypothesis has been derived from a detailed investigation of the success of tertiary irrigation schemes along the Bengawan Solo River in East Java, particularly in Tuban district. Therefore the first reason for this initial geographic focus is that it is sensible to first attempt the replication of this model in Tuban itself as well as adjacent areas and districts through which the Bengawan Solo River is passing.
- The second rationale for this concentration is that in the three districts there are approximately 200 HIPPA's or WUAs serving the needs of approximately 85,000 farmers along the Bengawan Solo River. The vast majority of these are operating well below their potential in terms of area coverage and in terms of technical and commercial efficiency. If a critical mass of commercially viable tertiary irrigation schemes can be demonstrated to be successful with more farmers receiving more water at the appropriate seasons, it can be expected that this model will be copied by many of these HIPPA's even without project support. This project will actively support this replication.

If the project can demonstrate significant copying of this model in the three above mentioned districts, its task to disseminate this to other districts which have significant river systems will be made easier. Similarly, if the principle of animating local private sector investors to initiate tertiary irrigation schemes can be well documented and popularised, the scope for replication in the four other provinces of AIP-Rural will be significant.



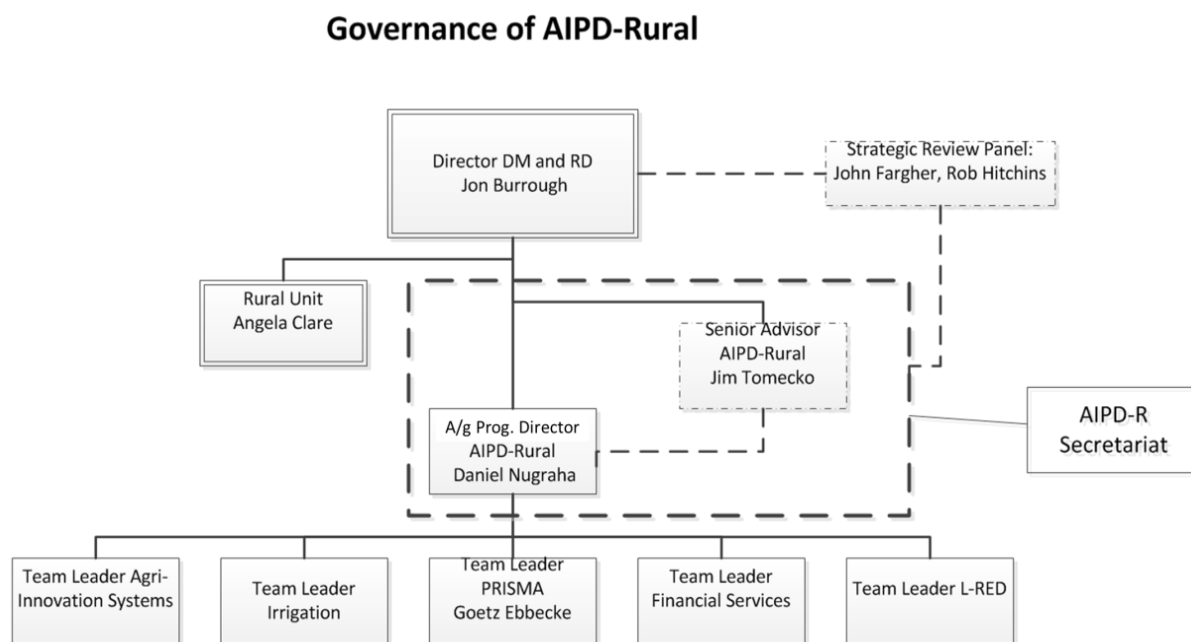
## ***Tertiary Irrigation Technical Assistance: TIRTA***



**Figure 4 Location of TIRTA phase 1 activities**

### **9 Governance**

AIP-Rural falls within the Bureaucratic Reform, Rural Development and Decentralisation Section of DFAT Jakarta. Under the guidance of this section's Director, the program will be led on a day to day basis by a Program Director supported by a Senior Advisor. These last two positions have been hired directly by DFAT specifically for the purposes of a) completing the AIP-Rural's design, and b) overseeing program implementation through projects which, for the most part, will be delegated to other international or Australian public organisations or commissioned to managing contractors. As presented in Figure 5 below there are several sub-projects to AIP-Rural. PRISMA has already been designed and is already outsourced to a managing contractor. The other projects for agricultural research and innovation, financial service, tertiary irrigation and local economic development, as of March 2014, are in various stages of scoping and design. Decisions on the relative allocation of resources within these components will be driven by four criteria: pro-poor relevance, growth potential, scope for interventions, and value for money. To assist AIP-Rural management, a Strategic Review Panel (SRP) has been created. The purpose of the SRP is to provide advice on the coherence of the program's differing projects (PRISMA, Irrigation, Financial Services, Agricultural Innovation and L-RED).



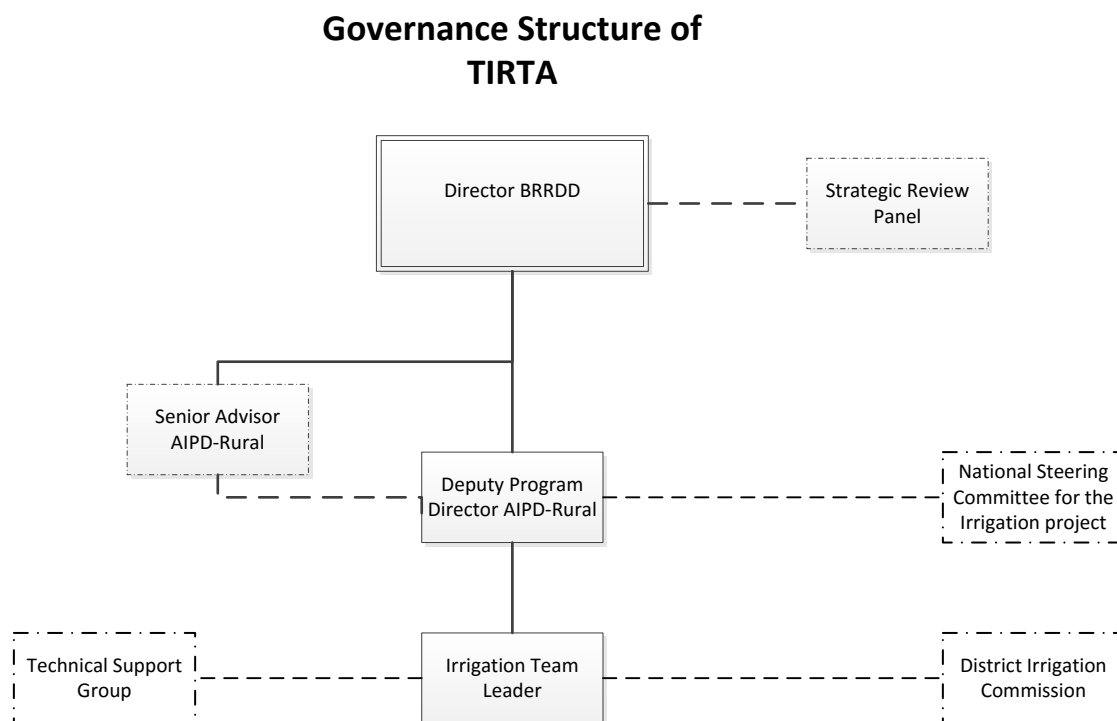
**Figure 5 Governance of AIP-Rural (as at June 2014)**

Each AIP-Rural component (PRISMA, Irrigation, Innovation, Financial Services) has or will have its own governance structures and Government of Indonesia partner. In the case of the irrigation project the likely counterpart ministry is Ministry of Public Works (PU), and within PU the directorate most closely associated with irrigation, the Directorate for Irrigation and Swampland. At the national level a Project Steering Committee will be created and co-chaired by PU and



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DFAT who, in this case, will be represented by the AIP-Rural Program Director. The mandate of this committee is to oversee annual work plans, budgets and progress reports and to provide appropriate feedback to both Government of Indonesia and DFAT. Its precise composition will be determined in the early stages of implementation but the inclusion of the Ministry of Agriculture and local authorities is considered essential. At the local level a District Irrigation Commissions already exist. The Irrigation Team Leader will coordinate closely with head of the District's DINAS and the District Irrigation Commissions to a) socialise the project's offer to local HIPPA's and investors and b) report on the progress achieved in commissioning of tertiary irrigation schemes. This coordination will be instrumental in either: a) avoiding any duplication with the project in the allocation irrigation funds of the national Jaringan Irigasi Tingkat Usaha Tani (JITUT) or the District's JIDES or b) complimenting these allocations with project resources as and when synergies exist. The initial governing structure is presented in Figure 6.



**Figure 6 Initial proposed governance structure of irrigation project**

## **10 Management**

The project will be guided on a day-to-day by the Irrigation Team Leader. This Team Leader will report directly to the Program Director of AIP-Rural. The project's management team will be co-located in Surabaya with three other projects of AIP-Rural (PRISMA, Innovation, and Financial Services). At the time of preparing this document adequate space is being renovated for the irrigation project so that a full team can be deployed shortly after the contract is awarded to the managing contractor. While below Figure 7 illustrates a potential management structure, the suggested tasks of the different personnel are as follows:

## ***Tertiary Irrigation Technical Assistance: TIRTA***

**The Irrigation Team Leader** reports directly to the AIP-Rural Program Director. This person is responsible for strategic direction and decision making for the project including: oversight of project implementation; the socialisation of the project to project stakeholders and the project's communications and knowledge management activities with the ambition of reaching scale through other HIPPA's or investors copying the project's model; coordination with the National Steering Committee and with the district officials and District Irrigation Commissions; the facilitation of investments for all interventions, and oversight of the project's monitoring and evaluation system and reports.

**The Irrigation Specialist** reports to the Team Leader. This person is responsible for the identification of technically and commercially viable tertiary irrigation sites including: developing site selection criteria; reviewing applications from stakeholders; providing guidance to the five intervention managers in the conducting of technical and commercial viability studies on prospective sites; surveying the capacity building needs of water user associations, investors and supporting service enterprises and then overseeing the delivery of programs to meet these needs; and the design and oversight of the three pilot demonstration sites.

**The Results Measurement Manager** reports to the Team Leader. This person is responsible the monitoring and measurement of progress according to the projects' key performance indicators. Specifically this person will be expected to: develop, in collaboration with the Irrigation Specialist, results chains or causal models for each of the project's interventions in compliance with the DCED results measurement standard; identify indicators for each of the critical links in the causal chain for each intervention; establish baselines for each of these indicators through small surveys; then assess and measure progress against these indicators through follow up surveys, and, finally aggregate qualitative and quantitative results for six-monthly progress reports. This person will be supported with an assistant who will also address the ICT needs of project staff.

**The Finance, Administration and Personnel Manager** reports to the Team Leader. This person is responsible for: establishing the projects financial systems (books of accounts, payment processes etc.) and the preparation of budgets and reconciliations; project administration processes; procurement and contracting; and, the recruitment and administration related to project personnel. This person will be supported with an assistant.

**The Intervention Managers** will report to the Deputy Team Leader. In all there will be up to five of these Intervention Managers. It is likely that their responsibilities will be allocated geographically. Each one of them will have a portfolio of up to 12 interventions at any one time, their responsibilities will include: coordinating with the Results Measurement Manager in the development of the results chains for their interventions; preparing implementation plans and results measurement plans for each of their interventions; coordinating with the HIPPA's, local investors and district officials in the execution of implementation plans; and compiling quarterly progress reports for each of their interventions.

### Management of TIRTA

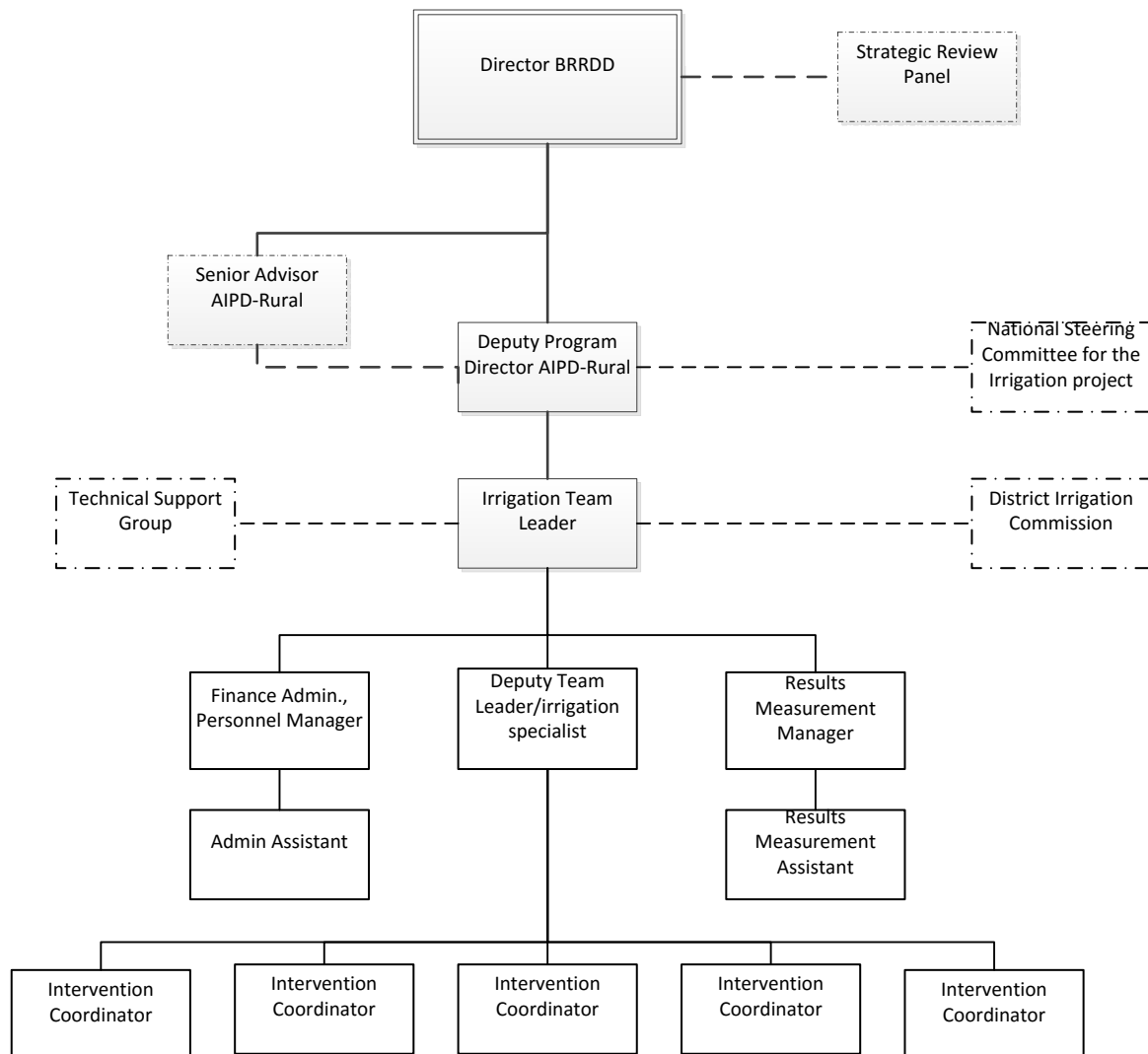


Figure 7 Potential management structure of the irrigation project

## 11 Monitoring and Evaluation

The senior management of AIP-Rural has decided to use a common results measurement framework for all components of the program. This framework is the Donor Committee for Enterprise Development or DCED's Results Measurement Standard (<http://www.enterprise-development.org/page/measuring-and-reporting-results>). This standard lays out key guidelines for establishing a results measurement system for a project of this nature, and it identifies control points and compliance criteria for the implementation of the system so that it can be audited by a third party. This framework also lays out the principles for assessing systemic change (replication, copying and crowding in). In addition to the compilation of impact the numbers the

## ***Tertiary Irrigation Technical Assistance: TIRTA***

system will enable simple value for money calculations to be made on each of the interventions as well as for the project as a whole.

Annex 1 illustrates the initial Logframe and Theory of Change for this project. The key indicators that will be assessed in this project and which are consistent with the overall Theory of Change for AIP-Rural will be:

- Net addition and attributable income changes of small farmers in the irrigation schemes,
- The outreach or number of farmer beneficiaries,
- Significant behaviour changes of these farmers leading to their income changes,
- The number of tertiary irrigation schemes supported,
- The additional investments, in tertiary irrigation, stimulated by either HIPPAAs or local investors,
- The improved technical and commercial viability of each of the schemes supported, and
- Any potential copying of the model by other HIPPAAs or investors in eastern Indonesia.

Because the system will be common to all components of AIP-Rural and since all key management personnel of AIP-Rural will be co-located in the same office in Surabaya, it is anticipated that, in addition to collaboration with other results-measurement colleagues in other AIP-Rural projects, regular technical back up support will be available to the Results Measurement Manager. This should enable the more efficient use of supporting short term experts to help with the establishment and roll out of the system. In terms of key milestones for the development of the system, the following will be essential:

- By, at least, the end of month 6 an appropriate short term consultant should have identified key areas of the projects results measurement system that require improvement before an audit.
- By the end of month 9 the project should be ready for an “in-place” audit and should have recruited an auditor to verify that the system complies with the DCED standard.
- By the end of month 30 the project should be ready for a full “in-use” audit so that key results are verified as plausible six months prior to the completion of the project.

Two other layers of monitoring for this project should be noted: the first is provided by the AIP-Rural Program Director whose support can be enlisted in: a) effectively handling Government of Indonesia relations; b) in the coordination of TIRTA with other AIP-Rural projects; and c) in dealing with the interface of the project with DFAT. At this layer the project can also draw on strategic guidance from the Senior Adviser in areas related to: a) market development and sustainability; b) systemic change; and c) results measurement systems. A second layer of monitoring is provided for this project in the form of AIP-Rural’s Strategic Review Panel. This is a small high level body that the overall strategic allocation of AIP-Rural’s resources and assessing the “value for money” for each of these allocations. For example, even though the financial allocation of this project is small, if evidence of the project’s impact on systemic change in the tertiary irrigation sector can be presented, support from the SRP can be anticipated.

## **12 Procurement**

It is envisaged that the project will be outsourced to a managing contractor. As such this procurement procedure will adhere to Commonwealth Procurement Guidelines. The specific terms and conditions for this managing contractor are contained in a separate Scope of Services. The assessment of the Managing Contractor's performance will be made on a six-monthly basis with the first assessment being held six (6) months after commencement. The performance assessment will be carried out by the Deputy Program Director of AIP-Rural. Other parties that may be consulted regarding the performance of the Managing Contractor may include the Senior Advisor for AIP-Rural, local stakeholders, relevant counterparts and representatives of the Government of Indonesia.

The indicative criteria to be used to assess the Managing Contractor's performance in delivering the required services are provided in Annex 1 (still to be developed). These criteria for selecting a managing contractor will include a) their understanding of the facilitation function as opposed to simply delivering the 35 schemes on their own, b) their recognition of the principles of sustainability and the need to work through others and c) their commitment to systemic change and the need to identify early strategies for achieving scale in the dissemination of this model or its variations. In consultation with the Program Director the Contractor Representative will modify and/or confirm the Managing Contractor performance assessment criteria within three (3) months of project commencement.

The performance of the Managing Contractor will be assessed within the first year of operations on project outputs including but not limited to: an inception report; a three-year strategic plan an operations manual, annual plans and budgets, six monthly progress reports, a results measurement manual, and DCED audit reports. In years two and three, when project results should become more evident, the criteria for this assessment will shift from outputs to outcomes. The key outcomes that will be measured will be: the number of tertiary irrigation schemes financed or supported; the number of resulting beneficiaries; the level of investment in these schemes by HIPPA's and private investors; and, the cropping intensity of these schemes. Other criteria will include: personnel quality judged by the appropriateness of the systems developed and delivered; the merit of implementation strategies formulated and implemented; and the perceived image of the project by key stakeholders. These outcome and output targets will be established in the 3-year strategic plan and will form an important part of the Basis of Payment to the Managing Contractor.

Following the notification to potential contractors, the assessment of technical and commercial proposals and the award of the contract, most subsequent project procurements will be in the form of small service agreements or grant agreements. Most of these contracts will be for: monitoring and evaluation studies; studies to determine scheme selection criteria; satellite maps; equipment purchases; social marketing; training needs assessments; environmental assessments; capacity building measures; and small grants to HIPPA's.

## **13 Risk Management**

As with any type of relatively new approach there are risks associated with its implementation. The risk assessment below is based on the experience of other similar programs within DFAT (CAVAC in Cambodia and MDF in Fiji/Timor L'Este) and other large scale projects of DFID in Kenya, Nigeria, and Nepal. The key risks are:

- Possible alienation of the program by the Government of Indonesia since implementation does not flow directly through them;
- The perception, by farmers and Government of Indonesia officials, that the project may be too aligned with the private sector;
- For a variety of reasons private local investors no not come forward;
- River water levels decline;
- HIPPAAs do not come forward to apply for participation in the project.
- That TIRTA places too much focus, during implementation, on direct delivery as opposed to facilitation; and that
- Strategies and attempts at scaling up will be addressed too late in the duration of the project to see any measurable impact on systemic change.

Strategies to mitigate all of these risks have been formulated and presented in Table 5 below.



## Tertiary Irrigation Technical Assistance: TIRTA

Table 5 Risk assessment and mitigation strategies

Risk Event	Program Impact	L	C	R	Risk Mitigation	Responsibility
<p>Lack of Government of Indonesia support</p> <p><b>1. Changes in relevant ministerial positions following the 2014 Indonesian elections.</b></p> <p><b>2. Lack of buy-in or understanding of program approaches across key Government Ministries e.g. Ministry of Agriculture or at regional level.</b></p>	<p>1. Potential loss of key champions for the program.</p> <p>2. Potential disruption to implementation; inability to work effectively with GOI.</p>	4	3	M	<p>1. Build good relationships with high level and working level civil servants to maintain commitment and gain entry to key ministers.</p> <p>2. Generate understanding and support from all key stakeholders including local government for program interventions through: a PCC that includes other ministries and local officials; capacity building measures of GOI stakeholders; study opportunities; and aligning program interventions with local priorities where possible.</p>	<p>DFAT Director DRMRD</p> <p>Program Director AIP-Rural</p> <p>Project Team Leader</p>
<p>The perception of being “too private” oriented.</p> <p><b>While the project will work with many private sector stakeholders, it will also coordinate with public agencies, but the perception of the project being too private needs to be addressed.</b></p>	<p>National and local governments become uncooperative and discourage program stakeholders to participate in interventions.</p>	3	4	L	<p>1. The project will conduct a “road show” in the 3 key districts of East Java to explain the approach to local government and enlist their support.</p> <p>2. The project may enlist the support of PRISMA, especially staff in the business enabling environment component, to assist in communicating with district officials.</p>	<p>Program Director AIP-Rural</p> <p>Project Team Leader</p> <p>Bappenas counterpart</p>
<p>Government of Indonesia’s agricultural subsidy programs <b>distort the effective operations of more sustainable market systems. This takes place in the sporadic disbursement of irrigation pumps and grants to HIPPA’s in the 3 districts.</b></p>	<p>It becomes difficult to find private sector partners willing to work with the program and the effectiveness of interventions is diminished.</p>	4	4	M	<p>1. Government subsidies are so infrequent and unpredictable and when allocated are so poorly implemented that the target group often recognises that the private sector option is more relevant and sustainable.</p>	<p>Project team Leader</p> <p>Irrigation Specialist Intervention managers</p>

## Tertiary Irrigation Technical Assistance: TIRTA

Risk Event	Program Impact	L	C	R	Risk Mitigation	Responsibility
Local private sector investors are not interested in the project's offer. <b>The project will rely on local investors or banks willing to invest in irrigation services, some investors may hesitate to come forward if they think, even informally, that public sector officials do not support this.</b>	Few irrigation projects are realised.	3	5	L	<ol style="list-style-type: none"> <li>1. During the scoping for this project in September and November 2013 mission members interviewed existing and potential investors to assess their appetite for investment and were convinced that the interest from investors is high.</li> <li>2. The project will complete technical and commercial viability on each site to demonstrate the business opportunity to local investors.</li> <li>3. The project will also enlist the support of key local public officials to endorse the model of private sector engagement in irrigation.</li> <li>4. The project will also conduct "due diligence" on HIPPA's to ensure the local investors that they are also willing and capable partners.</li> <li>5. The project will also build the capacity of HIPPA's to engage constructively with private investors.</li> </ol>	<p>Project team Leader</p> <p>Irrigation Specialist</p>
River water levels in the Bengawan Solo River decline. <b>The most recent data on water levels in the Bengawan Solo River (2009) show declining levels of water.</b>	This would have the effect of reducing the amount of water available for all of the existing and new irrigation schemes along the Bengawan Solo River.	3	4	L	<ol style="list-style-type: none"> <li>1. Access to water will be coordinated through existing local institutions channels that regulate water supply between the 3 districts.</li> <li>2. Technical solutions to pump installation will include "floating rafts" to mitigate water level variations.</li> </ol>	The Irrigation Specialist
HIPPA's show little interest in applying for the scheme.	Applications for water user associations are an	2	5	L	<ol style="list-style-type: none"> <li>1. The project will invest in socialising the project through many local meetings,</li> </ol>	DPD of AIP-Rural

## Tertiary Irrigation Technical Assistance: TIRTA

Risk Event	Program Impact	L	C	R	Risk Mitigation	Responsibility
<b>This may occur if HIPPA are either unaware of the opportunity or do not understand its potential impact. In some cases HIPPA managers may not favour the project's option because individual board members may lose control of finances.</b>	essential part of the project design				<p>social marketing and the mobilisation of local networks.</p> <p>2. The content of this socialisation will be that farmers can increase their net incomes by as much as 60% per annum if they participate in the project's scheme.</p> <p>3. In some cases the project will "incentivise" HIPPA's with small construction grants to install irrigation canals.</p>	Project Team Leader
During implementation greater emphasis is place by the project on direct delivery as opposed to facilitation. <b>This may happen if the managing contractor is either unfamiliar with facilitation function or if there is too much time pressure to deliver results.</b>	Goals related to the sustainability of the project may be compromised as a result and project that have been supported could disintegrate shortly after project support is withdrawn	3	4	M	<p>1. A clear selection criteria for the managing contractors will be the level of facilitation skills of the specified experts presented in their bids</p> <p>2. Monitoring the level of counterpart contributions from HIPPA's and local investors in comparison to the intervention costs provided by the project</p>	DPD of AIP-Rural Senior Advisor
Systemic change does not happen and the model, or its variations are not replicated without project support	Outreach targets beyond the 10,000 farmers will not materialize and even those schemes supported by the project may become unsustainable	3	4	M	1. A clear understanding of a pathway to scale must be developed by the end of month 12 of the project. This understanding should then inform the project of what it needs to do to support progress along this pathway	DPD of AIP-Rural Senior Advisor
Poor performance by the managing contractor	A large portion of the budget for AIP-Rural is unspent by mid-2016.	2	4	L	3. Quarterly assessments of the managing contractor in the first year of operations	DFAT SA DFAT DPD

Legend: L=Likelihood, (5 = almost certain, 4 = likely, 3 = possible, 2 = unlikely, 1 = rare); C = Consequence (5 = severe, 4 = major, 3 = moderate, 2 = minor, 1 = negligible) R= Risk Level (E = extreme, H = high, M = medium, L = low)

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## 15 Annexes

### Annex 1: Project logframe and theory of change

The following simple logframe has been assembled to test project logic and assist in the definition of outcomes and outputs and to assist in project costing.

TIRTA Logframe, 12 August 2014		
Desired Change	Indicators of Change	Means of Verification
Impact Goal: More farmers in eastern Indonesia increase their incomes from agriculture	10,000 male and female farmers in selected districts of EI increase their agricultural incomes by at least 60% as a result of increased access to irrigation services, by December 2017	Before–and–After household surveys conducted by independent consultants
Farmer Competitiveness: More farmers increase their annual agricultural productivity/profitability per hectare	At least 10,000 male and female farmers increase their productivity/yield by at least 30% within 3 cropping cycles of their scheme being completed	Before–and–After farm surveys conducted by independent consultants
Farmer Outcome: More farmers are effectively using water from irrigation schemes.	At least 10,000 male and female farmers have increased their cropping frequency under full irrigation by at least 100% by the 3rd cropping cycle after their schemes are completed	Before–and–After farm surveys conducted by independent consultants
Service Provider Outcome: More small tertiary irrigation schemes are effectively and sustainably providing irrigation services to farmers	At least 35 project-supported schemes of ~100 hectares each, reaching 10,000 farmers, are operational and have increased farmer cropping intensity by at least 100% by December 2017	Survey conducted by independent consultants
Outcome 1: The main stakeholder groups understand the potential impact of stimulating additional investment in tertiary irrigation	At least 10 viable applications are received by the project within the 1 <sup>st</sup> 12 months of project start, 20 more applications are received by month 18, 30 more by month 24 and 40 more by month 30 (100 applications in total)	From project's own records
Output 1.1: The project, together with relevant district officials, is introduced to the communities in the 3 districts with the aim of making HIPPAs, farmer groups and potential investors aware of the project's offer and also to explain the process of application	At least 30 meetings are organized between month 4 and 9 of project start at different locations along the Bengawan Solo River for at least 600 people at which the offer of the project is presented.  Among other measures a set of printed materials, explaining the project offer and the application process, is available at appropriate points of distribution (DINAS & PU offices, pump sellers etc.) by month 6 of the project	Minutes of meetings  Public relations materials



## ***Tertiary Irrigation Technical Assistance: TIRTA***

<b>TIRTA Logframe, 12 August 2014</b>		
<b>Desired Change</b>	<b>Indicators of Change</b>	<b>Means of Verification</b>
Output 1.2: Demonstration sites, together with selected project clients, are established along the Bengawan Solo River to show alternative “cost effective” pump/engine delivery configurations	<p>At least 3 sites are developed (1 in each district), with the consent of scheme owners, that demonstrate best practices in technical design by month 12</p> <p>At least 300 separate visitors, at least 50% of whom are from HIPPAAs, pump sellers, installation providers and potential investors, register at each one of the demonstration sites (total 900 visitors) by month 30 of the project and 600 by month 24</p>	<p>Agreements with site owners</p> <p>Visitor records</p>
Outcome 2: More viable sites for improved irrigation services are approved for project support by project governance bodies	At least 35 technically and commercially viable tertiary /village irrigation schemes, with additional cropping areas (either through increased cropping frequency or increased command area) of, on average, 100 hectares have been approved by project governing bodies, by month 24	From project’s own records
Output 2.1: Assessment surveys are produced of potential HIPPAAs, farmer groups and investors to help in the formulation of initial scheme selection criteria	Assessment report, including stakeholder, gender and social impact analysis, consulting with HIPPAAs, potential investors and district officials is produced to verify that the potential selection criteria are impact oriented as well as practical by month 4 of the project	Published survey /analysis documents
Output 2.2: Scheme selection criteria are defined, discussed and agreed upon with district officials	Notes are exchanged between the project and relevant district officials	Documented notes of exchange
Output 2.3: A “desk top” survey is produced to identify potential sites for project-supported irrigation schemes along the Bengawan Solo River	A survey report based primarily on a set of high resolution images are procured and digitized for areas within 2.5 km. of the Bengawan Solo River in the districts of Bojonegoro, Tuban and Lamongan by month 3 of the project	Published report
Output 2.3: Preliminary applications are screened, irrigation sites visited and private investors interviewed to assess prefeasibility using agreed selection criteria	At least 10 sites are visited and 10 potential investors and HIPPAAs interviewed within the 1 <sup>st</sup> 12 months of project start, 15 more by month 18, 20 more by month 24 and 30 by month 30 (75 applications go through preliminary screening)	Selection committee minutes

## ***Tertiary Irrigation Technical Assistance: TIRTA***

<b>TIRTA Logframe, 12 August 2014</b>		
<b>Desired Change</b>	<b>Indicators of Change</b>	<b>Means of Verification</b>
Output 2.4: More serious applicants attend presentations at demonstration sites to understand the technical and commercial aspects of scheme design (see Output 1.2)	At least 4 people, from every applying scheme, attends a ½ day demonstration at one of the project's demonstration sites prior to their schemes' technical and commercial viability being assessed	Visitor records
Output 2.4: Socio-political, technical and commercial viability studies are conducted on successfully screened applications	At least 6 schemes (2 per district) are technically (farmer viability) and commercially (investor viability) assessed within the 1 <sup>st</sup> 12 months of project start, 10 more within the 1 <sup>st</sup> 18 months, 25 more within 24 months and 15 more by month 30 (60 viability assessments completed)	Scheme documentation
Outcome 3: Project investors (HIPPA's or local entrepreneurs) raise the equity for investment in their irrigation schemes	Suitable local investors or banks finance at least 35 selected irrigation schemes to serve the needs of at least 10,000 small farmers by month 30 of the project start: at least 2 schemes by month 12, 5 by month 18, 10 by month 24, a further 18 by month 30 (35 schemes financed)	Agreements
Output 3.1: More irrigation schemes are introduced to either banks or local investors	At least 60 schemes are introduced to banks or investors by month 30: 5 within the 1 <sup>st</sup> 12 months of project start 10 more within the 1 <sup>st</sup> 18 months, 25 more within 24 months and 10 more by month 30	Minutes of meetings
Output 3.2: HIPPA members and investors are aware of the benefits and risks associated with their schemes	At least 35 operational agreements are reached between water users and local investors or banks by month 30 of the project  At least 70 facilitation meetings are arranged between HIPPA's and banks/investors to explain, in detail, roles and responsibilities contained in agreements by month 30 of the project	Agreements  Minutes of meetings
Outcome 4: The capacity of male and female farmers to manage their HIPPA's (water user associations) is enhanced	90% of the 35 project-sponsored schemes reach a cropping intensity of 100% within 12 months of project completion  At least 90% of project-supported schemes are collecting at least 90% of their water user fees 12 months after completion of their schemes  In at least 90% of project-supported schemes 90% of farmers express satisfaction with their irrigation services,	Farmer surveys  Interviews with investors and HIPPA's and account records, when they exist  Surveys of HIPPA members

## ***Tertiary Irrigation Technical Assistance: TIRTA***

<b>TIRTA Logframe, 12 August 2014</b>		
<b>Desired Change</b>	<b>Indicators of Change</b>	<b>Means of Verification</b>
	<p>within 3 cropping cycles of scheme's completion</p> <p>At least 90% of HIPPA's of the project-supported schemes can present up to date records relating to water user fees, assets and bank account balances.</p>	Written records
Output 4.1: A HIPPA management needs assessment and stakeholder analysis study is produced to assess the most relevant gaps in HIPPA management	A survey report is prepared that compares the more successful HIPPA's with those that are not, including consideration of social inclusion and socio-political factors, and then assesses the key management deficiencies of weaker HIPPA's	Survey documentation
Output 4.2: A training curriculum for HIPPA's is developed	Teaching materials addressing the main gaps in HIPPA management are developed and tested by month 6 of the project	Training materials
Output 4.3: Technical assistance is delivered to HIPPA management	At least 50% of the people in the managing committee of each project-supported HIPPA attends at least 24 hours of appropriate HIPPA management training (as per needs assessment survey) by month 30 of the project	Attendance records
Output 4.4: The executive of farmer groups/HIPPA's are introduced to either the eventual possibility to "buy out" the local investor or the need to pay back their loan	In training packages for HIPPA management at least 2 hours are devoted to this topic	Attendance records
Outcome 5: The capacity of farmers to increase their productivity/yield per hectare is increased	70% of the farmers that attend capacity building events apply at least 2 significant improved practices in their next cropping cycle	Sample surveys of farmers that have attended the capacity building events
Output 5.1: Farmer capacity needs assessment studies are conducted on farmers applying for irrigation schemes	A needs assessment study of farmers along the Bengawan Solo River identifying the farm practices most likely to increase yields is conducted by month 10	Project documentation
Output 5.2: Farmer capacity building measures are developed	A curriculum for the communication of farmer best practices, related to optimizing irrigation, is developed within the 1 <sup>st</sup> 12 months of project start	Training curriculum
Output 5.3: Training of trainers is conducted for the delivery of best practices to farmers	At least 5 people from each of the 35 schemes are trained as trainers in the set of best practices by month 15	Project documentation

## ***Tertiary Irrigation Technical Assistance: TIRTA***

<b>TIRTA Logframe, 12 August 2014</b>		
<b>Desired Change</b>	<b>Indicators of Change</b>	<b>Means of Verification</b>
Output 5.4: Training in productivity enhancement is delivered to farmers	At least 20% of farmers from each project (approximately 2,000 to 3,500) receive training/orientation in best practices by month 30 of the project At least 50% of this training is financed by the investors from the schemes	Training attendance
Outcome 6: The technical capacity of service agents (small repair firms, pump sellers, installation providers, local investors and water user associations) is developed and they are serving the needs of more tertiary irrigation schemes	Each of the scheme investors, farmer groups and HIPPA's are using at least 3 appropriate "standard operating procedures" related to technical efficiency of water pumping and delivery within 3 months of scheme completion	Survey of sites
Output 6.1: A survey is conducted of existing pumping schemes along the Bengawan Solo river to assess the status of pumping configurations and pumping efficiency.	Survey of 15 sample pumping schemes is conducted to assess pumping efficiency levels with a view to developing and documenting technical solutions to either cost savings or increased water delivery for the same costs by month 6 of the project's start	Site survey by independent consultants
Output 6.2: (see Output 1.2) Demonstration sites, together with selected project clients, are established along the Bengawan Solo river to show alternative "cost effective" pump/engine delivery configurations	At least 3 sites are developed (1 in each district), with the consent of scheme owners, that demonstrate best practices in technical design At least 300 separate visitors (50% of whom are from HIPPA's, pump sellers, installation providers and potential investors) register at each one of the demonstration sites (total 900 visitors) by month 30 of the project	3 sites are fully functioning at high levels of efficiency Visitor records maintained at the 3 sites
Output 6.3: Technical assistance is provided to pump managers, installation providers, pump suppliers and investors on scheme design/configuration and efficiency	At least 2 part time courses are organized for a total of approximately 60 participants (20 from each district) for a total of 4 days per course (based on survey data of capacity needs), by month 30 of the project At least 2 relevant personnel for every supported scheme attends at least 1 follow-up training course by month 30	Survey of HIPPA records  Survey by independent consultants
Outcome 7: The project is governed and managed effectively	Managing contractors score at least 5 out of 6 on all 18 Contractor Performance Assessments criteria for all years of operation	Contractor performance assessments

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<b>TIRTA Logframe, 12 August 2014</b>		
<b>Desired Change</b>	<b>Indicators of Change</b>	<b>Means of Verification</b>
Output 7.1: The project's steering committee is operating effectively	<p>The steering committee meets at least once a year to review annual plans, progress and budgets</p> <p>Members of the project management team regularly participate in District Irrigation Commission meetings (or any of its sub-committees) to coordinate scheme selection with public funding</p> <p>At least 10 public officials participate in significant capacity building measures including training and study tours (5 by month 12 and another 5 by month 24)</p>	Minutes of meetings
Output 7.2: The Project's Operations Manual (finance, grant approval process, personnel and administration systems) is completed and in use	The project financial audits report only minor infractions	Manual documents
Output 7.3: The projects results measurement system is established and functioning	<p>Baselines of farmer productivity and incomes are conducted for each of the supported schemes prior to their completion</p> <p>Follow up surveys of farmer productivity and incomes are conducted for each scheme 12 months after its completion to assess productivity and income changes</p> <p>The project passes a DCED results measurement audit within the 1<sup>st</sup> 18 months of operations</p>	<p>Survey reports</p> <p>Audit reports</p>
Output 7.3 A plan for scaling up of the model, or its variations, is developed	By month 12 of the project, a credible strategy has been developed for how the model, or its variations, can be sustainably scaled up at least in East Java and promoted, with reduced resources, in NTT and NTB.	Strategy document

# Tertiary Irrigation Technical Assistance: TIRTA

## Theory of Change for TIRTA Project

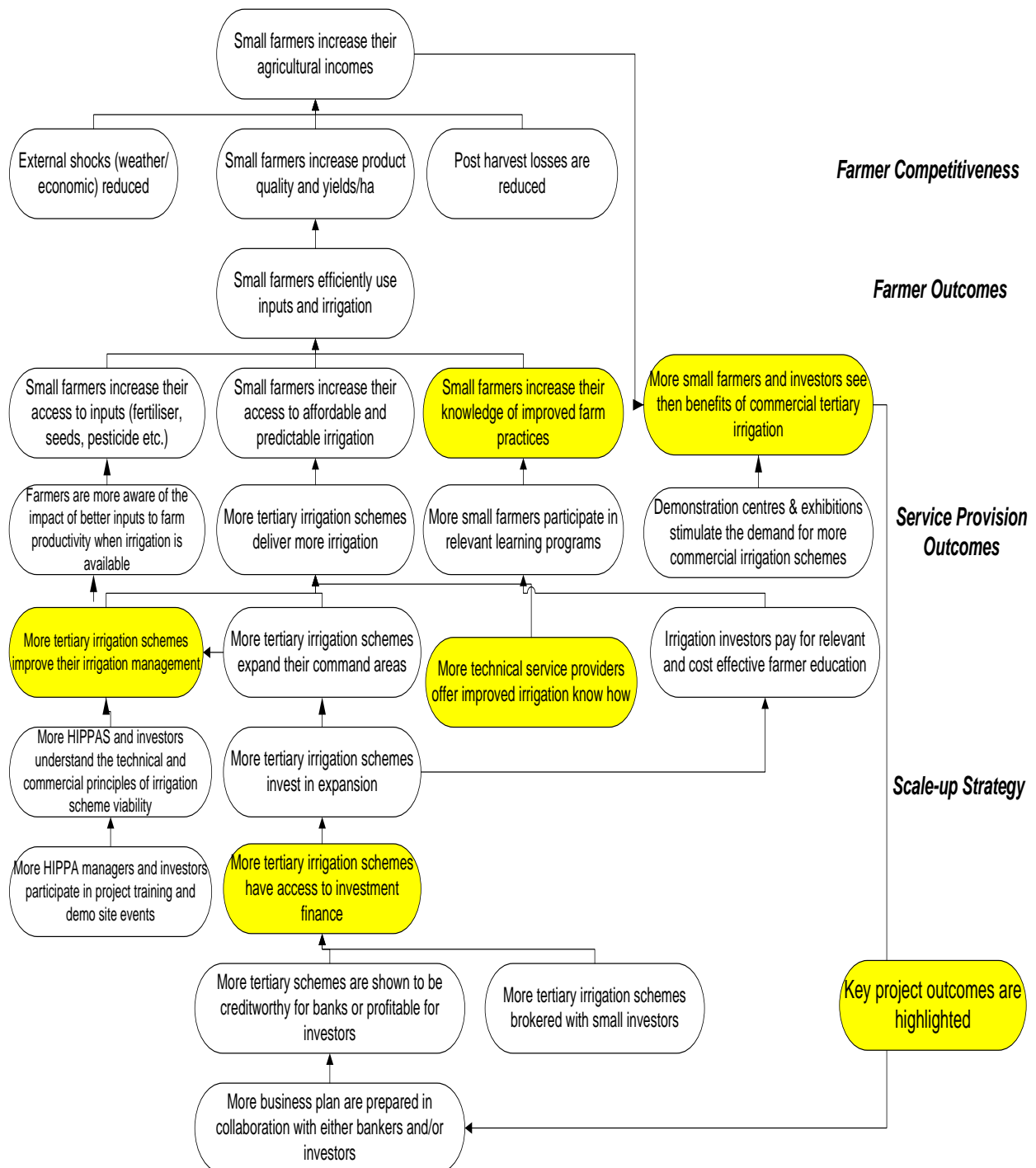


Figure 8 Theory of change for TIRTA project



## ***Tertiary Irrigation Technical Assistance: TIRTA***

### **Annex 2: Alternative forms of irrigation for eastern Indonesia**

#### ***Irrigation Modules for Small Scale Irrigation System***

The aim of the project is to assist communities to develop or expand their irrigation areas. Various “modules” could be developed which will define the range of irrigation systems that can be considered for support under the project.

Factors to be considered when developing modules include: (i) cost per hectare, (ii) maximum and minimum sizes in terms of number of farmers and cost and (iii) suitability for partial financing and management by local entrepreneurs. The irrigation development program will be considered as adaptive research during implementation, with lessons learned feeding back into the design process. Some modules may be dropped in the light of experience and others added.

Based on discussions with government departments and irrigation farmers in the three project provinces, the following modules could be considered for possible implementation, representing the main types of irrigation that are likely to be demanded by communities.

- Conventional surface irrigation from river diversion
- Conventional surface irrigation from water pumped from river or lake
- Rehabilitation of small government managed systems or the tertiary systems of larger irrigation systems
- Irrigation from shallow tube wells (STW)
- Irrigation from deep tube wells (DTW)
- Micro-irrigation from spring or other water source
- Irrigation from rain harvesting dams (referred to as embung in Bahasa Indonesia)

This section provides an initial description of the types of irrigation that could be supported by the project. Project management will need to review the systems and others and develop detailed module indicative designs and unit costings during the first three months of the project.

#### ***Conventional surface irrigation from river diversion***

This system normally comprises a weir or offtake on a river (referred to as the headworks), diverting water to one or two canals which take water to the irrigation area. In larger schemes the primary canals may supply one or more secondary canals, in turn supplying tertiaries. The systems that TIRTA could consider would mainly be under 100 ha in area, with a maximum of around 200 ha.

Most of the easily established conventional surface irrigation systems have already been developed, leaving mainly smaller and isolated areas with sometimes difficult terrain. The canals may pass through steep and sometimes landslide prone areas before reaching the irrigation area. Schemes therefore tend to be expensive – for example the Ministry of Agriculture in Vietnam has set a maximum cost of US\$ 10,000/ha for hill area surface irrigation. Small-scale systems in Lao PDR cost around US\$ 3,000/ha under multilateral agency projects.

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In Indonesia, costs vary greatly depending on the implementation process, topography and design of the scheme. In Aceh, under the Earthquake and Tsunami Emergency Support Project (ETESP) in 2006-10, 92 small irrigation schemes were developed or rehabilitated covering 30,400 ha at a cost of US\$ 20.7 million (equivalent to AU\$ 720/ha at current exchange rates). Including consultancy services, total cost per hectare was \$1,000, a common international level for rehabilitation works. One 215 ha scheme visited by the current project design team in Lombok Tengah cost a total of \$340/ha for the headworks and main canal under World Food Program and DoPW funding, a remarkably low level given the magnitude of the structures constructed<sup>17</sup>.

Schemes which can be developed at low cost – perhaps up to \$2,000/ha including command area development could be accepted by the project.

### ***Conventional surface irrigation from water pumped from river or lake***

This has some advantages over the previous system. The headworks comprise a pump station, normally costing less than a diversion or offtake and canal. It has been successfully used along the Bengawan Solo River in Tuban district in East Java. Systems could range in size from around 50 ha with around 150 farmers to 400 ha with more than 1,000 farmers. Capital cost would be expected to be in the range \$US1,000 to \$2,000/ha. While capital cost is likely to be less than a conventional diversion/canal system (due to low cost of headworks and main canal), operating costs would be higher due to the need for pumping. Where electricity is available, it would be the preferred option. Alternatively, diesel-powered pumps would be needed.

As in Tuban, this system is well-suited to support by local entrepreneurs, with investors being the key to successful development and operation. Key among their advantages are that they are required to guarantee water delivery and adequate maintenance, meaning that farmers can target high yields with confidence, and thus can afford the high ISFs required to operate the system and provide an adequate return to the investor.

### ***Rehabilitation of small government managed systems or the tertiary systems of larger irrigation systems***

Many large and small government-managed systems no longer work effectively (see Table 2). Other projects such as WRISM II are addressing this problem, and it is not recommended that existing government systems are given high priority by the project. However, where the project can assist through developing new water supplies (for example to assist farmers at the tail of the system), investment could be supported. Examples are likely to be found where water is over-used at the head of the system, depriving farmers lower down the system of adequate irrigation. In this case, a new offtake or diversion lower down the system can put water back into the lower system to supply farmers. Where groundwater is available, tube wells may be used to augment dry season supplies, termed conjunctive use.

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<sup>17</sup> The weir was built entirely by local craftsmen (*tukang*) and is classed as among the best constructed and largest infrastructure investments undertaken by WUAs, in this case with no outside supervision.

## ***Tertiary Irrigation Technical Assistance: TIRTA***

If for any reason, the project falls behind its subproject development target, increased numbers of existing irrigation systems could be targeted, since investment is usually straight-forward. For example canal cleaning, or structure rehabilitation activities could often be designed, contracted and implemented within a few months.

### ***Irrigation from shallow tube wells (STW)***

Where the water table in an area is shallow – say less than eight meters, where the aquifer is robust and recharge adequate and where soil characteristics are suitable, the construction of STW offers an effective and low-cost method of delivering water to farmers' fields. Because STWs generally only yield 5 to 10 litres per second (l/s), thus supplying around 4-8 ha, it would not be feasible for the project to fund individual wells. However, where a larger area of land is available, with farmers interested in irrigation, groups of STWs could be considered, with four or five farmers per group, each having less than 1 ha of land. Around 10 groups irrigating 40 ha could be considered to be a minimum for a subproject.

This system could also be well-suited to private sector support. For example, the investor could be sought to provide fuel and maintenance services to a group of 20 or 30 tube wells. For ease of management, it would be desirable to limit the number of different pumps and engine types in a cluster.

### ***Irrigation from deep tube wells (DTW)***

Deep tube wells are normally 80 to 120 meters in depth. Often they will pump from 30 or 40 meters and generate yields of 40 or 50 l/s, irrigating up to about 40 ha. Their pumping depth is greater and operational cost higher than for STWs. DTWs would be well suited to financing and management by investors. A typical investment program could be for the project to pay for the bore and casing, a local entrepreneur to fund the pump shed, pump and engine, and the farmers command area development and canals/piping. The entrepreneur could then operate and maintain the pump and deliver water to farmers for an agreed fee (share of the crop). If an entrepreneur cannot be found, the project could pay for the pump and engine, to be operated by the WUA.

Project investment could be considered where there is a sufficient area of suitable land, with reasonably equitable ownership, good water quality in and sustainable quantity.

### ***Micro-irrigation from springs or other water sources***

Micro-irrigation refers to the use of pipes to deliver water to plants using trickle, drip or micro-sprays. It is efficient in the use of water, with demand normally less than half that of surface irrigation per hectare. It is relatively new in the project provinces, though one effective trickle system was visited by the design team near Soe in NTT. Since the technology is fairly new, WUAs would need to be strongly supported, until the viability of the system is achieved and the system becomes self-financing.

The ideal source of water for such a system is a spring at a higher elevation than the area proposed for irrigation. This should allow gravity to be used to deliver water to the system or a

## ***Tertiary Irrigation Technical Assistance: TIRTA***

buffer reservoir, saving cost. However, pumping from a spring, river, lake or dam will also be feasible in many cases.

The irrigation system can if required be established on moderately sloping land, allowing irrigation to be extended beyond lowland areas. It is expensive to establish with e.g, drip lines every meter, or five meters for tree crops, and thus is normally used for high value crop production. It can be developed on under-used or unused land, but requires careful planning to ensure that farmers from the village or group can utilise the facilities. The ability of the group to organise at this level would be a key determinant of whether to support the group.

### ***Small irrigation dams or tanks (embung)***

Australia has a long history of supporting dam construction in NTT, commencing in 1981 under the NTT Livestock Development Project (NTTLDP) which built a number of earth dams on a 4,000 ha area at BesiPai in Timor Tengah Selatan (TTS) district. NTT Integrated Area Development Project (1986 to c. 1995), was originally conceived as the second phase of NTTLDP but evolved into a multi-sector institutional development project. However, it continued the dam building program in several areas of NTT, designed for small-scale irrigation.

The rain harvesting dams, including those supported by Australian, have had mixed success. Dams built in steep catchments have often had problems with sedimentation, reducing dam capacity. Several are no longer used for irrigation. However, in hilly areas, dams are often the only possible source of water for irrigation and often other uses. Earth dams up to around 7 meters in height and 100,000 m<sup>3</sup> storage capacity are recommended for inclusion in the project. Careful design and construction would be required for a dam to this size. In addition to careful siting it is necessary that spillway capacity and design are adequate to cope with flood events.

## Tertiary Irrigation Technical Assistance: TIRTA

### Annex 3 Crop budgets<sup>18</sup>

#### Jawa Timur

		Irrigated Rice			SRI Rice			Rainfed lowland rice		
Crop		Rice			Rice			Rice		
Variety		IR64			IR64			IR64		
Plot size	ha	1			1			1		
Inputs	unit	Amount	IDR '000 /unit	IDR '000 total	Amount	IDR '000 /unit	IDR '000 total	Amount	IDR '000 /unit	IDR '000 total
Seed	kg	50	8.0	400	10	8.0	80	40	8.0	320
Fertilizer										
Urea	kg	100	1.8	180	50	1.8	90	100	1.8	180
ZA	kg	100	1.4	140	50	1.4	70	100	1.4	140
SP	kg	80	2.0	160	40	2.0	80	80	2.0	160
NPK	kg	80	2.3	184	40	2.3	92	80	2.3	184
Organic	kg	500	0.5	250	2000	0.5	1000	500	0.5	250
Pesticide										
Fungicide	l	1	60.0	60	1	60.0	60	1	60.0	60
Insecticide	l	1	37.0	37	1	37.0	37	1	37.0	37
Labour										
Land cultivation	tractor	1	625.0	625	1	625.0	625	1	625.0	625
Nursery	Half MD*	25	15.0	375	30	15.0	450	25	15.0	375
Transplanting	Half MD	60	12.5	750	100	12.5	1250	60	12.5	750
Grass control	MD	20	25.0	500	40	25.0	1000	20	25.0	500
Fertilizer labour		10	12.5	125	20	12.5	250	10	12.5	125
Pest control	Half MD	20	12.5	250	30	12.5	375	20	12.5	250
Harvesting	Half MD	20%		5050			5500			5050

<sup>18</sup> All crop budgets have been sourced from the Agricultural Provincial Office and in some cases are incomplete.

\* MD = man day

## Tertiary Irrigation Technical Assistance: TIRTA

Irrigation fee	ha	1	100.0	100	1	100.0	100			
Total direct costs				9186			11,059			9,006
Production	kg	7,000	3.2	22400	10,000	3.3	33,000	5,000	3.3	16,500
Gross margin				13214			21,941			7,494
Land rent	ha	1	2,000	2,000	1	2,000.0	2,000	1	2,000	2,000
Net margin tenant				11,214			19,941			5,494

Crop	Corn				Soybean			
Variety	Komposit							
Plot	1 ha				1 ha			
Inputs	Amount	unit	IDR '000 /unit	IDR '000 total	Amount	unit	IDR '000 /unit	IDR '000 total
Seed	50	kg	2.5	125	40	kg	10	400
Fertilizer								
Urea	300	kg	1.8	540	50	kg	1.8	90
Ammonium sulphate	50	kg	1.4	70				
TSP	50	kg	2	100				
KCI	100	kg	2.5	250				
Growth regulator	40	kg	32	1,280				
NPK					300	kg	2.3	690
Dung					1,000	kg	0.5	500
Pesticide					4	kg	80	320
Fungicide								
Insecticide	2	l	37	74				
Labour								
Land cultivation	1	tractor	675	675				
					20	MD	35	700



### ***Tertiary Irrigation Technical Assistance: TIRTA***

Finishing (furrowing)	5	Half MD	15	75				
Nursery	5	Half MD	15	75				
Transplanting	15	MD	30	450	30	MD	30	900
Grass control	4	MD	30	120	33	MD	35	1,155
Fertilizer labour	2	Half MD	12.5	25	10	MD	35	350
Pest control	4	Half MD	12.5	50	7	MD	35	245
Harvesting	25%	gross			1		800	800
Irrigation fee	1	ha	100	100	1	ha	150	150
Total direct costs				4,009				6,300
Production	9,000	kg	1.2	10,350	2200	kg	6.0	13,200
Gross margin				6,341				6,900
Land rent	1	ha	2,000	2,000	1	ha	3,000	3,000
Net margin tenant				4,341				3,900

## Tertiary Irrigation Technical Assistance: TIRTA

### NTB

Crop		Lowland rice			Upland rice		
Variety							
Plot	ha	1			1		
Inputs	unit	Amount	IDR '000 /unit	IDR '000 total	Amount	IDR '000 /unit	IDR '000 total
Seed	kg	30	8	240	40	8	320
Urea	kg	250	1.9	475	250	1.9	475
NPK	kg	200	2.4	480	200	2.4	480
Pesticide	litre	1	115	115	1	115	115
Labour							
Land cultivation	MD	100	8	800	100	8	800
Transplanting	MD	100	8	800	100	6	600
Grass control	MD	100	5	500	100	3	300
Fertilizer labour	MD	8	20	160	8	20	160
Harvesting	MD	57	30	1,710	25	25	625
Irrigation fee	times	3	100	300			
Total direct costs				5,580			3,875
Production	kg	5,700	3.3	18,810	2500	3.3	8,250
Gross margin				13,230			4,375
land rent	ha	1	5,000	5,000	1	2,000.0	2,000
Net margin tenant				8,230			2,375

## Tertiary Irrigation Technical Assistance: TIRTA

Crop	Corn				Soybean			
Plot	1 ha				1 ha			
Inputs	Amount	Unit	IDR '000 /unit	IDR '000 total	Amount	Unit	IDR '000 /unit	IDR '000 total
Seed	20	kg	35	700	40	kg	6	240
Fertilizer								
Urea	300	kg	1.9	570	50	kg	1.9	95
NPK Phonska	200	kg	2.4	480	200	kg	2.4	480
Pesticide	1	litre	115	115	1	litre	115	115
Labour								
Land cultivation	100	MD	8	800	100	MD	8	800
Transplanting	100	MD	6	600	100	MD	4	400
Fertilizer labour	6	MD	40	240	2	Half MD	40	80
Grass control					4	Half MD	40	160
Pest control	3		40	120	4	Half MD	40	160
Harvesting	20	Half MD	40	800	12	Half MD	40	480
Drying					4	Half MD	40	160
Paring					4	Half MD	40	160
Rafting					4	Half MD	40	160
Others								
Sacks					22	unit	2	44
Total direct costs				4,425				3,534
Production	12	t	1,200	14,400	1,100	kg	10.5	11,550
Gross margin				9,975				8,016
Land rent	1	ha	5,000	5,000	1	ha	5,000	5,000
Net margin tenant				4,975				3,016

## Tertiary Irrigation Technical Assistance: TIRTA

### NTT

Crop		Rice Lowland irrigated			Rice Lowland Seed			Rice Upland		
Variety		Ciherang			Ciherang			Impari		
Plot	ha	1			1			1		
Inputs	unit	Amount	IDR '000 /unit	IDR '000 total	Amount	IDR '000 total	IDR '000 total	Amount	IDR '000 total	IDR '000 total
Seed	kg	40	8	320	30	8	240	40	8	320
Fertilizer										
Urea	kg	250	2.5	625	250	2.5	625	200	2.5	500
NPK	kg	200	3.5	700	200	3.5	700	100	3.5	350
Compost	kg	1,000	1	1,000	2,000	1	2,000			
Pesticide	litre	1	150	150	2	150	300	1	150	150
Labour										
Land cultivation	MD	80	8	640	100	8	800	50	8	400
Transplanting	MD	50	8	400	100	8	800	30	8	240
Grass control	MD	40	5	200	100	5	500	30	5	150
Fertilizer labour	MD	8	20	160	8	20	160	8	20	160
Harvesting	kg	580	6	3,480	600	6	3,600	250	6	1,500
Irrigation fee	Lump sum	1	100	100	1	100	100			
Total direct costs				7,775			9,825			3,770
Production	kg	5,800	4	23,200	6000	6.8	40,800	2500	4	10,000
Gross margin				15,425			30,975			6,230
land rent					1	10,000	10,000			
Net margin tenant				15,425			20,975			6,230

## Tertiary Irrigation Technical Assistance: TIRTA

Crop		Corn			Upland corn			Corn for seed		
Variety										
Plot	ha	1			1			1		
Inputs	unit	Amount	IDR '000 total	IDR '000 total	Amount	IDR '000 total	IDR '000 total	Amount	IDR '000 total	IDR '000 total
Seed	kg	20	35	700	20	35	700	20	35	700
Fertilizer										
Urea	kg	300	1.9	570	300	1.9	570	300	1.9	570
NPK	kg	200	2.4	480	200	2.4	480	200	2.4	480
Pesticide	litre	1	115	115	1	115	115	1	115	115
Labour										
Land cultivation	MD	15	40	600	15	40	600	20	40	800
Transplanting	MD	10	40	400	10	40	400	15	40	600
Grass control	MD	6	40	240	6	40	240	6	40	240
Fertilizer labour	MD	8	40	320	6	40	240	12	40	480
Harvesting	MD	20	40	800	10	40	400	20	40	800
Irrigation fee	Lump sum	1	500	500				1	750	750
Total direct costs				4,725			3,745			5,535
Production	kg	5,000	3.5	17,500	3,000	3.5	10,500	4,000	5.5	22,000
Gross margin				12,775			6,755			16,465
Land rent										
Net margin tenant				12,775			6,755			16,465

## ***Tertiary Irrigation Technical Assistance: TIRTA***

### **Annex 4 Terms of Reference for Specified Personnel**

**Position Title:** TIRTA Team Leader (Adviser Remuneration Framework (ARF) Level 3 or 4, Discipline Group B)

**Duty Station:** Surabaya

**Duration:** Three years

#### **Background:**

DFAT has a long history of rural development in Indonesia. There have been two main predecessors to AIP-Rural: ANTARA (2005-2010) with a budget of AU\$ 30 million for five years in NTT province; and, SADI (2006-2010) also with a budget of AU \$30 million for 4 years for NTT, NTB and Sulawesi provinces. DFAT's most recent program, AIP-Rural, has been designed as a 10 year program ending in June 2022. The program's 1<sup>st</sup> Phase, ending in June 2017, has a budget of AU\$ 112 million and is aimed at increasing, by at least 30%, the agricultural incomes of 300,000 smallholder male and female farmers living in 5 provinces of eastern Indonesia: NTT, NTB, East Java, Papua and West Papua.

The Theory of Change underpinning AIP-Rural is that agriculture is three times more efficient in reducing poverty compared to other major economic sectors. And if more farmers understand the impact of, and have access to, improved assets, technology, inputs and services, they will increase their competitiveness and incomes. The key strategies that AIP-Rural will use to improve access to these assets, technologies, inputs and services are:

- To identify commodity sectors like (maize, beef, cocoa etc.) or cross cutting sectors (mechanisation, irrigation, technology, finance), that are most relevant to generating pro-poor outcomes in the selected provinces; and then,
- To analyse these sectors, to assess the systemic or binding constraints that are most important to increased farm incomes for both males and females, and then
- To design 80+ sustainable and market driven interventions which generate "scaleable" impact and outreach to small farmers for whom these sectors relevant in these provinces.

The program will consist of several sub-projects:

- PRISMA, commissioned in November 2013, will concentrate its interventions mostly in selected commodity sectors,
- A financial Inclusion project will work through micro finance organisations to address small farmer access to credit and micro-insurance,
- An agricultural research and innovation project will improve farmer access to new processes and technologies,
- A small regional economic development project will improve the local competitive or enabling environment for agriculture, and



## ***Tertiary Irrigation Technical Assistance: TIRTA***

- A tertiary irrigation project (TIRTA) to boost agricultural productivity through improving farmer access to water.

The core rationale of TIRTA is that access to irrigation has three times more impact on farmer incomes than other inputs like fertilisers and seeds and within irrigation services tertiary irrigation offers the greatest prospects to AIP-Rural for improvement. The main constraints in tertiary irrigation are related to lack of investment for expansion and poor operations and maintenance. Because of its recognised impact on farmer incomes TIRTA will approach tertiary irrigation in a businesslike manner by facilitating the expansion of local commercial investment in tertiary irrigation schemes in eastern Indonesia.

**Duties:** Under the direction of the AIP-Rural Program Director, the TIRTA Team Leader will be responsible for the day to day management of the project. The Team Leader will be supported by an Irrigation Specialist, a Finance, Administration and Personnel Manager, a Results Measurement Manager and five Intervention Coordinators. Specifically the Team Leader will be responsible for:

- The strategic orientation of the project to ensure that it is in line with the goals and methodologies of AIP-Rural. This will mean that decision making on all interventions will be made against the criteria of: potential outreach, impact on male and female farmer incomes, sustainability and value for money.
- Overseeing the establishment and functioning of the project's results measurement system. This will entail: the preparation of a systems manual with guidelines and templates; the training of project staff, the quality control of all intervention reports and the aggregation of short and long term indicators.
- Based on the above mentioned results measurement system to assess progress on key short term indicators such as numbers of applications, numbers of viability studies etc. and, if needed, take appropriate and strategic remedial action.
- Liaising with Government of Indonesia officials at both the national and district levels to: introduce the project's aim and methodologies; establish acceptable intervention selection criteria, set up a National Steering Committee; collaborate with the District Irrigation Commissions; and coordinate intervention investment with the district level DINAS.
- Establish and monitor project communication strategies including: the marketing of the project and its offer to HIPPAAs, local investors, repair and maintenance service providers, and public officials; assessing the attendance of appropriate stakeholders at project events; validating the nature of feedback from key stakeholders on the substance and clarity of the project's message.
- Oversee, with support from the Administration, Finance and Personnel Manager, the quality assurance of all: recruitment, contracting, financial management and budgeting, and administrative support systems and activities;
- Prepare in collaboration with the AIP-Rural Program Director, all project related planning and reporting documents, such as: the Inception Report, Annual

## ***Tertiary Irrigation Technical Assistance: TIRTA***

Implementation Plans, Risk Assessments etc. to ensure that they are in line with the AIPD overall planning and reporting system.

### **Qualifications:**

#### **Essential:**

- 10 or more year's professional experience in international agricultural development and a good understanding of irrigation management,
- An excellent understanding of the principles of facilitation and negotiations skills,
- Demonstrated professional leadership and ability to lead a team of professionals and ability to coach and mentor more junior staff,
- At least 3 years' experience in a management position in an agricultural development project, and
- Excellent verbal and written communication skills in English and a working knowledge of Bahasa Indonesia.

#### **Desirable**

- 5 or more year's professional experience in irrigation development or management,
- Experience in providing strategic direction in one or more the agri-business sectors or value chains,
- Familiarity with international donor systems and requirements.

## ***Tertiary Irrigation Technical Assistance: TIRTA***

**Position Title:** Irrigation Specialist (Deputy Team Leader)

**Duty Station:** Surabaya

**Duration:** Three years

### **Background:**

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The Theory of Change underpinning AIP-Rural is that agriculture is three times more efficient in reducing poverty compared to other major economic sectors. And if more farmers understand the impact of, and have access to, improved assets, technology, inputs and services, they will increase their competitiveness and incomes. The key strategies that AIP-Rural will use to improve access to these assets, technologies, inputs and services are:

- To identify commodity sectors like (maize, beef, cocoa etc.) or cross cutting sectors (mechanisation, irrigation, technology, finance), that are most relevant to generating pro-poor outcomes in the selected provinces,
- To analyse these sectors, to assess the systemic or binding constraints that are most important to increased farm incomes for both males and females, and then
- To design 80+ sustainable and market driven interventions which generate "scaleable" impact and outreach to small farmers for whom these sectors relevant in these provinces.

The program will consist of several sub-projects:

- PRISMA, commissioned in November 2013, will concentrate its interventions mostly in selected commodity sectors,
- A financial Inclusion project will work through micro finance organisations to address small farmer access to credit and micro-insurance,
- An agricultural research and innovation project will improve farmer access to new processes and technologies,
- A small regional economic development project will improve the local competitive or enabling environment for agriculture, and
- A tertiary irrigation project (TIRTA) to boost agricultural productivity through improving farmer access to water.

## ***Tertiary Irrigation Technical Assistance: TIRTA***

The core rationale of TIRTA is that access to irrigation has three times more impact on farmer incomes than other inputs like fertilisers and seeds and within irrigation services tertiary irrigation offers the greatest prospects to AIP-Rural for improvement. The main constraints in tertiary irrigation are related to lack of investment for expansion and poor operations and maintenance. Because of its recognised impact on farmer incomes TIRTA will approach tertiary irrigation in a businesslike manner by facilitating the expansion of local commercial investment in tertiary irrigation schemes in eastern Indonesia.

**Duties:** Under the direction of TIRTA Team Leader the Irrigation Specialist will be responsible for the technical quality of irrigation outcomes. Specifically this person will handle:

- The identification of intervention sites according to selection criteria agreed upon by project management and local public agencies.
- The completion of technical and commercial viability studies for all schemes that are successfully screened by the project and its partners.
- Assessing the capacity needs of HIPPA management and designing, with support from consultants, training packages that address management gaps.
- Assessing the technical capacity needs of local service provision agents (pump sellers, diesel engine technicians, and civic contractors) with a view to designing and delivering practical capacity building measures for them.
- Assessing the capacity needs of farmers involved in the irrigation interventions with a view to designing and delivering (in collaboration with local investors) training on those practices that are most likely to lead to productivity improvements once irrigation is available.
- Overseeing the establishment, operation and utilisation of three irrigation pumping demonstration sites with alternate technical configurations along the banks of the Bengawan Solo River.
- Advising HIPPA management and local investors on alternative investment options with a view to reducing operations and maintenance costs and optimising scheme return on investment and farmer productivity.
- The day to day supervision of five Intervention Coordinators including: the allocation of interventions and targets, the monitoring of their intervention management plans, regularly assessing implementation progress, taking remedial action where necessary and conducting staff assessments on performance.

### **Qualifications:**

Essential:

- An excellent and practical understanding of irrigated agriculture,
- Experience in facilitating and negotiating agreements between various parties in short periods of time,

### ***Tertiary Irrigation Technical Assistance: TIRTA***

- A degree or commensurate diploma in agricultural engineering or a similar field, and
- A working knowledge of English.

Desirable

- Exposure to farming and agri-business in an Indonesian context,
- Work in a former irrigation project.

## ***Tertiary Irrigation Technical Assistance: TIRTA***

**Post Title:** Results Measurement Manager

**Duty Station:** Surabaya

**Duration:** Three years

### **Background:**

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## ***Tertiary Irrigation Technical Assistance: TIRTA***

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**Duties:** Under the direction of the TIRTA Team Leader the Results Measurement Manager will be responsible for the implementation of the project's results measurement system. Specifically this person will be responsible for:

- Introducing an effective Results Measurement System (see Results Measurement in AIP-Rural). This will include a results measurement manual, a capacity building program, and assessment and remedial action processes;
- Clearing all intervention concept notes before they are submitted for management approval to ensure that they meet the compliance criteria of: the project on impact, outreach, social inclusion, gender, environment, value for money and the DCED Standard for Results Measurement;
- Overseeing regular capacity building measures of project staff to ensure that all implementation staff members are familiar good practices related to assessing impact and measuring attribution;
- Preparing quarterly reports for management on portfolio quality. This will include, in the early stages of implementation, intervention by intervention projections of outreach and impact and a risk assessment for each intervention so that management may make decisions on the retention, suspension or elimination of the intervention. As the portfolio evolves, this report will monitor the achievement of all interventions against project objectives of outreach, impact and sustainability;
- Guiding implementation personnel in the preparation of results measurement plans and the identification of attribution strategies with a view to the appropriate use of survey instruments, the commissioning of surveys and research, the processing of the results of these surveys and the identification of remedial action;
- Overseeing the process leading to the project's compliance with the DCED Standard for Results Measurement, including the formulation of relevant documentation, the organisation of mock audits and the eventual project audit by a certified DCED Results Measurement auditor; and
- In collaboration with the Team Leader, preparing: public presentations, case studies, articles and materials for the project website on project impact and how impact is assessed and used for decision-making in the Project.

## ***Tertiary Irrigation Technical Assistance: TIRTA***

### **Qualifications:**

#### Essential:

- 5 or more year's professional experience or equivalent in the use of quantitative methods,
- Experience developing monitoring systems for development projects,
- Familiarity with the DECD standard on impact monitoring for private sector development projects,
- A sound understanding of statistics and quantitative measurement through a variety of survey instruments and analysis techniques,
- Excellent verbal and written communication skills, and
- Fluency in speaking, reading and writing in English and Bahasa Indonesia.

#### Desirable

- Familiarity with international donor systems and requirements,
- Experience in working the agriculture sector.

## ***Tertiary Irrigation Technical Assistance: TIRTA***

**Position Title:** Finance, Administration and Personnel Manager

**Duty Station:** Surabaya

**Duration:** Three years

### **Background:**

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The Theory of Change underpinning AIP-Rural is that agriculture is three times more efficient in reducing poverty compared to other major economic sectors. And if more farmers understand the impact of, and have access to, improved assets, technology, inputs and services, they will increase their competitiveness and incomes. The key strategies that AIP-Rural will use to improve access to these assets, technologies, inputs and services are:

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The core rationale of TIRTA is that access to irrigation has three times more impact on farmer incomes than other inputs like fertilisers and seeds and within irrigation services tertiary irrigation offers the greatest prospects to AIP-Rural for improvement. The main

## ***Tertiary Irrigation Technical Assistance: TIRTA***

constraints in tertiary irrigation are related to lack of investment for expansion and poor operations and maintenance. Because of its recognised impact on farmer incomes TIRTA will approach tertiary irrigation in a businesslike manner by facilitating the expansion of local commercial investment in tertiary irrigation schemes in eastern Indonesia.

**Duties:** Under the direction of the TIRTA Team Leader the Finance, Administration and Personnel Manager will be responsible for project operations. Specifically this person will be responsible for:

- Project financial management including: establishing the project's chart of accounts; the preparation of monthly financial statements; the reconciliation of bank accounts; the preparation of budgets; financial reporting in compliance with DFAT standards; clearing payments; and the training of staff in necessary financial reporting systems and procedures.
- Administration including: the development of contracting templates for short term consultants, local employees and grants (when appropriate), to project stakeholders. The execution of all above mentioned contracts including compliance with contractual milestones and deliverables.
- Personnel management including: staff recruitment, selection and salary negotiations, monthly staff payments, and ensuring performance assessments are regularly conducted.

### **Qualifications:**

#### **Essential**

- Relevant bachelor's degree or similar qualification in business or accounting,
- A minimum of 7 years of relevant work experience,
- A minimum 2 years of people management experience, including setting clear performance objectives, managing for results, giving and receiving feedback, performance evaluation and mentoring and coaching consultants/employees, and
- Good communications skills in English.

#### **Desirable**

- Minimum 3 years at a management level similar projects, or projects of another bilateral donor,
- Excellent verbal communication skills in Bahasa Indonesia,
- Knowledge of Indonesian public sector and experience working with government agencies,
- Experience working on Rural Development or Agricultural projects or initiatives.

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**Position Title:** Intervention Coordinator

**Duty Station:** Surabaya

**Duration:** Three years

### **Background:**

DFAT has a long history of rural development in Indonesia. There have been two main predecessors to AIP-Rural: ANTARA (2005-2010) with a budget of AU\$ 30 million for five years in NTT province; and, SADI (2006-2010) also with a budget of AU\$ 30 million for 4 years for NTT, NTB and Sulawesi provinces. DFAT's most recent program, AIP-Rural, has been designed as a 10 year program ending in June 2022. The program's 1<sup>st</sup> Phase, ending in June 2017, has a budget of AU\$ 112 million and is aimed at increasing, by at least 30%, the agricultural incomes of 300,000 small farmers living in 5 provinces of eastern Indonesia: NTT, NTB, East Java, Papua and West Papua.

The Theory of Change underpinning AIP-Rural is that agriculture is three times more efficient in reducing poverty compared to other major economic sectors. And if more farmers understand the impact of, and have access to, improved assets, technology, inputs and services, they will increase their competitiveness and incomes. The key strategies that AIP-Rural will use to improve access to these assets, technologies, inputs and services are:

- To identify commodity sectors like (maize, beef, cocoa etc.) or cross cutting sectors (mechanisation, irrigation, technology, finance), that are most relevant to generating pro-poor outcomes in the selected provinces,
- To analyse these sectors, to assess the systemic or binding constraints that are most important to increased farm incomes, and then
- To design 80+ sustainable and market driven interventions which generate "scaleable" impact and outreach to small farmers for whom these sectors relevant in these provinces.

The program will consist of several sub-projects:

- PRISMA, commissioned in November 2013, will concentrate its interventions mostly in selected commodity sectors,
- A financial Inclusion project will work through micro finance organisations to address small farmer access to credit and micro-insurance,
- An agricultural research and innovation project will improve farmer access to new processes and technologies,
- A small regional economic development project will improve the local competitive or enabling environment for agriculture, and
- A tertiary irrigation project (TIRTA) to boost agricultural productivity through improving farmer access to water.

The core rationale of TIRTA is that access to irrigation has three times more impact on farmer incomes than other inputs like fertilisers and seeds and within irrigation services,

## ***Tertiary Irrigation Technical Assistance: TIRTA***

tertiary irrigation offers the greatest prospects to AIP-Rural for improvement. The main constraints in tertiary irrigation are related to lack of investment for expansion and poor operations and maintenance. Because of its recognised impact on farmer incomes TIRTA will approach tertiary irrigation in a businesslike manner by facilitating the expansion of local commercial investment in tertiary irrigation schemes in eastern Indonesia.

**Duties:** Under the direction of the Irrigation Specialist the Intervention Coordinator will be responsible for the design and management of 7-10 potential and on-going irrigation interventions in eastern Indonesia. There will be five Intervention Coordinators who will specifically be responsible for:

- Making contact with farmer groups, HIPPA, local investors and other stakeholders in the project areas with a view to assisting them to make applications to the project for support.
- The preparation of Intervention Concept Notes (adapted from those used by AIP-Rural) and results chains or causal models to identify the stages in intervention implementation, together with short and long term indicators of change.
- After intervention approval, the preparation of Intervention Management Plans laying out the sequencing of critical activities as well as identifying what instruments should be used and when they should be applied in the measurement of key results.
- Participation in the technical and commercial viability studies for each of their interventions to determine optimum technical configurations for each site, to ensure that the schemes offers: investors a reasonable return on investment; a reasonable operating cost; and a steady and predictable supply of water to farmers involved in the scheme.
- The preparation of terms of reference and the commissioning of “before and after” or “difference of difference” surveys for each of their interventions to monitor project attribution and impact.
- The facilitation of agreements between HIPPA and local investors or banks based on minimum levels of due diligence carried out on each of the parties to the agreements.
- The preparation of quarterly progress reports according to a format to be developed by project management.

### **Qualifications:**

#### **Essential**

- A degree in irrigation engineering or in water resources management,
- Excellent communication and relationship management skills,
- Fluency in speaking and reading Bahasa Indonesia, and
- A working knowledge of English.

#### **Desirable**

- Working experience in the project target area,



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- Existing networks among public and private stakeholders East Java, NTT and NTB provinces.

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### **Annex 5 Lessons from other completed irrigation projects**

Lessons relevant to the proposed project are available from three main sources:

- (i) the Asian Development Bank (ADB) database of lessons learned, maintained by ADB's Independent Evaluation Department (IED),
- (ii) a summary of lessons learned from AusAID project experience in eastern Indonesia, and
- (iii) more recent completion and evaluation reports.

It is noted that many of the lessons are from older style projects implemented by government institutions. Nonetheless, many remain relevant to the private sector orientation of the proposed project.

#### **Lessons from the IED database**

The Independent Evaluation Department database of lessons learned was sorted by country and the lessons learned in Indonesia listed. Lessons from agricultural and (particularly) irrigation projects were sorted by their main features, with minor editing. Lessons were drawn from 12 projects as follows:

<b>Loan</b>	<b>Approved</b>	<b>Name</b>	<b>Acronym</b>	<b>Report</b>	<b>Report date</b>
L1339-INO	6-Dec-94	Capacity Building Project in the Water Resources Sector	CBP	PPER	15/08/2005
L1126-INO	26-Nov-91	Central Java Groundwater Irrigation Development Project	CJG	PCR	15/11/2001
L1378-INO	21-Sep-95	Farmer Managed Irrigation Systems Project	FMIS	PCR	14/01/2005
L818-INO	11-Dec-86	Integrated Command Area Development Project	ICAD	PPER	15/05/1998
L1017-INO	17-Apr-90	Integrated Irrigation Sector Project	IISP	PCR	14/12/2001
L581-INO	14-Sep-82	Irrigation Package Project	IPP	PPER	13/09/1996
L952-INO	7-Feb-89	Nusa Tenggara Agricultural Development Project	NTADP	PPER	15/12/1999
L1296-INO	20-Jan-94	Second Integrated Irrigation Sector Project	SIISP	PPER	13/09/2002
L627-INO	19-May-83	Second Irrigation Package Project	SIPP	PCR	13/01/1995
L1099-INO	19-Sep-91	Second Land Resource Evaluation and Planning	SLREP	PCR	15/08/2002
L1258-	26-Oct-93	Sustainable Agriculture Development in	SADIJ	PCR	15/12/2003

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<b>Loan</b>	<b>Approved</b>	<b>Name</b>	<b>Acronym</b>	<b>Report</b>	<b>Report date</b>
INO		Irian Jaya Project			
L1118-INO	14-Nov-91	Tree Crop Smallholder Sector Project	TCSSP	PCR	15/07/2002
L1579-INO	13 Nov-97	Northern Sumatra Irrigated Agriculture Sector Project	NSIAS	V	15/02/2007

PCR = project completion report, PPER = project performance evaluation report, V = PCR validation report

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<b>A summary of lessons learned from AusAID project experience in eastern Indonesia</b>		<b>Project</b>
<b>Planning</b>		
More involvement of provincial and district authorities and beneficiaries in key policy directives is essential. Implementation of government operation and maintenance (O&M) policy should be formulated, explained, and discussed jointly with the provincial water resources service (PWRS) district and provincial managers, BAPPEDA (provincial and district), and other senior provincial government officials in a participatory manner. A long-term provincial/district irrigation development plan should be ratified by provincial planners and beneficiaries, and used for annual program definition.		IISP
The appropriateness of the traditional objectives associated with irrigation projects requires review. In a country which has achieved rice self-sufficiency, the impact of irrigation projects in employment increase is modest and may need to be viewed as an attendant benefit. Of the objectives mentioned in the Appraisal Report, that of increasing the living standards of farmers by raising incomes appears more relevant in the context of poverty reduction. Even in the pursuit of an income objective, it needs to be recognized that irrigation may be just one of the several options available to increase farmers' incomes. For this reason, the planning for rural area development should become increasingly multi-sectoral.		SIPP
<b>Participation</b>		
Participation of farmer-beneficiaries in all stages of project preparation and implementation enhances institution building and management, and achievement of the objectives of projects. Meaningful participation of beneficiaries from the onset will require substantial time, effort, and flexibility, and intensive technical supervision. But this would result in more viable and sustainable projects through the benefits of cost savings, mobilization of farmers' resources, development of a sense of ownership among farmer-beneficiaries, and improved ability of the beneficiaries to manage the project after its completion.		SADIJ
All future irrigation development projects should be formulated with mechanisms encouraging and ensuring the full participation and ownership of beneficiaries with the support of PWRS and district water resources service for future system management.		IISP
<b>Design</b>		
The implementation period was too short to allow for full development of tertiaries and land in new schemes. Insufficient time also meant that water users associations (WUAs) did not get enough support to build their capacity for system O&M. [Note also slow command area development in Lao Community Managed Sector project and in CAVAC]		SIISP
<b>Construction</b>		
The quality of construction work remains a problem, but there is no easy solution. Giving consultants a larger role as engineers to approve all		SIISP

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<b>A summary of lessons learned from AusAID project experience in eastern Indonesia</b>		<b>Project</b>
payments to contractors may not be cost-effective on projects such as the SIISP where there are many scattered small-scale work sites. Farmers could take a greater role, but they lack training and expertise. And they have become used to accepting substandard work in the knowledge that it will be rebuilt by another rehabilitation project within a few years. The use of precast concrete sections for lining small canals and for structures could reduce quality control problems at small work sites.		
Civil works done by WUAs were implemented effectively, were of high quality, and increased ownership by the beneficiaries. Implementation of simple contracts should have been given to WUAs in all project provinces.		NSIAS
Generally, the quality of construction work undertaken by the farmers is better than works that are built by contractors. This is because the farmers have a better appreciation of the value of properly constructed works, and participation in design and construction gives farmers a sense of pride and ownership. However, in some cases, particularly in more remote locations, the supervision of the works by district staff members was lacking, and some construction problems occurred. Assigning more district staff members to supervise schemes in such remote locations would be beneficial.		FMIS
<b>Cost and cost sharing</b>		
To achieve farmer contributions through provision of labour and materials to field-level system construction, significant efforts, outside the capabilities and time constraints of PWRS staff, are required. These efforts should not be underestimated; district and subdistrict officials understand these requirements better than national planners. Every project should include comprehensive, long-term, institutionalized WUA development programs.		IISP
As a matter of principle, farmers should be required to contribute to construction costs and that this requirement should be clearly stated at the outset and applied as a precondition for the selection of subprojects. During implementation, the requirement for farmers to agree to a 20% contribution for the cost of the irrigation improvements was relaxed, and the farmers' contributed less. Consequently, the project paid for a greater share of the costs than planned. However, the farmers provided in-kind and voluntary labour support, which increased their ownership of the project. The value of the farmers' contribution cannot be estimated accurately because clear records were not kept, but, in many cases, the contribution was significant, and most farmers' groups were willing to contribute in some way.		FMIS
Project implementation suffered from persistent delays in provision of counterpart funds [by government implementing agencies]. Proper planning could have minimized effects of the budget issue. The significant delay in the start of project implementation caused many project activities to be implemented in a shorter time frame than originally envisaged, resulting in lower quality of agricultural support, WUA empowerment, and planning and design.		NSIAS
<b>Benefit monitoring and evaluation (BME)</b>		
BME was not successful in generating useful information, either during project implementation or for post project reviews. There is a need to		SIISP

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<b>A summary of lessons learned from AusAID project experience in eastern Indonesia</b>		<b>Project</b>
review the BME approach because the system was not being used by government agencies in view of lack of incentive to use it, and not being understood by WUAs.		
BME surveys undertaken under the project gathered data on irrigation structures, water supply, and maintenance activities, as well as physical conditions and cropping intensity; irrigated area; agricultural production; and other benefits, such as the increase in agricultural employment. Although the goal was to reduce rural poverty, the surveys did not capture relevant data such as income distribution among the beneficiaries before and after the project. This deficiency makes assessing the poverty impact in quantitative terms difficult.		FMIS
A BME system needs to be standardized and integrated with the management information system. Socioeconomic surveys should become a routine part of a feasibility study not only to more accurately ascertain the present agro-economic conditions and household incomes but also to involve potential beneficiaries in the planning of projects and choice of crops. In order to make better use of BME systems, the involvement of national agencies (such as Bappenas) should be considered.		SIPP
<b>Extension</b>		
The project design envisaged that the District Agricultural Services (DAS) would be closely involved in providing support to farmers through extension services and establishing demonstration plots. However, levels of involvement of the field agricultural extension workers and support from DAS were low, particularly after decentralization in 2001. DAS and agricultural extension agencies were funded and controlled by district administration, and sufficient funds were not made available for the agricultural extension services needed to provide the planned level of support. The project would have benefited from specific and adequate funding for agricultural extension services.		FMIS
Providing improved physical facilities for agricultural support services is not an appropriate response when the agricultural staff do not have the logistical support to maintain an effective extension service. There are lower cost options to improve this situation, including the semi-privatization of agricultural extension.		NTTADP
<b>High value crops (HVC)</b>		
The demonstration plots under the agricultural support component were generally successful. However, the dissemination of new agricultural technologies and practices had been very limited. Since the potential economic benefits of adoption of new agricultural practices are great, more emphasis should have been paid to these activities during project implementation. Agricultural support activities should have started even before the completion of rehabilitation and upgrading (R&U) activities.		NSIAS
Support for the introduction of high-value crops requires more ongoing assistance from competent government agencies such as the provincial and district agricultural services. A bottom-up participatory approach is required to match farmers' expectations with potential benefits. Many farmers are reluctant to adopt HVCs for various reasons such as, the required additional investment exceeds their resources, volatile markets mean higher risks, and market information is inadequate. Moreover, the higher investment in HVCs can mean higher loss due to pests and theft.		CJG



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<b>A summary of lessons learned from AusAID project experience in eastern Indonesia</b>		<b>Project</b>
Many farmers, too, have a preference for growing rice at every opportunity for reasons of food security and cultural preference.		
<b>Operation and Maintenance</b>		
WUA formation and operational efficiency are prerequisites to the implementation of government policy in many aspects of irrigation development. Beneficiaries must participate if they are to feel a sense of ownership and responsibility, which will also effect attitudes to ISF collection and O&M. Lack of appreciation of the need to develop linkages with target groups during WUA formation has hindered programs for WUA development. In forming WUAs, care has to be taken to minimize disruption to existing social structures. Farmers are reluctant to form and join government-induced WUAs that substitute for traditional associations that have survived for a long time. WUA establishment and strengthening should be accelerated with a focus on (i) quality organizations, (ii) involvement in tertiary and main system O&M, and (iii) a clear linkage between irrigation service and ISF. As the government has not been able to adequately fund post-project O&M, private O&M managers, financed by WUAs, should be considered as an alternative to publicly provided O&M. All future development projects should include components specifically orientated toward WUA development. However, WUA institutional building is a complex process: appropriate performance indicators must be identified and progress of capacity building efforts strictly monitored.		IISP
The concept of efficient operation and maintenance largely failed. It did not result in increased government O&M spending as decentralization has largely transferred responsibility for O&M from provincial irrigation agencies to district governments. The approach to system operation was flawed, being too complicated for many of the staff involved, as well as for farmers who are increasingly playing a role in system operation.		SIISP
Sustainability of irrigation projects would be better ensured if timely and adequate maintenance could be provided. This would avoid early physical deterioration and production shortfalls requiring costly rehabilitation works resulting in less than optimal economic returns.		NTTADP
The involvement of WUAs in O&M of irrigation facilities is key to project sustainability.		NSIAS
Small scheme design activities (handover [PIK] and village [PID] schemes) should be carried out in a participatory manner at subdistrict level with support from district offices and consultants.		IISP
<b>Impact</b>		
In the design of rehabilitation projects, the optimum level of investment should be studied carefully because the impact of rehabilitation on agricultural production may not be as large as is often thought. Rehabilitation per se does not bring about appreciable increases in crop yield unless such rehabilitation makes a real difference in the availability of water. Therefore, potential benefits of rehabilitation schemes need to be researched carefully.		IPP
Due to the dominant effect of the price of rice on the viability of irrigation projects and the volatility of rice prices in the world market, it is necessary to take a cautious view in the design of irrigation projects that may lead to producing exportable surplus of rice. The factors critical in		SIPP

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<b>A summary of lessons learned from AusAID project experience in eastern Indonesia</b>		<b>Project</b>
the selection of such projects are, inter alia, large realizable incremental benefits, suitability of the physical conditions, good O&M potential in terms of the willingness to pay irrigation service fees, and community leadership and participation. Where conventional technologies are not economically viable, the use of cost-effective, small-scale and viable technologies needs to be explored.		
<b>Institutional development</b>		
During project design, institutionalization of project activities needs to be given priority.		IISP
Introducing change to bureaucratic procedures is difficult in many developing countries. Where a project seeks to introduce major changes (such as a user pays principle for a service that has previously been provided free), the mechanisms need to be assessed in detail and accompanied by adequate institutional analysis and policy dialogue at the time of project design. A loan covenant may not be sufficient to ensure that the objective is achieved.		SLREP
Institutional capacity is a continuing concern in the sector. Improvements are needed in procedures for the prequalification of contractors, quality control of feasibility studies and engineering design, the standard of construction supervision, cost recovery including the collection of irrigation service fees, and O&M including the organization of water users associations. For areas with soil, geological and topographical problems, more thorough technical studies including engineering design should be prepared prior to appraisal.		SIPP
The project called for effective interagency coordination at both the national and provincial levels to implement the government's pre-financing credit scheme to provide funding to farmers for land development. However, experience indicated that it was very difficult to coordinate multiple agencies resulting to over 2 years delay in implementation of the land development component. The government has since abandoned its policy of full cost recovery for the land development program through the pre-financing credit scheme and instead has provided budgetary support for all land development activities.		ICAD
<b>WUAs</b>		
Community organizers are required to ensure beneficiaries participate in government-led activities. Farmers need to participate and be organized into WUAs (or other suitable institutions) at the earliest possible stage of system planning. Ensuring farmer involvement in tertiary system construction and main system design, and prior to agreement on the modality of subproject development and O&M, is essential. For farmers to be available to participate in planning and design activities, field motivators must be active and in place in a timely manner, coinciding with the fielding of the survey, investigation, and design consultant.		IISP
WUAs should be formed before R&U design activities commence and be encouraged, by the use of community organizers, to participate in system design. A program of tertiary and field-level system construction with farmer participation should be scheduled to be complete within one year of the main system works		IISP

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A summary of lessons learned from AusAID project experience in eastern Indonesia		Project
WUA establishment and strengthening activities under the multiagency on-farm water management (PTGA) training program should be accelerated and routine PTGA training ( <i>pembinaanpengairan</i> ) financed through the regional development budget; the legal status of WUAs should allow the WUA to undertake contracts with second parties and choose where they obtain their services		IISP
WUAs need adequate support from skilled community organizers to help the officers develop their skills and the confidence to play more effective roles in managing water distribution and in maintaining the systems.		NTTADP
For farmers to accept the concept of paying irrigation service fees, they need to be introduced at the outset of the project and set at a level that is realistic in terms of the actual costs of providing effective operation and maintenance. If the amounts levied and collection levels are minimal, there is little prospect for the introduction of efficient operation and maintenance and for farmers to play a more prominent role than is generally the case.		NTTADP
WUAs need ongoing support beyond the project to facilitate their development into viable and responsible organizations that are committed to organizing and collecting sufficient water user fees for routine O&M, to ensure sustainability. Further assistance for strengthening WUA capacity and management is necessary. Bappeda should provide assistance for such strengthening, including ongoing monitoring and support. These arrangements can likely be implemented under the decentralization policy, which allows district governments to play a key role in providing a conducive environment and support and services to newly empowered WUAs.		FMIS
BME surveys showed that the involvement of women farmers in the project was limited to agricultural activities and that their involvement in WUA organization and the management of irrigation was minimal. Special attention and assistance to support the role of women in the administration and management of WUAs is required to increase their involvement. Similar types of projects, those that are small-scale and directly benefit farmers and poor rural communities, are frequently presented by district governments to development partners, including ADB, with requests for assistance. The participatory process developed by the project is very relevant and could be replicated and expanded to other areas.		FMIS
<b>Land tenure</b>		
In order to effectively implement the issuance of land certificates, the National Land Agency (BPN) should have been one of the executing agencies. Land titles and land tenure security are extremely important and should be given high priority in future projects.		TCSSP
<b>Training</b>		
Project experience confirms a commonly held view that traditional classroom training has limited application; various forms of on-the-job training brought to the trainees, while more time-consuming and expensive, and requiring skilled delivery, is generally more beneficial and of better value.		CBP

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<b>A summary of lessons learned from AusAID project experience in eastern Indonesia</b>		<b>Project</b>
<b>Groundwater</b>		
Some groundwater irrigation areas have limited capability for growing high value crops because of their soil type, drainage, and other physical characteristics. Areas with corrosive groundwater present continuing problems of well failure and the need to use more expensive material and provide special protection measures. More consideration should be given to the feasibility of developing such areas.		CJG
<b>Private sector</b>		
When the government provides planting materials and inputs, it gives farmers reasons to complain if yields are low, and reasons not to pay back the credit to the government. Farmers should have been given a choice of suppliers of planting material from which they could make their own selection, thus shifting some of the responsibility onto the shoulders of the farmers. Farmers could have also been given the opportunity to buy agro-inputs from their local KUD (Village Cooperative Unit) or other outlet.		TCSSP
<b>Water resources - river basin approach</b>		
Well-designed and well-maintained schemes are essential for the success of irrigation schemes. This is particularly true given the present and projected levels of the price of rice. Many feasibility studies and engineering designs have not been thorough. Project experience points out, in particular, that it is necessary to take a river-basin approach to the management of water resources in areas with potential scarcity of water. Such an assessment of water resources should take into account drinking water and industrial water requirements as well as irrigation.		IPP

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### **Annex 6 Lessons from DFAT projects in eastern Indonesia**

In 1998, AusAID commissioned a study of lessons learned from project experience in eastern Indonesia<sup>19</sup>. This report included a number of lessons relevant to the proposed project, listed below:

#### **Institutional Aspects**

Physical Development is Easier. The institutional difficulty of a project is inversely proportional to the amount of concrete physical development the project aims to achieve.

The Pace of Development under Difficult Economic Conditions. The position of eastern island provinces is unlikely to improve in the near future. It is noted that efforts to decentralise have been slow and the institutional constraints upon the eastern islands are major in nature. These constraints and the pace of development are unlikely to improve in the near future. Project design should reflect this reality.

Institutional Development in Established Organisations. It is often difficult to work at strengthening existing institutions where well-established and entrenched attitudes and procedures exist. It is easier to follow a path of institutional strengthening during the pioneering days of an institution when everyone is trying new approaches.

Well Timed Policy Decisions. The power of a well-timed policy decision to bring about systemic change needs to be noted as a lesson well learned.

Keeping Senior Officials Fully Informed. If an eastern islands project has elements that may contribute to policy decision making at national level, project designers must include a mechanism for ensuring that senior policy makers are kept fully informed.

Planning for Approvals. Any formal change to procedures, however small, will require someone at the top of the hierarchy to formally authorise it. If such change is attempted in the project environment, implementers need to be quite clear as to exactly what is to be achieved, by whom, and exactly what mechanisms must be brought in to play to cause it to happen. This needs careful planning particularly to ensure that the right senior officials are approached and enough time is devoted to approval mechanisms.

Trialling and Modifying Procedures. Project duration needs to take account of trialling and modifying new procedures. Periodic inputs may also be needed following cessation of full-time project inputs to reinforce and assess the continuing applicability of new procedures and the capacity to apply them.

Being aware of the institutional framework for development cooperation activity is important. This includes an understanding of the constraints on time and on what is possible to achieve. It includes an awareness of the need to keep projects simple, well defined and to allow plenty of time for activities to develop.

Ensuring Advisers are Briefed on Institutions. Project advisers must be briefed on the institutional framework in which they are to work, either prior to, or on, arrival. Briefing should be undertaken by the MC and where possible augmented by inputs from the GOI counterpart agency.

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<sup>19</sup> AusAID1998 Indonesia: Eastern Islands Study of Lessons Learned in Aid Delivery by AusAID and Other Donors

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Understanding Variations in Capacity. It is important for Australian project designers and field staff to appreciate differences in institutional capacity in different regions. It is particularly important to understand the differences in capacity to plan and budget between well-resourced and less well-resourced offices.

Participatory Planning is Time Consuming. The effort to engender truly participatory planning activities is quite considerable. The time required should not be underestimated during project design.

Restrict the Number of Sectors in a Project.

Clearly Specifying Funding Channels. It is incumbent on project designers to specify very clearly the need for funds to come through different channels. Each participating agency should ideally have a project allocation from central government. It would also be ideal if this could be arranged prior to project inception.

Encouraging Institutional Linkages. Institutional linkages are predicated on people within linking organisations understanding each other's organisational viewpoints, and their strengths and weaknesses. The study tour is noted as a potentially useful tool in bringing this understanding about. Nearer to home, the workshop technique, very popular in Indonesia, can have a similar effect.

### **Project Design**

Extended Design Periods for Participatory Planning. If projects are to involve more levels of government and to involve participatory planning and implementation by communities, design exercises are likely to require more time. Consultation should allow significant time for rural appraisal techniques and workshops for government participants, together with formal introductory and reporting back meetings, field visits and meetings to discuss project issues.

Including Realistic and Measurable Goals. It is important, at least for monitoring and evaluation (M&E) purposes, to include project goal statements that, as far as possible, are both realistic and measurable.

Attention to Project Data Needs. One of the functions of project design is to examine rigorously existing data systems and ascertain accurately the need to build data collection systems into the project that ensues.

Early Use of Adaptive Research. Adaptive research in early stages of a project to really establish what is required may often be very wise. However research must not get bogged down to the point where it is beyond the capacity of local people to undertake, or where its results are not apparent until late in the project. It must be short in duration, highly focused and immediately relevant.

Project Documentation in Bahasa Indonesia. It is worth considering making available more project documentation in Bahasa Indonesia, particularly summaries of key documents like project designs and annual plans. Distribution of this documentation through GOI should be as wide as possible to cater for the needs of project participants.

Identifying Potentially Critical Delays. In the eastern islands, critical delays can be exacerbated by the difficulties inherent in logistics in the region. Projects in the region require longer lead times for the acquisition and delivery of equipment and supplies or the

## ***Tertiary Irrigation Technical Assistance: TIRTA***

recruitment and deployment of staff. This needs to be noted in analysis of project timing and formulation of schedules.

Allowing Time for Project Preparation. Project designs need a realistic timeframe for the provision of financial inputs from the donor and from the GOI in order that all required inputs can come together in the most effective manner. In some cases this will not be a critical issue, but in some cases special measures may be required such as preparatory work on budgets prior to project inception or the provision of donor funds to cover counterpart requirements for an initial period. In some cases the problem could be avoided through design so that significant counterpart funds are not required in the first phase, or so that the first phase consists of a preparatory period with limited donor personnel deployment.

### **Project Implementation:**

Government of Indonesia (GOI) Defined Roles in Projects. The GOI project system, whilst it has similarities with our own, has fundamental differences relating to regulated roles and remuneration, of which we need to be aware. These differences can contribute to mutual misunderstanding of roles between GOI officials and foreign consultants. They may also create an impression that GOI staff and overseas workers are working in different directions. One key to ameliorating this is to work jointly on project documentation from the design stage onwards.

Understanding GOI Staff Needs. Sensitivity to and understanding of the system under which GOI officials work is one precursor to good project relations. This includes understanding of the constraints of remuneration and career opportunity many people are under.

Widening the Group of Trainees in a Project. Training should be provided for a wider group than just those who are to implement; this helps to cover for staffing changes.

Training Senior Staff. Training of senior managers in awareness of new skills being acquired by their operational level staff is a sound strategy for institutional strengthening projects or for projects in which institutional strengthening is an element.

Realistic Expectations of Australian Field Staff. Project design needs to be realistic about just what Australian funded advisers can be expected to achieve. Requiring a very diverse range of skills from one person, and expecting specialists to cover too many other fields, are unrealistic. The inception period for staff is also a crucial time for them to assess the task in hand. It should therefore not be overly occupied with housekeeping matters. Similarly staff should not be expected to push their own basic requirements aside for the sake of the project. This requires better planning.

Ensuring Gender Balance on Teams. Care needs to be taken in ensuring gender balance on AusAID teams. This means ensuring that the needs and views of women participants are fully canvassed and incorporated at the design and implementation stages. This can happen if women are used on design, appraisal, review and evaluation teams, and if women are deployed as professional advisers in implementation teams.

Understanding GOI Budget Sensitivities. Budget sensitivities for GOI officials are as real as our own. Different aid delivery mechanisms cause different constraints within the budgetary system of the recipient government, and project implementers and monitors need to be aware of these constraints. Notably:

- There may be a preference amongst GOI officials for GOI control of all project funds,



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- There are significant constraints to the rolling-over of GOI funds from year to year,
- There is a need to include significant elements of clearly labelled GOI funding in projects, and
- There is need to understand the paucity of local revenue mechanisms and the consequent reliance on funds from higher levels of GOI.

Encouraging Cooperative Monitoring. Greater cooperation in monitoring between AusAID and GOI could have significant benefits for project coordination and success. AusAID should continue to encourage the involvement of central GOI officials, should consider the formal involvement of regional officials with planning and monitoring functions, and should consider building up a more comprehensive picture of GOI monitoring mechanisms.

Encouraging Maintenance of Assets. The assumption that systems or mechanisms for maintenance of physical infrastructure exist and, moreover, will be used, needs rigorous checking during design and implementation. Plans for maintenance after project implementation finishes should certainly be encouraged during the life of the project.

Attention to the Detail of Community Development. With renewed focus on rural development in the Indonesia program and with GOI efforts to decentralise development, will come increased requirements to work with the agencies most closely linked to village development, PMD and the LKMD. Attention to the detail of community participation in design and implementation will be increasingly important.

Community Capacity to Pay for Services. The issue of user ability to pay for services encouraged through development projects will continue to become more critical in the future. This is likely to be in the context of government's dwindling capacity or willingness to subsidise such services, and also in the context of pressure for privatisation. Projects need to be rigorously designed to ensure that services provided are priced within the capacity of the community to pay.

The Use of Non-Government Organisation (NGO) Facilitators. The use of NGO personnel as community facilitators and extension workers is likely to continue to be a useful aspect of AusAID's program. GOI is now more comfortable with the use of NGOs in development projects than it was in recent years. The value of technically competent and motivated NGO staff to the program should not be under-estimated. However, it should not be assumed that NGO facilitation is a sustainable activity in all cases. In this regard it should be stressed that planned withdrawal of NGO facilitation services from development activities encouraged through projects should be considered in project design.

### **Lessons from other irrigation projects**

Documents reviewed:

**World Bank    2012    Water Resources and Irrigation Sector Management Program  
(Phase I – WRISM I). Implementation Completion report.**

Monitoring and evaluation (M&E) indicator design should be specific and easy to measure, and be able to reflect PDO achievement. M&E implementation arrangements should be included as an integral part of project management with designated staff, and M&E results

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should be utilized in supporting decision-making (incl. making timely adjustments in project implementation and resource allocations).

No other relevant lessons that have not already been documented. Most relate to policy reform and inter-agency cooperation which are of limited relevance to our project.

### **ADB                      2010                      Irrigation Component, Indonesia: Earthquake and Tsunami Emergency Support Project (ETESP) Component Completion Report.**

The most positive experience, and valuable lesson learned, from the implementation of the Irrigation Component was the success of the participation of local communities. The component demonstrated that local communities are able to undertake substantial infrastructure works effectively even when traumatized by a major natural disaster and decades-long conflict, provided the right level of initial support is provided.

Altogether almost 500 community contracts were implemented, with a total value of around \$5 million. That these were implemented with no significant problems was mainly due to the strong sense of ownership displayed by the WUAs. In some cases, they used the profits from their community contract to purchase materials and equipment for future maintenance. With appropriate support, community contracts based on a participatory approach will often result in better quality of civil works, generally with on-time delivery, and often at a lower overall cost, compared to construction undertaken through commercial contractors. Benefits of the participatory approach and community contracting include empowerment, a strong sense of ownership, local employment and the generation of income for the involved communities.

Though not implemented under ETESP, WUAs could have been allocated responsibility for participatory evaluation and monitoring of contracts undertaken by commercial contractors. In the community contracts WUAs demonstrated a willingness and capability for the supervision, quality control, and quality assurance of the reconstruction and rehabilitation construction works. With appropriate training and the allocation of responsibility (and some resources), they are in a good position to contribute to the monitoring of works in progress on larger contracts. Aspects they could monitor include, for example, quality of materials including earthfill and concrete aggregate, embankment/backfill compaction, proper placement of reinforcement, and concrete thickness. They should also be closely involved on a consultative basis in the post-construction, pre-handover, evaluation of the quality, functionality, and effectiveness of the works as carried out. WUAs have the potential to make a major contribution to monitoring and supervising construction under LCB contracts, and the handover of works. This would contribute to “ownership” as well as assuring works quality.

In terms of environmental monitoring and control, strict enforcement of environmental safeguards and environmental monitoring are crucial tasks that require significant attention. Even in challenging circumstances, irrigation schemes can, with adequate attention, be rehabilitated and upgraded without causing significant environmental degradation. Overall the component’s subprojects did not result in significant long-term negative impacts.

WUAs were developed and supported during planning and implementation. The component placed much emphasis on this activity, particularly through the efforts of the consultants and community facilitators. By project completion, (i) most WUAs were registered, (ii) they had

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demonstrated capacity in the successful implementation of community contracts, and (iii) they continued to function reasonably effectively in relation to crop planning and irrigation scheduling. However, schemes visited on the west coast had shown little capacity in relation to overall scheme management and development or the establishment of strong relationships with the district water resources services. WUAs on the east coast are substantially stronger and have good capacity to survive and develop, but still need support to develop into effective management organizations. The component recognized the need for future participatory O&M as the forthcoming challenge.

The component demonstrated that community contracts through WUAs were effective in constructing irrigation infrastructure. No significant problems were experienced in managing contracts of up to \$US30,000 under ETESP, much above the \$US5,000 limit on community contracts permitted under Indonesian budgetary legislation. The \$US5,000 limit makes its use problematic for anything other than small contracts, acting as a disincentive to both communities and irrigation institutions. Discussions with water resources services in two east coast districts, indicate that they already use the WUAs to implement works on the primary and secondary systems, such as canal cleaning; weed removal, and grass cutting; and minor infrastructure repairs using force account - referred to by the Indonesian term *swakelola*- procedures where the value exceed the IDR 50 million limit for community contracts. It is recommended that the Government consider increasing the financial limit for community contracts, to promote their wider use in future development or rehabilitation projects.

### **NTT Integrated Area Development Project (NTTIADP 199)**

The main achievements of the project to date relate to the construction of earth dams and gravel roads. In settlements where dry season water supplies are limited and remote, earth dams often represent the most cost-effective means of water provision.

Dam construction is best undertaken in the dry season, and the delayed start means that it is difficult to complete the program before the onset of the rains in November.

Within the GOI system, monitoring tends to focus on the quantitative aspects of projects (e.g. the number of dams constructed), rather than qualitative (the number of households serviced, reliability of water supply or the factors contributing to success or failure). This is mainly due to the orientation of monitoring towards control, combined with the relative simplicity of physical verification of construction.

Due to the spread-out nature of the settlements within most desa, project activities have affected only a small proportion of families. The lack of pipe to connect most dams to the village water points in Timor Tengah Utara (TTU) has been a further factor limiting impact.

In the few villages where water has been connected, the water appears well-utilised for livestock and domestic use and some dry season vegetable production. One case was reported of a family making 40 trips (of 800 meters) per day for vegetable watering. In BesiPae, vegetable production has continued following project completion, though some gardens had been abandoned. The success of the project's vegetable program would be enhanced by improvement to seed supplies and continued assistance to villagers by PPLs or project agronomists.

Potential return is reduced when benefit generation is delayed. It is thus essential that water sources are connected to settlements as soon as possible after development. Water-related

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project benefits are likely to be delayed by an average of about two years by limiting pipe provision to 600 meters per dam.

The NTTIADP Project Completion Report stated that at least a year was required to ensure that all resources were available for on-the-ground implementation. All donors with whom this was discussed in Jakarta noted that problems occur with timely arrival of GOI funds.

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### **Annex 7 On-going irrigation projects in eastern Indonesia**

#### **1. Nusa Tenggara Barat - Water Resources Management Programme**

**Sector:** Environmental policy and administrative management

**EU Contribution:** €10 million (82% of total)

**Description:** The project purpose is to establish an efficient and sustainable Water Resources management system, inclusive of irrigation, through improved governance and transparency, stakeholders' empowerment and devolution of powers to stakeholders.

#### **2. Decentralized Irrigation System Improvement Project II in Eastern Region of Indonesia (DISIMP-II), Indonesia**

The main objective of DISIMP-II is to alleviate poverty in economically depressed rural areas in the eastern region of Indonesia by increasing rice production. This is done through the establishment of profitable and sustainable irrigated agriculture using an irrigation-based rural development approach emphasizing empowerment of beneficiary farmers. Under DISIMP-I (2003-2009) a start was made with the rehabilitation and extension of 61 irrigation systems in eight eastern provinces, which included the improvement of water management and the O&M of these systems. DISIMP-II is the second phase of DISIMP-I and will be implemented in 14 irrigation systems in nine provinces (one in Bali, two in Lombok NTB (Jurang Sate and PangaGebon) two in NTT (Bena, Timor Barat and Mbay in Flores), one in Maluku and eight on the island of Sulawesi).

#### **Components**

##### **1) Infrastructure Improvement Component**

This component covers all activities related to the design, tendering, construction and supervision of main, secondary and tertiary irrigation systems.

##### **2) The Soft Component including:**

- The formation/restructuring of WUA and WUA Federations and build their capacity in O&M activities;
- Training of local government officers of irrigation institutions in the O&M of irrigation infrastructure;
- On-farm water management and agricultural activities: assist in training in improved on-farm water management practices, establishment of field schools, preparing demonstration farms; and
- Asset management: capacity building in asset management, preparation and socialization of irrigation asset management plan.

Financing Agency: Japan Bank for International Cooperation

Implementation Period: December 2009 to December 2013

Contract value: € 8,000,000

#### **3. Water Resources and Irrigation Sector Management Program (Phase II WRISM II)**

Borrower: 52.56

Total IBRD Financing: 150.00

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Total project cost: (US\$ million)      202.56

Project Implementation Period:      Start: May 1, 2011      End: May 31, 2016

Project Objective:      To assist Indonesia to improve its capacity for basin water resource and irrigation management and increase irrigated agriculture productivity in the project area [14 provinces including all three project provinces].

### **Components:**

1. Basin Water Resource Management Improvement
2. Participatory Irrigation Management Improvement:
  - (a) Improvement of participatory irrigation management institutions in participating provinces and kabupaten, including establishment and enhancement of local participatory irrigation management regulatory frameworks and capacity building of local institutions such as government irrigation and agriculture agencies, Irrigation Commissions, and Water Users Associations Federations;
  - (b) Light and moderate rehabilitation and repair of irrigation system infrastructure; and
  - (c) Provision of support to irrigated agriculture, and carrying out of climate change adaptation measures, including support to farmers in relation to: (i) adoption of new technology and development of agribusiness management skills and (ii) establishment of public-private partnerships for farming and marketing through the implementation of Community Subprojects.
3. Jatiluhur Irrigation Management Improvement (an irrigation system south of Jakarta)
4. Project Management

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### **Annex 8 Irrigation Terminology**

Irrigation terminology varies from country to country. The following list defines a number of terms which are used in Indonesia.

#### **Irrigable & Command Area**

Command area - the nominal or design area to be irrigated.
Gross command area - irrigable area plus non-irrigable land such as high areas, water courses, canals, roads and settlements.
Command area development (CAD) - expansion of lower canal network within the command area or enlargement of the command area by canal extension or construction.
Irrigable area - the area that can be irrigated in a given season; often the maximum area within an irrigation system that can be irrigated in a "normal" year

#### **Irrigation infrastructure**

Irrigation system - a system comprising an area of irrigable land and its irrigation infrastructure
Drainage system - the network of natural or man-made drains that allow water to drain from the irrigation bays
Irrigation infrastructure- the headworks (dam, weir, offtake), canals, regulators and gates in an irrigation system
Main system -the headworks and main (primary) canal(s) in an irrigation system
Secondary canal -to which water flows from a primary canal via a gate
Tertiary canal - canal to which water flows from a secondary canal
Field canal - small canal that takes water from the tertiary to the field

#### **Water demand and usage**

Crop demand - potential crop evapotranspiration under well-watered conditions. For wet rice, deep percolation losses are added to crop demand
Irrigation efficiency - volume of irrigation water beneficially used as a proportion of water delivered

#### **Irrigation Water Control**

Irrigation management transfer - transfer of management responsibility of all or part of a system to WUAs
On-farm water management (improved) - water management at the farm level, often by construction of field canals, water distribution and crop planning matched to water supply
Field to field irrigation - irrigation water flows from one field to the next, ie, with no field canals
Controlled irrigation - irrigation where control exists for water flowing to canals and fields
Free flow irrigation -irrigation that lacks regulators and gates to regulate flow particularly at lower levels
Irrigation duty - the amount of water required by a crop or system, expressed as e.g, l/s/ha or mm water per crop – often of the order of 1 l/s for upland crops, more for wet rice.



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Drainage duty - the rate at which water drains from a system, often expressed as l/s/ha. Usually several times higher than irrigation duty.
IWRM integrated water resources management – the management of water within a river basin (or sub-basin) in a way which takes account of the needs of different uses and stakeholders.
<b>Irrigation Institutions</b>
National irrigation system - Scheme >3,000 ha or which cross provincial boundaries.
Provincial irrigation system - Scheme of between 1,000 and 3,000 ha or which cross district boundaries.
District irrigation system - Scheme of less than 1,000 ha.
Irrigation Commission (IC) District level - Formed under Government Regulation in each district. IC is chaired by Head of Bappeda for coordinating irrigation development and management in district level.
Water user association WUA - an association of irrigators (normally within a system) formed to manage irrigation infrastructure and water distribution referred to in Indonesia as P3A in NTT and NTB and HIPPA in Jatim.
Water user group - a group of irrigators normally on one canal or STW, responsible for operation and maintenance of the canal or tube well.
<b>Types of Conventional Irrigation</b>
Surface (gravity) irrigation - water is diverted from a river or dam to a canal system.
Surface (pumped) irrigation - water is pumped from a water source to a canal system.
Flood irrigation - water is applied to a more or less level field by flooding – in Indonesia most often to paddies, surrounded by check banks or bunds.
Furrow irrigation - crops are planted on ridges and are watered by directing water down the furrows. Also called, ridge & furrow or row cropping.
Groundwater irrigation - irrigation by pumping water from a borehole or well from shallow or deeper aquifers.
Deep tube well - DTW usually =>100 m in depth large diameter boreholes. Irrigating 30 ha or more.
Shallow tube well - STW, usually less than 30 m in depth, irrigating around 2.5 ha or more if hose is used to distribute water.
<b>Micro-irrigation</b>
Micro-irrigation - irrigation systems that spray, mist, sprinkle or drip water to deliver the water needed for plant growth without wetting the entire soil surface.
Drip or trickle irrigation - a method of applying precise amounts of water to plants, in the form of drops delivered to the root zone by means of dripping devices called emitters or through trickle pipe with pre-drilled holes.
Multiple-use system (MUS) - water supply for domestic and livestock use and (usually) micro-irrigation from a single source.
Sprinkler irrigation - water under pressure ejected through the nozzle of a sprinkler.
Dug well - a well dug by hand, used for domestic or irrigation supply.

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Water harvesting - collection of rainfall runoff in a tank for use in micro- or flood irrigation.	
<b>Indonesian Irrigation Classification</b>	
<b>Full irrigation</b>	( <i>irigasi teknis</i> ) is the complete water distribution system with dam, reservoir, primary, secondary and tertiary canals. Central government is responsible for managing the main system, and primary and secondary canals for systems >3,000ha, provincial governments for systems between 1,000 and 3,000 ha and district governments for smaller systems. WUAs/farmers are responsible for tertiary system management.
<b>Half irrigation</b>	( <i>irigasi setengah teknis</i> ) is a system where central government is responsible for the main and secondary canals and tertiary irrigation system is the responsibility of local government and water users association/farmers.
<b>Community-based irrigation</b>	( <i>irigasi sederhana</i> ) is a system where farmers draw water directly from a water source (spring water, river, boreholes, water catchment - commonly called <i>embung</i> ). The irrigation system may be non-permanent and varies from one place to another. The structure is private property and not governed by the government.

### Cropping

Upland crops	In an irrigation system, crops which are not permanently flooded (e.g. wet rice). Includes such crops as maize, wheat, beans and other vegetables.
Wet rice	Rice crop where water is kept above the soil surface over the whole growing season.
Aerobic rice	Rice grown as an upland crop.
Wet & dry rice	Rice grown under alternating wet and dry conditions.
SRI rice	System of rice intensification, involving wide plant spacing, single and young plants transplanted. SRI methodology is based on <b>four main principles</b> that interact with each other: <ul style="list-style-type: none"> <li>• Early, quick and healthy plant establishment. Transplanting at 2-leaf stage</li> <li>• Reduced plant density, often 16/m<sup>2</sup></li> <li>• Improved soil conditions through enrichment with organic matter</li> <li>• Reduced and controlled water application</li> </ul>

Source: DFAT Australia-Indonesia Partnership for Decentralisation Rural Economic Development Program (AIP-Rural).