Lessons learned

Participation in Indonesian irrigation projects

comparative evaluation of decentralised irrigation projects in eastern Indonesia

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Abstract

There is widespread support in academics for the idea of participatory irrigation management. Since 1999 a shift has taken place in Indonesia from central government steering to regional governance, accompanied by a growth of public participation. Since 2004 this trend has entered the irrigation sector. Participatory programmes are however frequently unsuccessful, and new programmes needlessly repeat the mistakes of the past. Clarity about the critical success factors of the implementation of participation in irrigation is therefore necessary.

In order to assess the critical success and failure factors of participatory irrigation management projects, four irrigation projects in Indonesia have been studied. Performance indicators have been used to identify the extent to which the projects called Bena, Toraut, Paguyaman and Jurang Sate are successful. The success is evaluated based on triangulated data collected through document analysis, observation and interviews with farmers, consultants and government officials.

Success is varying among the case studies. Positive points include the activity of water users associations in Bena, the good state of the irrigation system in Toraut, the influence of farmers in irrigation management in Paguyaman and the adoption of SRI in Jurang Sate. Negative point include the poor state of the irrigation system in Bena, the lack of farmers' discipline in Toraut, the non-engagement of women in Paguyaman and the financial situation of associations in Jurang Sate.

Several lessons can be learnt concerning the critical success and failure factors of participatory irrigation management. The most important issue is that the responsibilities of the different government bodies become clear, and that preferably one single agency is dedicated to the participation of farmers. Participation of farmers should not mean the withdrawal of the government, and the government should continuously guide the farmers and WUAs in their activities.

Preface

This report contains the result of research undertaken at the Decentralised Irrigation System Improvement Project II in the Eastern Region of Indonesia (DISIMP-II). The report serves as a thesis as finalisation of the double degree master programme in Environmental & Infrastructure Planning at the Bandung Institute of Technology (Indonesia) and University of Groningen (Netherlands). The research is funded by Euroconsult Mott MacDonald in Arnhem and NEDECO Netherlands Engineering Consultants in Amsterdam.

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Many people are really appreciated for their assistance at the four case study locations. At the case study locations my thanks go to the field staff, local consultants and drivers in Bena, Toraut, Paguyaman and Jurang Sate. For the data collection I was especially assisted by the four subproject leaders, and some of their staff. They are Anang Nugrolestyono, Handoko Atmodjo (Bena), Wiji Sejati (Toraut), Djoko Santosa, Hana Efendi (Paguyaman), Chairil Anwar and Ayi Sutari (Jurang Sate). The information received through interviews has been very valuable, so I thank all of the interviewees, who are listed in annex 1.

Finally, I would like to thank my classmates at ITB and RUG, and specifically the other members of the 'DD Belanda'. In addition, I want to thank my family and my girlfriend Emma for their moral support.

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Acronyms and definitions

List of acronyms, terms and symbols

APBD	*Anggaran Pendapatan Belanja Daerah* (Regional Developement Budget)
APBN	*Anggaran Pendapatan Belanja Negara* (National Development Budget)
Bappenas	*Badan Perencanaan dan Pembangunan Nasional* (National Planning Agency)
Beras	White rice (hulled and milled rice)
BPS	*Badan Pusat Statistik* (Central Statistics Agency)
BWS	*Balai Wilayah Sungai* (Regional River Basin Management Center)
Demfarm	Demonstration farm
DGWR	Directorate General for Water Resources
DISIMP-I	Decentralised Irrigation System Improvement Project I (2003-2009)
DISIMP-II	Decentralised Irrigation System Improvement Project II (2009-2013)
FAO	Food and Agriculture Organisation of the United Nations
Gabah	Unhulled and unmilled rice
GDP	Gross domestic product
GKP	*Gabah kering panen* (dried unhulled rice harvest)
Gto	Gorontalo province
ha	Hectare
HLD	High Level Diversion
IAP2	International Association for Public Participation
IMT	Irrigation Management Transfer
IWMI	International Water Management Institute
JICA	Japan International Cooperation Agency
Kerja bakti	Communal service. Joint activity of farmers or a water users association, for example for building or cleaning canals.
LC	Local Consultant(s)
Legowo	Paddy planting method originating from Java resulting in higher rice yields.
NTB	*Nusa Tenggara Barat* (West Nusa Tenggara province)
NTT	*Nusa Tenggara Timur* (East Nusa Tenggara province)
O&M	Operation and maintenance
PIM	Participatory Irrigation Management
PP	*Peraturan Pemerintah* (Government Regulation)
PPA	*Penjaga Pintu Air* (water distribution official, 'water gate keeper')
PPB	*Penjaga Pintu Bendung* (weir water distribution official, 'weir gate keeper')
PRT/M	*Peraturan Menteri* (Ministerial Regulation)

RPJMN	*Rencana Pembangunan Jangka Menengah Nasional (National Medium Term Development Plan)*
SRI	System of Rice Intensification
Sulut	*Sulawesi Utara* (North Sulawesi province)
t	Metric tonne
TTS	*Timor Tengah Selatan* (South Central Timor regency)
UU	*Undang-Undang* (law)
WUA	Water Users Association (*P3A*)
WUAF	Federation of Water Users Associations (*GP3A*) System level Federation of Water Users Associations (*IP3A*)

Currencies

The Indonesian rupiah (IDR, Rp.), as the local currency at the project location, is used as the standard currency in this document. For international comparison, the euro (EUR, €) is used as additional currency. 1 euro is equal to 11.800 rupiah.

Administrative divisions of Indonesia

Indonesia is divided in 33 provinces (Indonesian: *provinsi*). Every province is further divided in regencies (*kabupaten*) and municipalities (*kota*). All DISIMP-II subprojects are located in regencies rather than municipalities. A regency consists of several districts (*kecamatan*), which is in turn consists of villages (*desa*). In several sources different English names are used for the administrative divisions. In this report the aforementioned names, which are also used by the Indonesian government, are employed.

Chapter 1

Introduction

As the first chapter, this introduction will describe the background, objectives and relevance of this thesis. The chapter is divided into five sections. Firstly, it describes the background of the study, introducing the issue of participatory irrigation management. In the second and third section, respectively, the research problem and objectives are discussed. The academic and social relevance and significance of the research is explained in section 1.4. The final section of the first chapter gives an overview of the structure of the thesis.

§ 1.1 – Background

Indonesia's national medium term development plan (*RPJMN*) mentions poverty reduction and food security as two of its national priorities for the years 2010 until 2014 (Bappenas, 2010). The implementation and revitalisation of irrigation systems increases national food security and in addition properly functioning irrigation systems diminish the incidence and depth of rural poverty (Hussain et al., 2006). Food security is reached "when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life" (FAO, 1996). Rice is the main nutrient in Indonesia and since irrigation has the potential to dramatically increase rice production (Mukherji et al., 2009), it can help attaining the food security goals.

Irrigation is therefore considered suitable for reaching the national priorities. Numerous projects have been set up to develop new irrigation systems or improve existing systems in Indonesia. Since 1990 there have been five programmes for irrigation projects in eastern Indonesia by the Indonesian government in association with the government of Japan (Sato et al., 2011). From experiences in these and other projects (Mukherji et al., 2009; Garces-Restrepo et al., 2007) it has become apparent that strong engagement and motivation of the local farming community is essential for the success of the project.

The irrigation programme currently being carried out is known by its acronym DISIMP-II (Decentralised Irrigation System Improvement Project II in Eastern Region of Indonesia). The objective of the programme has been formulated as follows: "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" (Euroconsult, 2008, p.1). Participation of the local community and community capacity building are included as objectives of DISIMP-II, next to the physical infrastructure component: "Especially, participation of beneficiaries in the O&M [operation and maintenance] financing and management is indispensable for sustainability of the Project" (Euroconsult, 2008, p.1). According to Garces-Restrepo et al. (2007) the results of participation processes in irrigation projects can be perceived as a mixture of successes and failures.

Irrigation management transfer (IMT) emerged around the globe as a process towards the end of the 20th century. IMT follows the principle of subsidiarity – the idea that matters ought to be handled on the lowest level possible. Considering the decentralisation process in Indonesia since 1999, IMT is a logical development in the Indonesian context. The concept of IMT is typically the shift of responsibility and authority from the (central) government to organisations that are not controlled by the government. According to Garces-Restrepo et al. (2007) IMT can have a number of forms, ranging from full IMT to participatory irrigation management (PIM). In case of full IMT both the ownership and the management of the irrigation system are fully transferred to the civil society, for example a water users association (WUA). PIM indicates that the ownership of the system remains in the public sector, but management is shared between the government and civil society. Several intermediate forms of partial IMT are possible as well.

According to Groenfeldt (2003) there are two main rationales for the implementation of PIM, being a political and a substantial reason. Politically PIM is attractive as a participatory approach has proven to provide significant cost reduction. Substantially a greater reliance on farmers induces rural development and the improvement of productive and social capital. However, in IMT and PIM processes there are aspects that lead to difficulties to reach the original objectives of the process (Garces-Restrepo et al., 2007). "It is irresponsible to give so little attention to evaluation and learning that could be applied to new programs" (Groenfeldt, 2003, p.15). By means of better evaluation, mistakes of the past can be prevented for the future and unnecessary costs can be averted.

§ 1.2 – Research problem

There is a widespread support for the idea of PIM using WUAs, in academics as well as in international organisations and in Indonesian politics. Several studies however also stress the difference in level of implementation and success between PIM processes (Vandersypen et al., 2008; Herbel et al., 2012; Kell Nielsen, 2004; Bruns, 2005) and irrigation systems in general (Gorantiwar & Smout, 2005). "New PIM programs needlessly repeat the mistakes of the past, at great – but unaccounted – costs to both borrowers and lending agencies" (Groenfeldt, 2003, p.15). Some participative programmes have yielded significant benefits, but assessment suggest that results have been much more mixed than hoped. "It appears that programmes for institutional reform in irrigation have often underestimated the difficulty of 'transplanting' institutional innovations and overestimated the potential benefits" (Bruns, 2008). With more than thirteen million hectares of rice area harvested, Indonesia belongs to the three largest rice producers in the world (FAO, 2010). By implementing programmes such as DISIMP-II the rice yield is intended to grow in order to increase food security and alleviate rural poverty. Participation is part of the objectives of such programmes and failures make the costs increase and the effects minimise. Clarity about the critical success factors of the implementation of participation in irrigation is therefore necessary.

§ 1.3 – Research objectives and questions

The purpose of this study is to perceive the effectiveness of existing processes of participatory irrigation management (PIM) in Indonesia. The study tries to observe the usefulness of the

implementation of participation in Indonesian irrigation management as a tool to increase food security and decrease rural poverty. An overview of critical success and failure factors of PIM implementation will be given, as well as guidelines for future successful functioning of PIM in the context of Indonesian irrigation projects. Based on these objectives, the central research question is:

- Central question: *"What are the critical success and failure factors for participatory irrigation management projects in Indonesia?"*

This main question will be answered in the concluding chapter 6. Several sub questions have to be answered in order to be able to give a substantiated answer to the central research question.

1. *"What are the theoretical and political rationales for PIM?"*
2. *"How is PIM regulated in Indonesia?"*
3. *"How can the performance of irrigation projects be assessed?"*
4. *"How is PIM carried out in selected case study projects?"*
5. *"What is the performance of the selected case study projects?"*
6. *"To what extent are theoretical, regulatory and actual situations of PIM consistent?"*

§ 1.4 – Relevance

The relevance of this study is multifold. The research has social and economic as well as academic significance.

Socially, the research is relevant because participatory irrigation management influences the lives of many people in Indonesia. A high percentage of people in Indonesia, especially in rural areas in eastern Indonesia, live in poverty. Irrigation projects have the potential of significantly improving the living situation of local farmers. The success of the projects therefore genuinely makes a difference. This research aims to set out the success and failure factors. In that way it intends to help avoiding mistakes and to encourage positive development in the future, in order to achieve better chances of successful irrigation projects.

Economically, the significance of this research is twofold. As poverty alleviation is a main objective of irrigation projects, the success of the project directly relates to the accomplishment of this economic objective. Secondly, irrigation projects are costly. Great amounts of money are spent in order to carry out irrigation projects. Failure of such projects is therefore a huge waste of resources. The total costs of the DISIMP-II programme are estimated to be 18,2 billion Japanese yen, being € 187,5 million (JICA, 2008). For that reason insights in success factors are highly important.

The research aims to contribute to academic knowledge by exploring the factors for the success of PIM and community participation in general. As pointed out by various scholars, practices of participatory irrigation management often face difficulties and levels of success differ widely. Gathering success and failure factors of the implementation of PIM will result in an overview of best practices. This will add to the scientific knowledge about public participation, specifically in Indonesian irrigation projects.

§ 1.5 – Methods and outline

The critical success and failure factors of participatory irrigation management projects in Indonesia will be considered through case study research. Four case studies will be assessed on the basis of performance indicators.

After this first chapter, in which the background, objectives and relevance of the research are explained, chapter 2 focuses on the theoretical framework. Irrigation, irrigation management, community participation, IMT, PIM and policy performance will be discussed, based on literature review. A section considering the relevant Indonesian laws, government regulations and policies is included.

The third chapter considers the methodology of the research in detail. The research will be carried out by assessing four case studies of irrigation projects in eastern Indonesia. The case studies are selected out of the fourteen subprojects of the DISIMP-II irrigation programme by the Indonesian Ministry of Public Works. The success of the case studies will be operationalised by using performance indicators. The cases are assessed by considering fifteen indicators. These indicators focus on crop production, system conditions, farmer participation and economic and social conditions.

The fourth chapter gives an overview of the results from the four case studies. In chapter 5 the results from the case studies will be compared with each other, with the literature and the regulations, presenting a comparative analysis. The final chapter encompasses the conclusion and will give an answer to the main research question.

Chapter 2
Theoretical framework

In this chapter the relevant theoretical concepts are explored. The chapter starts with an introduction to irrigation and irrigation management in general. Subsequently, the concept of public participation is discussed. In the third section, the implementation of participatory approaches in irrigation management is examined. An overview of the for irrigation management relevant laws and regulations in Indonesia is given in the fourth section. The final section discusses how to conceptualise success and introduces the concepts of policy conformance and performance.

§ 2.1 – Irrigation and irrigation management

§ 2.1.1 – The rationale for irrigation

Thomas Malthus argued two centuries ago that the supply of food for humans is inherently inelastic. This would mean that food supply is the main factor of influence for the rate of population growth. In the 1960's there has been a fear that Asia would fall in this "Malthusian trap of high population growth and low agricultural productivities resulting in widespread food crisis and famines" (Faures & Mukherji, 2009). Following the logic of Boserup (1965) however, population increase led to the adoption of more intensive systems of agriculture and an increase of agricultural output. Irrigation has contributed significantly to this increase.

Indonesia shows a massive population growth, reaching an average of 1,45 percent per year since 1990, with several provinces reaching numbers above 3 percent per year (BPS, 2011). Such growth inherently leads to concerns about food security. The national medium term development plan states that "at the end of 2014 there should be an increase in food security (…) and continued increase in the ability to attain self-sufficiency in rice" (Bappenas, 2010, p.42). This is only possible if the notion of Boserup is followed and agriculture is indeed intensified. This is the reason for the development of many irrigation projects in Indonesia.

§ 2.1.2 – Functional scope of irrigation management

According to the World Bank Institute, irrigation management consists of several aspects and several levels (WBI, 2003). There are many ways to classify the different aspects, which are also known as irrigation management tasks or functional roles. Since various authors categorise the aspects of irrigation management in diverse ways, it is complicated to make an unequivocal classification. However, the following tasks are generally included.

Development: The development task includes the planning, design and implementation of irrigation development, both for construction of new systems and upgrading of existing systems (Budisantoso, 2007). Smet (2003) mentions 'ownership' as one of the aspects of irrigation management, and argues that the organisation that develops the system usually has the legal ownership.

Decision-making: The FAO (2001) lists decision-making authority as one of the four 'basic components' of irrigation management. Decision-making, also known as governance, includes the election of representatives and the establishment of the articles of association, by-laws and policies (Vermillion & Sagardoy, 1999). Kono et al. (2012) state that the decision process includes deciding matters related to annual plans and policies.

Financing: 'Paying for the service' is one of the basic components of irrigation management (FAO, 2001). Also Satoh et al. (2007), Budisantoso (2007) and Groenfeldt (2000) mention finance to be one of the aspects. Financing can usually be split into two categories, being investment finance and operation finance. Investment financing is needed for the construction of a new system or rehabilitation of an existing system, and might therefore be included in the aspect of development. Operation financing is needed for the operation and maintenance of the system.

Operation: The operation is arguably the most important aspect of irrigation management, dubbed by the FAO (2001) as 'the provision of the service'.

Maintenance: Maintenance is often mentioned to be one with operation, being O&M. Maintenance in this case encompasses the day-to-day maintenance of the system. Larger maintenance and rehabilitation of systems is included in the development aspect.

Evaluation: Monitoring and evaluation encompasses the control of and feedback towards the working of the system. Not all authors include this aspect to be one of the irrigation management tasks, and it may be part of the operation and decision-making tasks.

Another classification is SIDCOM, distinguishing the stages of survey, investigation, design, construction, operation and maintenance (Pratiwi et al., 2006). The first four of these stages can all be included in the development task. Other tasks such as financing and evaluation are not included in the SIDCOM classification and may be counted to the stage of operation.

§ 2.1.3 – Physical scope of irrigation management

In addition to the different aspects, irrigation management also focuses on the different levels of the irrigation system. The levels are the object of management and are also know as hydraulic interfaces, physical levels or system levels. Groenfeldt (2000) states that 'all levels' would refer to "the full physical limits of the irrigation system, up to the policy level in the capital city". However, this research focuses specifically on the physical levels of the irrigation system itself.

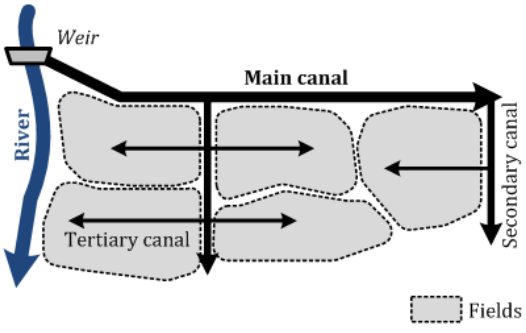

Figure 1 - Physical levels of irrigation systems

An early classification was made by Bos and Nugteren (1974) distinguishing the main canal, lateral canal, sub-lateral canal, distributary and farm ditch. A similar classification was used by Vermillion and Sagardoy (1999), who divided irrigation systems in four hydraulic interfaces; the

river basin, the main and branch canals, the distributary canals and the field channels and drainage.

A widely used method to distinguish between levels of the irrigation system is the use of ordinal indicators. Starting from the weir, the canals are respectively referred to as primary, secondary and tertiary canals (Van den Bosch et al., 1992; FAO, 2001; Budisantoso, 2007). The primary level corresponds with the main canal. The secondary level encompasses the lateral or branch canals and the tertiary level covers the distributaries. From the tertiary canals, the water flows into the field system, also known as farm ditches or tertiary system. This classification of canals is illustrated in figure 1.

§ 2.2 – Participation

§ 2.2.1 – Definition and objectives of citizen participation

Involvement of citizens in planning and public decision making has been promoted by many since the second half of the 20th century. A paternalistic and patronising technocratic idea of 'planning for the public' was perceived as a failure and participatory planning evolved as its successor (Allmendinger, 2009). Arnstein (1969) defines participation as the enabling of citizens to be deliberately included in the future. The citizens "join in determining how information is shared, goals and policies are set, tax resources are allocated, programs are operated, and benefits like contracts and patronage are parcelled out" (p.216). Wagle (2000) highlights that citizen participation is not the goal, but a means to reach the goal of democratic policymaking.

Woltjer (2004) points out that democratic policymaking is not the only objective of citizen participation. Several other objectives or 'functions' can be associated. It is argued that participation can prevent objections and appeals in a later stage, which results in saving of time and money. Also the effectiveness of solutions can be improved, because additional participants can provide additional knowledge and ideas. Finally, citizen participation can result in a feeling that the citizens are partly owner of a project or plan: "A 'sense of ownership' is particularly important for the plan or project to win public support, and thus facilitate implementation" (Woltjer, 2004, p.50).

Irvin and Stansbury (2004), in their elaborate evaluation of the advantages and disadvantages of citizen participation, composed an overview of thirteen benefits. Advantages to the citizens include education (learn from the government) and gaining some control over the policy process. For the government education is also a benefit (learning from the citizens), as well as trust building, legitimacy for decisions and avoiding of conflict costs. The achievement of better implementation decisions is a benefit for both government and citizens.

§ 2.2.2 – Arguments against citizen participation

Multiple authors point out that citizen participation does not only provide advantages. "In practice, participation often leads to tensions between representative and direct democracy" (Michels, 2012, p.285). Also Irvin and Stansbury (2004) mention this problem, because citizen participation inherently leads to a loss of decision-making control for the government.

While one of the advantages of citizen participation could be saving time and money, this is not certain. For many decisions, government officials may be capable of recognising consequences of the decision and choosing the same option like the community would choose. In that case, an elaborate participation process needlessly pulls away resources (Irvin & Stansbury, 2004). This applies to both the government and the citizens, who might prefer to pay taxes for hiring a capable public administrator rather than allocate their own time to participate in the decision-making.

Main disadvantage of citizen participation is what Irvin and Stansbury (2004) call 'the power of wrong decisions'. Usually, not all citizens participate in the process. Higher-educated people are typically more involved than lower-educated fellow citizens. Also, business or strong interest groups influence the process more than 'the average citizen'. Therefore, decisions may be distorted by excessive influence of specific groups. Local economic interests might be valued more than environmental interests and the government is, obviously, reluctant to reverse decisions that are made through a participatory process.

§ 2.2.3 – Levels of citizen participation

While citizen participation is discussed as a single concept in the previous sections, in reality there are many different levels of citizen participation. In 1969 the very influential 'ladder of citizen participation' was introduced by Sherry Arnstein. "The eight-rung ladder is a simplification, but it helps to illustrate the point that so many have missed – that there are significant gradations of citizen participation" (Arnstein, 1969, p.217). Building on Arnstein's ladder, various authors have introduced new ladders, categorizations, hierarchies and spectra (Choguill, 1996; IAP2, 2000; Ross et al., 2002; Bruns, 2003).

The different ladders and categorizations are more or less similar, but presented in diverse manners. Arnstein (1969) and Choguill (1996) present their ladders as a clear hierarchy from high to low citizen participation. They built in value judgments which shows they see high levels of participation as the desirable goal. The categorizations by Bruns (2003) and Ross et al. (2002) are presented more neutral, though still as a hierarchy. The spectrum by IAP2 (2000) is presented horizontally to introduce it as a range of options instead of a hierarchy.

Based on the various ladders and spectra, a participation spectrum consisting of nine levels has been composed with increasing citizen influence, which is visualised in figure 2.

(1) Bureaucratic decision-making: Concentration on internal government expertise for analysis and decision-making results in non-participation.

(2) Informing: The public is informed with balanced and objective information in order to let them understand the problems and solutions. There is a one-way flow of information without possibilities for feedback or negotiation.

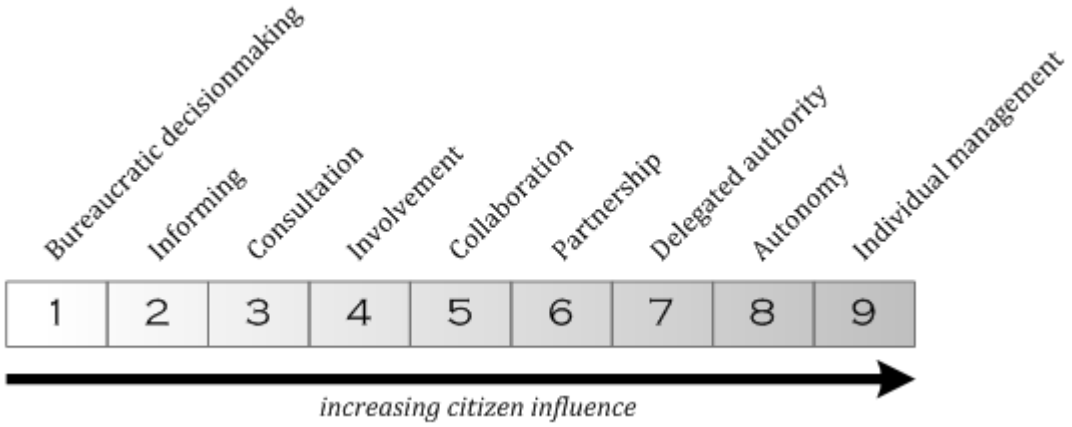

Figure 2 - Spectrum of citizen participation levels

(3) Consultation: In addition to informing the public, feedback of them is taken into account. Citizens are usually involved through surveys or in neighbourhood meetings. In this level the government listens to the community, but not necessarily uses their views.

(4) Involvement: The government works together with the community to ensure the issues and concerns of the citizens are directly reflected in decision-making. This can be done for example through workshops. This is the lowest level where an interactive participatory approach is employed. However, the government does not surrender its control over decision-making.

(5) Collaboration: Representatives of the community are included in each aspect of the decision-making process. A strong effort is made to promote participation of the community and to reach consensus. However, the final authority over the decisions still lies with the government.

(6) Partnership: At this level power is redistributed between the government and the public. Community members and the government agree to share the responsibilities over planning and decision-making through structures such as joint policy boards or planning committees. There may be asymmetries of power, information and expertise but mutual agreement about decisions is required.

(7) Delegated authority: The government assigns the task of coming up with a solution to a certain group, for example a community organisation, and says it will accept whatever solution the group chooses. The government retains ultimate ownership rights and usually provides budget limitations and restricting guidelines.

(8) Autonomy: The government does not get involved in decision-making about the specific issues. The only way the government is still involved is through general regulatory arrangements such as environmental standards. The government may or may not be involved by giving advice to the community groups that hold the responsibility. The community might be assisted in other ways as well, such as by providing legal status to the community groups.

(9) Individual management: There is no relevant involvement of the government at all. The community manages itself and its own projects. This level shows similarities with the first level,

because in both cases there is no interaction between government and community. Individual management may therefore also occur simultaneously with bureaucratic decision-making.

§ 2.3 – Participation in irrigation

§ 2.3.1 – Irrigation management transfer and participatory irrigation management

Participatory approaches have been introduced in the irrigation sector. Following the objectives of citizen participation in general, participation in irrigation is expected to increase effectiveness of irrigation systems and enlarge the commitment of the community towards the system. The process of shifting responsibilities from irrigation agencies in the government to the farmers is known as irrigation management transfer (IMT).

The transfer of responsibilities regarding irrigation can take many forms, and naming is vague and inconsistent. IMT and participatory irrigation management (PIM) are often confused. Garces-Restrepo et al. (2007) describe PIM as a subset of IMT. IMT is a reform process that encompasses transfer of ownership and management rights from the public sector to civil society. Frequently the government does not surrender all of its rights and responsibilities but only increases collaboration with the community. In that case often the term PIM is used. PIM is therefore seen as a 'lower form of IMT' that only consists of a behavioural and attitudinal change. Van Vuren et al. (2004, p.2) have a completely different view of the difference between PIM and IMT. They state that IMT is a subset of PIM. IMT is the transfer of responsibility and authority that is necessary for the introduction of PIM. Pant (2008) on the other hand uses the terms PIM and IMT interchangeably.

In the remainder of this paper, the term PIM will be used to indicate the public involvement in irrigation management, while IMT is used to indicate a shift in responsibilities and authority. This is in line with the use of the terms by the International Water Management Institute IWMI and the Food and Agriculture Organisation of the United Nations FAO (Vermillion & Sagardoy, 1999). In short, PIM is a process of public participation that might be accompanied by IMT, a transfer of authority.

Classic top-down approaches have turned out to be ineffective and provided inadequate operation and maintenance. Bruns (2004, p.3) states that the "need for rehabilitation [arose] much sooner than the expected lifetime of the infrastructure." International donors, such as the Asian Development Bank and JICA realised that other methods were needed in order to slow down the degradation of the systems. PIM and IMT are seen as suitable methods for lingering the lifetime of irrigation systems. In general, usually the objectives of PIM and IMT include (Garces-Restrepo et al., 2007; Vermillion & Sagardoy, 1999):

- Elimination or reduction of government expenditures
- Establishment of financially autonomous water service providers
- Reversal of deterioration of irrigation infrastructure
- Provision of transparency in accountability of water service providers
- Achievement of improvement in productivity and sustainability of irrigation systems.

§ 2.3.2 – Extents of IMT and PIM

As participation in general, participation in irrigation management can be implemented to various extents. Participation can take place at different levels, as discussed in section 2.2.3. This participation can be applied to different functional and physical levels of the irrigation system's management, as set out in sections 2.1.2 and 2.1.3.

Garces-Restrepo et al. (2007) proposed a classification ranging from full bureaucracy to full IMT. The classification is presented in figure 3, showing the division of authority between the public sector and non-governmental bodies. In this model only a distinction is made between the ownership and the management of the system, so not every functional level is included. A clear image however is the level of 'participation'. In case of participatory irrigation management (PIM) the management is a shared responsibility of the public sector (government agency) and civil society (WUA). The ownership remains with the government.

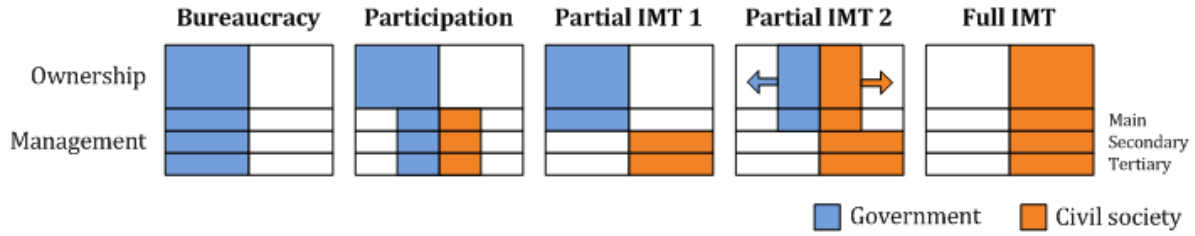

Figure 3 - Classification of IMT levels

A well-known classification of participation in infrastructure management in Indonesia is the 'participation ranking for WUAs and WUAFs' as clarified by Bappenas (2005). This classification specifically focuses on the operation and maintenance of secondary and main canal systems. An overview of the four participation levels is given in figure 4. The model determines the division of funding. In the case of level IV, which is seen as the final goal, half of the funding is done by the WUA or WUAF itself. The other half is paid by the government as a donation to the association. The association has the responsibility and control of the use of the funds. Compared to the spectrum introduced in section 2.2.3, level I could be seen as informing or consultation, level II would be involvement, level III is collaboration and level IV is a combination of partnership and delegated authority.

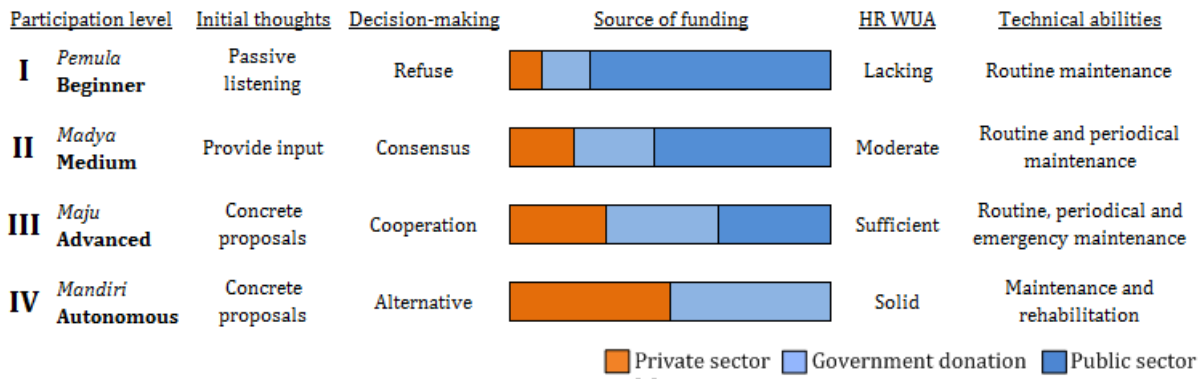

Figure 4 - Participation ranking for WUAs and WUAFs

§ 2.3.3 – Water users associations

In the case of IMT or PIM the farming community is typically represented by a non-governmental organisation, regularly named a water users board or water users association (WUA). In Indonesia these associations are known as *P3A*, 'water using farmers associations'. In larger irrigation systems the WUAs are usually united in federations (WUAF) in order to cope with higher level issues, for example at the main and secondary canal level. The establishment of WUAs is an essential condition for the shift towards a more sustainable irrigation sector, according to Kijne (2001, p.122): "The WUA, as the organisational structure for the empowerment of farmers and for forcing farmers to take responsibility for their own decisions, especially their long-term impact, is thus the essence of the democratic process (...) in the irrigation sector."

Several authors composed a list of criteria or factors that enable the functioning and sustainability of WUAs. Based on Bruns (1992), Vermillion and Sagardoy (1999), Smet (2003) and Groenfeldt (2003) the key factors can be summarised as follows:

- *Clarity of objectives*: There needs to be a clear, agreed and measurable definition of the goals of the WUA. The policies and rules are subject to approval by the water users. Water users are responsible for adherence to agreed rules and policies.
- *Autonomy*: The WUA needs to have full control over its activities, which are clearly defined. These include at least operation and maintenance of tertiary systems.
- *Accountability*: Transparency of the activities of the WUA is needed. Leaders can be judged for their actions and can be elected and removed by the water users. In addition, financial and technical audits need to be performed by an independent actor, usually a government agency.
- *Just enough organisation*: "The goal for WUA development should be to avoid unnecessary, expensive institutional overhead. The goal should be to develop the ability to rapidly meet specific needs and keep the irrigation system operating, rather than wastefully building up excess capacity to deal with contingencies" (Bruns, 1992, p.38).

Vermillion and Sagardoy (1999, p.50) stressed the importance of sufficient legal status for WUAs. Global experience suggests that WUAs at least need to have the following powers:

- extract water from a specified source.
- operation and maintenance of irrigation and drainage infrastructure.
- establish rights of way for existing and future infrastructure.
- raise funds or muster labour inputs from its members.
- apply sanctions against members for non-compliance with rules. According to Bruns (2007) farmers are better able to solve conflicts with lower costs, than the government is. It is therefore important to give the WUA the legal right for conflict resolution.
- delegate powers, such as to a water service provider.
- enter into contracts.
- purchase, own and sell property.

§ 2.3.4 – Potential problems related to PIM

The objectives of farmer involvement in irrigation management include cost reduction, infrastructure improvement and sustainability. Many authors however also stated the possible problems that may arise, which can limit or eliminate the effectiveness of PIM or even of the irrigation system at large. Much research to difficulties related to PIM has been undertaken and results are often similar. The issues are not necessarily drawbacks of PIM or a participatory approach but merely common problems encountered in PIM implementation.

A first issue that can lead to failure of PIM is a lack of devotion to the process by the relevant government agencies. The mindsets of government officials have to be changed. The role of the government changes from directing to cooperating, but there remains a "general lack of willingness or ability to collaborate, possibly due to an absence of tradition for collaborating" (Kell Nielsen, 2004, p.5). Additional reasons for the governmental hesitance towards dedication to PIM include fears that the system will not be managed well (Howarth & Lal, 2002), concerns of work reduction and downsizing of the agency (Svendsen et al., 2000) and misunderstandings of the new participatory situation (Veldwisch, 2007; Sehring, 2007).

Not only from the side of the government there are possible difficulties to adapt to a participatory situation. Farmers sometimes feel that the government should take care of the maintenance of the irrigation structures that they have built and paid for (Howarth & Lal, 2002). Farmers not always perceive their WUA as an independent organisation. Instead, "often they think it is a special department of the local government (...) or the donors" (Sehring, 2007, p.287). In short, there might be a lack of awareness among farmers about the necessity of WUAs and if the activities of the WUA are not understood there are usually no significant changes in agricultural performance or economic return as a result of participation (Hamada & Samad, 2011).

Potential problems for the functioning of WUAs are a lack of organisational, technical and financial strength. Svendsen et al. (2000) indicate that skill enhancement of WUA managers is needed because associations are often faced with deficiencies in management expertise. Financially, WUAs have to deal with a general lack of willingness or ability to pay association contribution fees (Kell Nielsen, 2004; Sehring, 2007). This may be induced by rural poverty because of low productivity, lack of appropriate collection methods, or a lack of appreciation for

the WUA's activities (Svendsen et al., 2000; Ul Hassan et al., 2007). A lack of funds regularly leads to neglecting of maintenance.

An impediment to the proper functioning of WUAs can be heterogeneity of communities. Communities are differentiated by gender, age, wealth, education, etcetera. According to Bruns (2005) domination by the 'local elites' is almost inevitable and poor people, women, ethnic minorities, youths and elderly may be left out. Biased decisions (i.e. based largely on the opinions of local elites) may reinforce inequities in the local community. Therefore, even if a WUA is established and functional, the common farmers still may have little to say in the irrigation management (Van Vuren et al., 2004). An example by Sehring (2007, p.286) shows an example from Kyrgyzstan. Even though extreme, the example demonstrates a real possible problem of WUAs: "At the Kyrgyz WUA [called] Zhany Pakhta, the WUA chairman is [also] director of the agricultural cooperation, chairman of the municipal council, deputy of the district council, and a close friend of the head of the local government." Bruns (2007) states that conflict, heterogeneity, asymmetry and inequity are common and local solidarity and cooperation should not be held for granted.

The involvement of women is also often a problematic issue. "In most irrigation cases, women appear to be almost absent from those [WUA] groups" (Zwarteveen, 1995, p.8). This might be caused by social norms and values, that are often centred around men decision-making. "The inclusion of women's perspectives, their ideas, opinions, needs and interests will thus require an active and conscious effort" (p.10).

A final issue is the risk that the activity of WUAs fades away soon after special support for the project, usually by a donor organisation, disappears (Bruns, 2008). Bassi (2010) states therefore that strong support by the government is needed in order to avoid overdependence on donors. In addition, clear strategies for the future of the WUA should be created in order to keep the system in working condition, even after the aid ends.

§ 2.4 – Indonesian regulation of PIM

§ 2.4.1 – History of irrigation management in Indonesia

Originally, irrigation has been the sole responsibility of the government. This fits within the tradition of central steering by the national government that has been apparent in Indonesia from the end of the eighteenth century until 1998. The Dutch colonial government, the 'Old Order' government of president Soekarno and the 'New Order' government of president Soeharto all carried out strong authoritarian rule without room for citizen participation (Fredholm, 2008). Primary motive for this method of government has been to maintain political stability. However, substantive arguments for central rule, especially in the case of irrigation management, are available as well. Hardin (1968) wrote the very influential article 'The Tragedy of the Commons'. He argued that the users of a common are caught in an inevitable process leading to the destruction of the resource they depend upon. Each individual seeks to maximise its own gain, taking into account the costs imposed on themselves but ignoring costs imposed on others. This would result in overuse of common pool resources that can, according to Hardin,

only be prevented by means of central government control of all common pool resources. As an irrigation system is a common pool resource, following Hardin's logic, external control has to be imposed on the system and its users. In the participation spectrum of section 2.2 this would fall in level 1 ('bureaucratic decision-making') or 2 ('informing'). There is no public participation at all. It is presumable that farmers took own initiative in order to improve their situation. This fits in level 9 ('individual management').

The fall of Soeharto's regime in 1998 marked the end of the 'New Order' and the beginning of the 'Reform' era. One of the most significant changes was the process of decentralisation. Laws UU 22/1999 and UU 25/1999 theoretically transform Indonesia from being the world's most centralised large country to one of the most decentralised countries (Alm et al., 2001). The shift of responsibilities from the central government to regional governments was accompanied by the growth of public participation in governance, notably irrigation management. As stated above, the central command from the Soeharto era was backed by Hardin's theory. New theories show conversely that "tragedies of the commons are real, but not inevitable" (Ostrom et al., 1999, p.281). According to Ostrom (1990) it is possible that self-organised collectives overcome transaction costs and problems of trust in order to achieve sustainable management of a common pool resource, without external control. Ostrom et al. (1999) composed conditions for self-organisation of common pool resources.

- Resource conditions must not have deteriorated to such an extent that the resource is useless.
- Benefits are easier to assess when users have accurate knowledge of external boundaries and internal microenvironments and have reliable and valid indicators of resource conditions.
- When the flow of resources is relatively predictable, it is easier to assess how diverse management regimes will affect long-term benefits and costs.
- Users need to share an image of how the resource system operates and how their actions affect each other and the resource.
- Users must be interested in the sustainability of the particular resource so that expected joint benefits will outweigh current costs.
- If users have some initial trust in others to keep promises, low-cost methods of monitoring and sanctioning can be devised.
- Previous organisational experience and local leadership reduces the costs of coming to agreement and finding effective solutions.
- Individuals must overcome their tendency to evaluate their own benefits and costs more intensely than the total benefits and costs for a group.

Considering these conditions, participation in irrigation management can be beneficial. Based on this idea that self-organisation of irrigation systems is possible the Indonesian regulations have seen changes directed to participation. In the following section the current regulatory framework is set out.

§ 2.4.2 – Current regulatory framework

The main legislation concerning irrigation in Indonesia is water resources law UU 7/2004. This act regulates the responsibility of irrigation systems. Article 41, 64 and 78 allocate the responsibilities for development, O&M and O&M financing of irrigation systems, respectively. The main and secondary parts of systems larger than 3.000 hectares are the responsibility of the central government. Tertiary systems are the responsibility of the WUA. The WUA is also expected, but not obligated, to be involved in the development of the main and secondary systems. The government may assist farmers financially in the development, operation and maintenance of tertiary systems. All but one of the subprojects of DISIMP-II, and all four of the case studies, are larger than 3.000 hectares and are therefore the responsibility of the central government.

The general regulations in the law are elaborated in government regulation PP 20/2006 about irrigation. Chapter III of the regulation states the necessity to establish WUAs and WUAFs for every irrigation system and irrigation commissions for every regency and province. The water users associations have the following rights and responsibilities (article 20): to carry out the development and management of tertiary irrigation systems and to maintain its effectiveness and efficiency. No authority or responsibility of farmers in main and secondary systems is mentioned. However, in chapter V the importance of farmer participation is stressed: "The national, provincial or regency government encourage public participation in the development and management of irrigation systems in order to increase the 'sense of ownership' and a sense of responsibility towards the sustainability of the system."

Further detail to PP 20/2006 has been provided by the Ministry of Public Works in four ministerial regulations. These regulations are the following, all issued in 2007.

- 30/PRT/M/2007: development and management of participatory irrigation systems
- 31/PRT/M/2007: guidelines regarding irrigation commissions
- 32/PRT/M/2007: guidelines for the operation and management of irrigation networks
- 33/PRT/M/2007: guidelines for the empowerment of WUAs and WUAFs

Participation of farmers, WUAs and WUAFs in primary and secondary systems is encouraged on a voluntary basis: "Public participation in the development and management of primary and secondary irrigation systems includes initial thinking, decision making and implementation of construction, improvement, operation, maintenance and rehabilitation activities. This public participation can be manifested in the form of donations of thoughts, ideas, time, energy, materials and funds." The involvement of farmers is foreseen in all stages, being survey, investigation, design, land acquisition, construction, operation and maintenance. In other words, farmers should participate at all functional (see section 2.1.2) and all physical (section 2.1.3) levels of the irrigation system. The sources and division of funding for the WUAs are not set out. Government bodies may provide financial assistance to the WUAs, and it is recommended for WUAs to raise membership fees. Statutes of the WUA, that are formalised by the regent, should clarify these issues.

In conclusion, farmers and WUAs are only responsible for construction, operation, maintenance and financing of the tertiary system. This is clarified in article 19 of ministerial regulation 33: "The empowerment is aimed at the formation of an independent WUA in institutional, technical and financial aspects, in order to be able to participate in the development of irrigation systems." The end goal is therefore to reach a participation level of *mandiri* (level IV), as mentioned in section 2.3.2. There is no authority or responsibility for the main and secondary system. However, the ministerial regulation encourages governments to involve the farmers in all aspects of the irrigation system. This cooperation between the government and farmers is voluntary from both sides. Governments are expected to involve farmers, but not obligated. Farmers are encouraged to participate, but for the main and secondary systems they are in no way required to do so. Bruns (2004) argues that farmers are now empowered with far more choices about directing their own development than before the *reformasi* era.

The current regulatory framework in Indonesia leads to more citizen influence. Considering the participation spectrum of section 2.2, it remains unclear which level is reached. The regulation gives the possibility to government bodies to collaborate thoroughly with farmers and WUAs. However, many aspects remain voluntary. The regulations give reason to expect a participation level between 3 and 5. All of these are levels where the public is involved. However, the level of partnership is not reached since the government retains its authority.

§ 2.5 – Conceptualising success

Fudge and Barrett (1981) discussed the question to what extent action is influenced by policy decisions emerging from a political decision-making process. They concluded that "the relationship between policy and action could not be regarded as a simple transmission process but rather must be viewed as a complex assembly job involving the fitting together of different interests and priorities" (Fudge & Barrett, 1981, p.251). Policies and regulations made by the Indonesian government and instructions by JICA do therefore not directly and unequivocally lead to its implementation. "The policy-action relationship must be considered in a political context and as an interactive and negotiative process, taking place over time between those seeking to put policy into effect and those upon whom action depends" (Fudge & Barrett, 1981, p.252). In the case of irrigation management, the action depends largely on the efforts of the farming community.

The success of Indonesian irrigation management can therefore not only be assessed by considering the official policies, since actual implementation may deviate from these procedures. In the case that the action matches with the policy, there is 'policy conformance' or 'policy compliance'. Bridgman (2007) argues that policy conformance is relatively easy to measure, by observation of the action and comparison with the initial policy. More complicated, but also more important, is 'policy performance'. This expression is about the extent to which the objectives of the policy are met.

Policy conformance is of less interest than policy performance. It is important that the objectives of the policies are met, rather than that the action is exactly the same as the initial policy. In

section 3.2 the conceptualisation of success is operationalised using monitoring indicators, in order to be able to evaluate the success of irrigation projects.

§ 2.6 – Model for implementation of participation

Based on the theoretical background and regulatory framework in Indonesia, theoretical ideal principles for implementation of farmers' participation in irrigation management can be presented. In the conclusion of this report the situation in practice will be compared to these theoretical principles.

As set out in this chapter, international scientists agree that participation of farmers in irrigation management is beneficial for several reasons. Especially the increase of agricultural productivity is a major benefit, but also the creation of a 'sense of ownership of the system' for the farmers. If the farmers feel responsibility for the system the deterioration of irrigation infrastructure can be slowed down, discontinued or reversed.

The degree to which participation should take place is more contested. Some authors argue that 'more participation is better', both in general (Arnstein, 1969; Choguill, 1996) and in irrigation management (Smet, 2003). However, most authors recognise the need for adaptation to the local situation, which means that in one place more participation is desirable than in other places (Vermillion & Sagardoy, 1999; Garces-Restrepo et al., 2007).

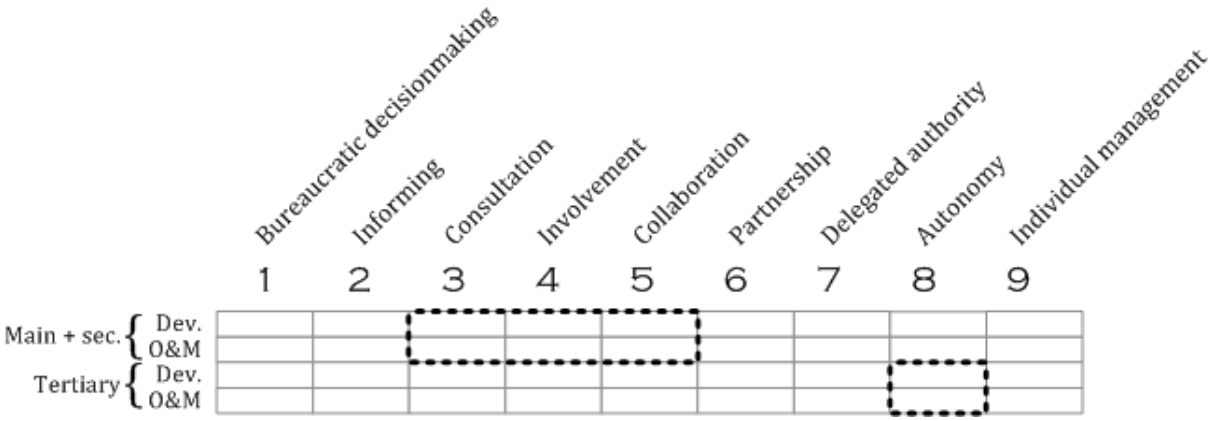

Figure 5 – Participation level proposed by Indonesian government regulations

Regulations by the Indonesian national government propose a level of participation as visualised in figure 5. The management of the tertiary canal level is the responsibility of the farmers, who have 'autonomy'. For the main and secondary canal levels the involvement of the government is greater. Depending on the enthusiasm and activity of the relevant government, the farmer participation level could be 'consultation', 'involvement' or 'collaboration'. All of these are levels where the farmers are involved in the management of the system, but the government has the final authority and responsibility. 'Consultation' is no interactive participatory approach, so according to the literature 'involvement' or 'collaboration' would be preferable. In section 5.3.3 this model for public participation is compared to the reality in the case studies.

Chapter 3
Methodology

This research aims to give an overview of the critical success and failure factors of implementation of participation in Indonesian irrigation management. The research is carried out using case studies and assessing them based on performance indicators. In this chapter the case study method as well as the performance indicators are explained. In the third section the methods of data collection are described and the fourth section discusses the analysis. In the final section the limitations of the research method are highlighted.

§ 3.1 – Case studies

§ 3.1.1 – Case study method

A case study method is used to carry out this research. The case study approach is suitable for identifying critical success factors of participatory irrigation management considering that "the case study approach allows the researcher (...) to learn what works and what does not" (Corcoran et al., 2004, p.10). In that way it is a method of learning about complex matters through description and analysis of its contexts: "A case study investigates a contemporary phenomenon within its real-life context" (Yin, 1989, p.23).

Feagin et al. (1991) state that case study research aims for holistic understanding of 'cultural systems of action'. Not only opinions of individual actors or single phenomena are analysed, but an entire system of action. This system includes all relevant groups of actors and their interaction. In the case of irrigation projects these groups of actors include government bodies at several levels, local farmers, construction and consultancy firms and a donor organisation. The system of action is embedded in the local context of rural areas, all with different cultural backgrounds.

Using one case study may draw conclusions specific to that particular unit. It is however not reliable to draw general conclusions based on one case. Irrigation projects are unique in terms of design and context of implementation. It is therefore necessary to use multiple case studies to generate more reliable data. For this research four case studies are carried out.

§ 3.1.2 – Selection of case studies

To identify the critical success factors of the implementation of PIM and the functioning of WUAs, four case studies are investigated. These case studies are irrigation projects that are part of the Decentralised Irrigation System Improvement Project II in the Eastern Region of Indonesia (DISIMP-II).

The DISIMP-II programme consists of the implementation of fourteen irrigation projects (subprojects) in nine provinces in the eastern part of Indonesia. The projects consist of an 'infrastructure improvement component' and a 'soft component'. The infrastructure improvement component includes the actual rehabilitation and construction of the irrigation systems, including its design, tendering and supervision and covers roughly 83.300 hectares. The

soft component covers about 124.340 hectares and encompasses the formation and empowerment of water users associations, the training of local government officers in operation and maintenance activities, the development of improved on-farm water management and capacity building in asset management (Euroconsult, 2010). For this research, four of the subprojects where these components will be carried out have been selected. For the selection of case studies, some criteria were relevant.

- Water users associations have been established in the project area
- The DISIMP-II project is active in the project area at the time of research
- It is feasible and safe to visit the project area

Based on these criteria and in consultation with the DISIMP-II programme staff, the case studies have been selected. These four projects have, as a part of the DISIMP-II programme, similar objectives but they are implemented in different contexts. In table 3.1 an overview is given of the fourteen subprojects and the selected case study projects. The column 'total area' indicates the total area for the soft component of the subproject. In some projects the infrastructure improvement component only focuses on part of the area, while the soft component is aiming at the entire area.

Table 1 - Overview of DISIMP-II subprojects

Project name	**Regency**	**Province**	**Total area**	**Case?**
Empas Sungi	Tabanan, Badung	Bali	4.462 ha	
Pengga-Gebong	West Lombok	West Nusa Tenggara	5.180 ha	
Jurang Sate	Central Lombok	West Nusa Tenggara	10.630 ha	✓
Bena	South Central Timor	East Nusa Tenggara	3.500 ha	✓
Mbay	Nagekeo	East Nusa Tenggara	3.836 ha	
Sadang-3	Pinrang	South Sulawesi	24.479 ha	
Sadang-4	Sidrap	South Sulawesi	16.195 ha	
Lamasi	Luwu	South Sulawesi	7.664 ha	
Bajo	Luwu	South Sulawesi	6.150 ha	
Tommo	Mamuju	West Sulawesi	2.500 ha	
Toraut	Bolaang Mongondow	North Sulawesi	5.436 ha	✓
Wawotobi	Konawe	Southeast Sulawesi	11.273 ha	
Paguyaman	Boalemo, Gorontalo	Gorontalo	6.880 ha	✓
Way Apu	Buru	Maluku	3.626 ha	

§ 3.1.3 – Introduction of the case studies

As indicated in the table, the four case studies are the projects Jurang Sate, Bena, Toraut and Paguyaman. The names of the projects are usually derived from the name of a village or district where either the weir or (a part of) the irrigation system is located. In the following paragraphs the four case studies are introduced. The provided maps are to give an indication only and are not on the same scale.

Subproject *'Bena'* focuses on an irrigation system covering 3.500 hectares on the island of Timor. The DISIMP-II project encompasses the construction of the greater part of the main canal and all of the secondary canals, irrigating 2.929 hectares. The first 571 hectares and the headworks of the system, Linamnutu Weir, have been constructed as a part of the DISIMP-I programme. The project is located in South Central Timor regency (*kabupaten Timor Tengah Selatan*), of which Soe is the capital town. Being located within the province of East Nusa Tenggara (*Nusa Tenggara Timur*), the relevant regional river basin management centre is located in provincial capital city Kupang.

Figure 6 - Location of Bena in East Nusa Tenggara

Figure 7 - Location of Toraut in North Sulawesi

Irrigation system *'Toraut'*, with an area of 5.436 hectares, has started operation in the year 1986. Considering its insufficient functioning the DISIMP-II project aims to rehabilitate the entire system. The project is located in Bolaang Mongondow regency, part of the province of North Sulawesi (*Sulawesi Utara*). The capital of the regency is Lolak, several government agencies are however still located in Kotamobagu, the previous capital. The regional river basin management centre is located in Manado, the capital of North Sulawesi.

Figure 8 - Location of Paguyaman in Gorontalo

Figure 9 - Location of Jurang Sate in West Nusa Tenggara

Subproject *'Paguyaman'* has been started as part of the DISIMP-I programme but because of a lack of funds it had not been completed. As a part of the DISIMP-II programme the lower part of the right side irrigation system will be finished. The total irrigated area is projected to be 6.880 hectares. The right side of the irrigation system is located in Boalemo regency, of which Tilamuta is the capital. The left side is located in Gorontalo regency, governed from the town of Limboto. Both regencies are part of Gorontalo province. Even though Gorontalo City is the provincial capital, the regional river basin management centre is located in Limboto.

Subproject *'Jurang Sate'* encompasses the rehabilitation of the secondary canals of Jurang Sate irrigation system. The system has been operational since 1935. In the 1980's the Jangkok-Babak High Level Diversion (HLD) has been built in order to divert water from three rivers to the system's main canal. As a part of the DISIMP-I programme the weir and main canal have been improved. The total area irrigated by the Jurang Sate system covers 10.630 hectares. It is located in the Central Lombok regency (*Lombok Tengah*) which is governed from the town of Praya. Being located on Lombok Island in West Nusa Tenggara province (*Nusa Tenggara Barat*), the relevant regional river basin management centre is located in Mataram.

In figure 10 an overview is given of the locations of all DISIMP-II subprojects and specifically the four case studies. All projects are directed from the DISIMP-II Central Office which is located in Indonesia's capital city Jakarta. The initiator of the project, the ministry of Public Works, is located in Jakarta as well.

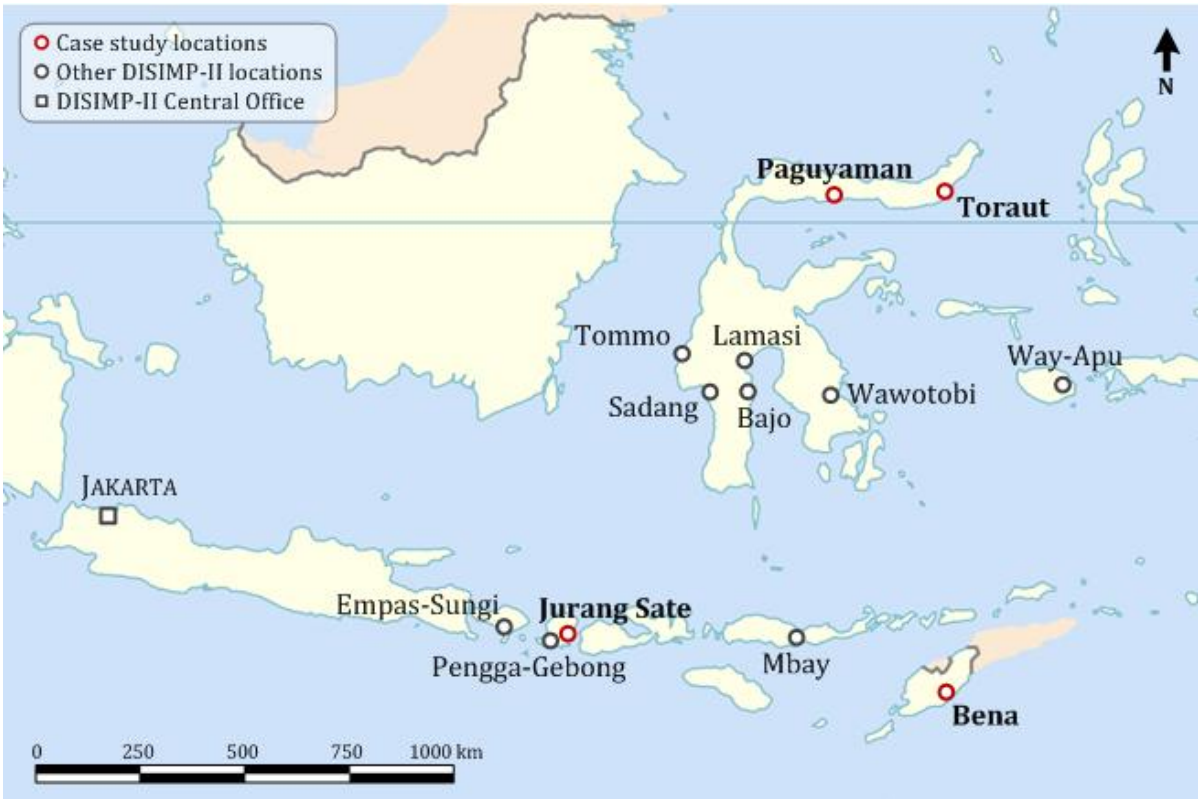

Figure 10 - Map of DISIMP-II subproject locations

§ 3.2 – Performance indicators

§ 3.2.1 – Using performance indicators

In order to assess the success of an irrigation project, indicators should be used. The Japan International Cooperation Agency (JICA) composed a set of 'monitoring indicators' for the assessment of subprojects of the DISIMP-II programme. In order to carry out a thorough analysis of the entire 'system of action', additional indicators are used, based on a range of literature.

Performance indicators measure the impacts, outcomes, outputs and inputs of a project, in order to assess its progress towards the objectives of the project (Mosse & Sontheimer, 1996). In order

to select performance indicators, USAID (1996) and Mosse and Sontheimer (1996) composed sets of criteria to be used when selecting indicators. The selection for this research is based on the following criteria:

- *Relevance*: The indicators are relevant to the objectives of the project and the objectives of the applicable legislation.
- *Practicality*: The data required to compile the indicators is available and can be acquired in a timely way and at reasonable cost.
- *Objectivity*: The indicators are one-dimensional and operationally precise. There is no ambiguity about what kind of data is needed and the indicators only measure one phenomenon at a time. If possible, quantitative indicators are used. However, qualitative indicators provide "a richness of information that brings the (...) results to life" (USAID, 1996).

§ 3.2.2 – Evaluation of indicators

The official monitoring indicators for the entire DISIMP-II programme are set up by JICA (2008). The indicators, as shown in table 2, show the original values and targets for the fourteen subprojects combined. For some of the indicators there are specific targets per subproject.

Table 2 - Official DISIMP-II monitoring indicators (JICA, 2008)

No.	Indicator		Original 2007	Target 2018	Increase (%)
1	Target area (ha)		81,600	81,600	-
2	Cropped area (ha)	- Rice	115,639	143,852	24%
		- Maize	7,315	12,263	68%
		- Other	8,326	13,896	67%
3	Cropping intensity (per year)		161 %	210 %	30%
4	Rice production (tonnes/year)		464,946	660,306	42%
5	Rice yield (tonnes/ha/season)		4,0	4,6	15%
6	Maize production (tonnes/year)		20,530	41,270	101%
7	Other crops production (tonnes/year)		11,524	26,356	129%
8	WUA coverage		63 %	100 %	59%
9	Payment of irrigation water fee		36 %	90 %	150%
10	Poverty rate in selected area		32 %	-	reduced
11	Farmers annual income (Rupiah)		4.154.000	10.252.000	147%

These indicators are not sufficient to measure the performance of the irrigation projects. Several authors proposed sets of monitoring indicators for irrigation systems. These sets and their relevance is discussed in order to attain a complete overview of possible indicators.

Mukherji et al. (2009) proposed a list of nine indicators, more focused on the role of the WUA's. As with JICA, there is an indicator 'crop related impacts' and an indicator assessing the influence of the irrigation system on the economic situation of the community. The other seven indicators are related to the functioning of the WUA and the changes participation has made to the functioning of the irrigation system and the community:

- Irrigation service fee collection rate
- Financial viability of WUA
- Functional condition of infrastructure
- Equitable distribution of water
- Reliability and adequacy in water
- Popular awareness and participation in WUA activities
- Reduction in frequency of disputes

Another set of indicators has been created by Bos (1997). He focuses particularly on technical indicators, such as water balance ratios and the effectiveness of infrastructure. However, also the financial self-sufficiency and the users' stake in the irrigation system are considered. Raby (2000) set up a list of evaluation criteria for irrigation systems as well, focusing on the effectiveness of operation and maintenance activities, financial performance and organizational discipline of the WUA's.

Three of the indicators by JICA are irrelevant. The target area is no performance indicator but a static characteristic of the project. Rice yield and rice production are redundant, since the rice production is a function of cropped area, cropping intensity and rice yield. The indicator of irrigation water fee payment is dropped, considering the judgment of DISIMP-II staff that the actual collection of these fees is an illusion.

Instead, several other indicators that are not used by JICA are considered relevant. In the following section the indicators are introduced.

§ 3.2.3 – Indicators and operationalisation

Based on the various sets of indicators and other literature, a list of fifteen indicators has been composed to assess the irrigation systems of Bena, Toraut, Paguyaman and Jurang Sate. In this section the indicators are introduced and operationalised. Compared to the official indicators by JICA, the fifteen indicators below focus more on the performance of the irrigation system and management as a whole. JICA requires quantitative outputs, but because the actual situations are very complex a lack of output does not necessarily mean a lack of performance. The following indicators therefore focus both on quantitative output and on qualitative impacts.

(1) Cultivated area: The cultivated area, or cropped area, is the total surface that is used for farming, measured in hectares. This indicator is relevant considering that one of the means of reaching improved agricultural production is by increasing the harvested area. In most of the DISIMP-II subproject areas there is already a small irrigated area, in addition to rainfed farmland. Target is to increase this area and assure it is entirely irrigated.

(2) Cropping intensity: The cropping intensity is measured by dividing the gross cropped area per year by the total cultivated area and multiplying it by 100. Boserup (1965) identifies five types of cropping schemes, resulting in different cropping intensities. All of the DISIMP-II subprojects are among the two most intensive types, being annual cropping (cropping intensity ≈ 100%) and multi-cropping (cropping intensity is higher than 100%). Target for the entire DISIMP-II project

is to increase the cropping intensity to 210% (JICA, 2008). This means that in addition to the harvest in the wet season, also yields are required in the dry season.

(3) Crop production (quantitative): This indicator measures the production of crops in tonnes per year. Consistent with the JICA indicators (2008) crops are divided over three categories, being paddy, maize and other crops. Production of all crops is targeted to increase. The crop production is a function of the cultivated area, the cropping intensity and the yield per hectare. Gorantiwar & Smout (2005) use a gross term for this indicator, being the actual crop production divided by the target crop production. However, in my opinion the difference of production in relation to the production before project implementation is more relevant.

(4) Crop production (subjective): As Mukherji et al. (2009) state there are limitations to quantitative crop-related indicators. It is often difficult to prove a causal relationship between an intervention and a result. Apart from the project interventions (being the irrigation system construction, the establishment of WUA's and the improvement of O&M activities), changes in crop production may be induced by external factors such as weather, natural phenomena or human behaviour. An extra indicator of crop production is therefore added that measures in a subjective way. The experience of the local farmers is examined: "To what extent did crop production improve due to the (improvement of the) irrigation system?" It is expected that the local farmers are able to distinguish the causes for changes in production.

(5) Functional condition: An overview of the actual condition of the irrigation system is given. Although not included in the JICA indicators, this indicator is important because the effects of the irrigation system depend on the actual functionality of it. Bos (1997) introduces this indicator as the 'effectiveness of the infrastructure' by dividing the number of functioning structures by the total number of structures. Even though Bos's calculation gives only a simplified view of the situation, it is used as a clarification of the functional condition of the system.

(6) Reliability and adequacy: According to Raby (2000) is is important that adequate amounts of water are delivered in a timely fashion to the individual farmers during a cropping season. Measurement of this indicator is based on the experience of the local farmers and project staff. As with the previous indicator, the reliability and adequacy of the system influences the effects of the entire irrigation project.

(7) WUA coverage: In the Indonesian government regulation PP 20/2006 the importance of water users associations is stated. JICA (2008) introduces the rate of WUA presence as one of the indicators for the DISIMP-II project. The target for the WUA coverage is 100%, meaning that WUAs should have been established for the entire irrigation system. WUAFs are taken into consideration as well. In addition, the extent to which farmers within the irrigation system are member of a WUA is part of this indicator.

(8) Regular meetings: The only indicator JICA (2008) includes related to public participation is the WUA coverage. Other authors mention more relevant WUA-related indicators. Raby (2000) mentions the 'holding of regular meetings' as an indicator. This is similar to Bos's (1997)

indicator of the activeness of WUA's. Bos uses a division between the active WUAs and the total number of WUAs for this indicator, where 'active' is defined as holding more than a minimum required number of meetings. For this indicator it is simply explored how many times per month the WUAs have meetings on average.

(9) Participation: This indicator is twofold. Firstly, the share of the farmers that attend the meetings and activities of the WUA is important. Both Raby (2000) and Mukherji et al. (2009) include the attendance at meetings as an indicator. Secondly, the equity in participation will be considered; are all groups of the community equally involved in the WUA and its meetings? This especially focuses on female participants; are women members of the WUA and are they equally represented in its board? Meinzen-Dick and Zwarteveen (1998, p.339) stress that "using water or irrigating is not confined to men; women do use water both for productive as well as domestic purposes." However, the participation of women in WUAs is often much lower than men's participation. In order to be representative, all water users should be involved in a WUA and therefore the involvement of women is a key issue. Also Vermillion and Sagardoy (1999, p.75) state that "it may be useful to grant voting rights to both male and female adults in households".

(10) Financial viability of the WUA: One of the indicators by JICA is the collection rate of irrigation water charge (JICA, 2008). However, experience in the beginning of the DISIMP-II project proved that these water charges are typically not paid. In this research an alternative indicator is used, being the financial viability of the WUA. The question for this indicator is to what extent the WUA is capable of financing its activities. The financial capacity of the WUA affects the effectiveness of the organisation and the irrigation system. Bos (1997) includes this indicator as 'financial self-sufficiency'.

(11) Influence and involvement: The previous four WUA-related indicators give information about the existence, activity and viability of the WUAs. This indicator focuses on the actual influence the WUA has on all aspects of the irrigation system. This is relevant as the Indonesian legislation targets to include the farmers in all steps, as pointed out in section 2.4. The aspects of irrigation projects could be involved in are discussed in sections 2.1.2 and 2.1.3 about the functional and physical scope of irrigation management.

(12) Poverty rate: JICA (2008) uses the poverty rate in the project area as a measurement of economic development. According to JICA, the current poverty rate in the project areas is on average 32%. The target is simply to reduce this number. The relevance of this indicator is clear since the ultimate goal of the DISIMP-II programme is "to alleviate poverty in economically depressed rural areas in the Eastern region of Indonesia" (Euroconsult, 2008). Hussain et al. (2006, p.332) state that "the incidence and depth of poverty is significantly less in irrigation systems than in rainfed areas, indicating that irrigation has poverty reducing impacts." Apart from poverty rate, Indonesian statistical agencies also measure the number of families that are 'pre-prosperous'. This means these families are not able to meet at least one of the five basic needs that are determined by the Indonesian law UU 10/1992, being food, shelter, clothes, health and religion.

(13) Farmers' income: According to JICA (2008), the average income of a farmer in the DISIMP-II project areas was 4.154.000 Indonesian rupiah before the project started. It is targeted to increase the annual income to 10.252.000 rupiah on average. Because of considerable differences in income between the regions, the relative change of income is more important than the actual number.

(14) Equity of water distribution: While indicator 6 handles the adequacy of water delivery, this indicator answers the question what the farmers think about the fairness of the distribution of water. Bos (1997) describes the 'social capacity' of the people in the system to manage it. This, including the technical knowledge of the staff that operates the system, determines the equity of water distribution. Gorantiwar and Smout (2005) use the interquartile allocation ratio as a measurement for equity. In my opinion the equity of water distribution is a social issue and therefore it is measured subjectively.

(15) Disputes and sanctions: The extent to which disputes occur related to the irrigation system or the water users associations is the final indicator. It is important to know whether a WUA or other body can impose sanctions and if it is able to solve (potential) conflicts. Mukherji et al. (2009) include the 'reduction in frequency of disputes' as an indicator. This issue is relevant since disputes and conflicts can undermine the effectiveness of the system. Sanctions are important considering that "rights mean little unless there are ways to enforce them when they are infringed" (Bruns, 2005, p.6). The dispute and sanction mechanisms are preferably managed by the WUAs. In the case that effective systems are absent in the WUAs, mediation by government authorities is the appropriate method.

In table 3 on the next page the indicators are listed and categorised. The indicators are used as guidance for the research of the case studies. In chapter 4 the results are presented using the five categories of indicators as shown in the table. Annex 2 gives the table used for field research at the four case studies, in Indonesian language.

§ 3.3 – Data collection

Data about the case studies is collected using several methods, including document analysis, interviewing and observation.

Information about several indicators, most notably crop-related and economic, is collected at the relevant government agencies. Documents are analysed and responsible officers are interviewed in order to get accurate and up-to-date data. The following government agencies are considered most relevant.

- River Basin Management Centre (*BWS*)
- Agricultural Department at regency level
- Statistics Agency (*BPS*) at regency level

Most of the information is retrieved by conversations and interviews with actors in the field. These include local farmers, WUA managers and village leaders but also subproject office staff and local consultants. Method for selecting interviewees is convenience or judgement sampling.

Relevant government bodies have been selected for interviews, but the individual within the agency to be interviewed depends on availability at the moment of visit. Farmers are selected on the basis of availability and attendance at public meetings or by chance of encountering. The interviews are structured by using the fifteen indicators presented in table 3 (and annex 2) as a guideline. A list of interviews is provided in annex 1.

Observation of the irrigation system and local activities provides additional information about the local situation. In addition, many of the indicators are clarified by information from (internal) project reports, such as monthly and quarterly reports and documents composed by the various subproject offices and local consultants.

Table 3 - List of performance indicators

Crop-related indicators		
1	Cultivated area	Previous, target and actual cultivated area in hectares
2	Cropping intensity	Previous, target and actual cropping intensity in %/year, including information about the cropping pattern
3	Crop production (quantitative)	Previous, target and actual production of paddy, maize and other crops in tonnes per year.
4	Crop production (subjective)	Farmers' experience of increase in crop production
System conditions		
5	Functional condition	Status of the structures and canals
6	Reliability and adequacy	Reliability and adequacy of water delivery
Public participation		
7	WUA coverage	Extent to which WUAs are established for the entire area
8	Regular WUA meetings	Frequency of WUA meetings
9	Participation in WUA	Extent to which all farmers are participating in the WUA and its meetings, and the equality of inclusion of community members
10	Financial viability of WUA	Extent to which WUAs have sufficient funding
11	Influence and involvement	Extent to which farmers are involved in all aspects of the irrigation project
Economic indicators		
12	Poverty rate	Percentage of people living in poverty
13	Farmers' income	Development of local farmers' income and wealth
Social indicators		
14	Equity of water distribution	Farmers' experience of water distribution fairness
15	Disputes and sanctions	Incidence of conflicts and methods to solve them

§ 3.4 – Analysis

Comparison and analysis of the case studies and the literature is carried out in chapter 5. In the literature review the issues of irrigation management and community participation in general and participatory irrigation management in particular have been conceptualised. Subsequently the relevant laws, regulations and policies in the Indonesian setting are presented. On the basis of the fifteen indicators presented in section 3.2 the case studies are investigated. By combination of the information from document analysis, literature review and case study research one can speak of methodological triangulation. As Baxter and Jack (2008, p.554) state:

"A hallmark of case study research is the use of multiple data sources, a strategy which (...) enhances data credibility."

Based on the combined information the analysis will lead to an insight in the critical success and failure factors of participative irrigation projects. The type of analysis can be described as cross-case analysis (Miles & Huberman, 1994) or cross-case synthesis (Yin, 1989). Based on the case study information, consistencies and inconsistencies across the cases will be analysed. In addition, a comparison with the literature and the Indonesian regulations is made.

According to Eisenhardt (1989, p.540) the danger of cross-case analysis is that people are "notoriously poor processors of information. They leap to conclusions based on limited data, they are overly influenced by (...) more elite respondents, (...) or they sometimes inadvertently drop disconfirming evidence." A main tactic used to avoid these dangers is to search for in-case similarities and cross-case differences, based on the indicators provided in section 3.2.3. The analysis is carried out after data collection for all of the cases, in order to avoid drawing premature conclusions.

§ 3.5 – Limitations

The methodology and design of this research has some unavoidable limitations. Firstly, the size and scope of the case study sample leaves a margin for invalidity. The evidence created from a multiple case study method "is considered robust and reliable" (Baxter & Jack, 2008) and even though four case studies give a thorough insight in the circumstances of irrigation projects, other projects are not necessarily similar. In addition, only subprojects within the DISIMP-II project are assessed, which means the applicability to other irrigation projects can be questioned. As a result, internally the study is valid, but the external validity is uncertain.

Within the case study, a limitation is the number and selection of interviewees. Considering the planning of case location visits interviews are conducted on the basis of convenience sampling. Even though this diminishes the generalisability, the interviews provide an in-depth context to the research.

A final limitation is the lack of available and reliable data. Information regarding agricultural productivity, for example, is often of low quality. Local government agencies in Indonesia have incomplete, outdated or contradictory information which makes it difficult to draw conclusions.

Chapter 4
Case studies

In this chapter an overview is given of the results of the four case studies. In the four sections consecutively Bena, Toraut, Paguyaman and Jurang Sate are examined. Each of the four sections is divided over five subsections in which the different categories of indicators are discussed. The first subsection handles the agricultural situation, including the cropping pattern and paddy production. In the second subsection the functional condition of the system is discussed. Subsequently, the issues regarding public participation and water users associations are examined. The fourth subsection identifies the economic conditions in the project area and in the final part social issues are considered.

§ 4.1 – Bena

§ 4.1.1 – Agricultural situation Bena

The project contract states that the cultivated area in Bena before project implementation consisted of 2.439 hectares of arable land. The area was partly irrigated by the system built in 2001-2003 from APBN funds. The target of the project is to extend the system downstream to result in irrigated arable land with a total area of 3.500 hectares (Euroconsult, 2011a). From the information from the regency agricultural department, in 2011 only 2.155 hectares of land has been functional. Because of a lack of water, only 1.006 hectares has been cultivated in 2011. Assessment in the field suggests that less than 2.155 hectares is functional in reality. The agricultural department aims to develop 150 to 200 hectares of land per year. Following this programme, the project goal will not be reached before the year 2018.

The cropping intensity before implementation of the project has been 115,4% per year. In the wet season paddy and maize was grown, in the first part of the dry season a second harvest of paddy was done and in the second part of the dry season the land was left fallow. After the project a more intensive cropping pattern is targeted consisting of paddy (100%) in the wet season, paddy (45%) and maize (25%) in the first part of the dry season and maize (100%) in the second part of the dry season. This would result in a total cropping intensity of 270% per year (Euroconsult, 2011a).

In reality, the situation is very different. Local rice farmers do not practice maize farming. As a result, the cropping pattern is either paddy-paddy-paddy or paddy-paddy-fallow. Because only a small part of the entire area is cultivated in reality, the cropping intensity is very low. According to the local consultants (LC Bena, 2011), the actual cropping intensity in the upstream irrigated areas of Linamnutu is currently 200%, while in the downstream area of Bena a percentage of 105% is reached.

According to the explanatory note (Euroconsult, 2011a) the crop production before the project implementation consisted of 11.067 tonnes of paddy and 910 tonnes of maize per year. Target for after the project is 20.300 tonnes of paddy and 15.313 tonnes of maize. Following the

information from the agricultural department, however, the crop production is in reality lower. A paddy production of 9.056 tonnes was reached in 2011 (Dinas Pertanian TTS, 2011). Maize and other crops have only been produced outside the irrigated area, and are therefore not included in the figures.

For large parts of the project area, the irrigation system has no effect yet because of the interruption of the main canal. Only the upper part over a length of seven kilometres, from the weir down to structure BB.6, has been fully functional. In this area, farmers clearly experience improvement in their production. As one farmer says: "Before, our rice production was very low. Now it is... more than low." Demonstration farms in this area show improvement as well. Mr. Johannes Kini: "There are seven dem-farms of one hectare each. The success is varying. Some farmers are enthusiastic and follow the instructions. One of the dem-farms reached a production of 12 tonnes and another one produced 10 tonnes. However, others produced less than 5 tonnes. This is because farmers do not have the required knowledge and they do not follow the instructions. Because of insects and plant diseases the production is low. And some farmers are just lazy." The agricultural department states the average rice yield in the cultivated areas is currently 4 tonnes per hectare.

The irrigation system appears to improve crop production. However, farmers should be motivated to follow instructions to increase the crop production more. Overall there is no crop production increase yet because of the problems in the system construction. Other issues that limit crop production are the planting method used and the farmers' knowledge. 50% of the farmers use the conventional method, 49% use the Legowo system while only 1% of the farmers use SRI. In addition, the farmers have a lack of knowledge about the proper use of pesticides and insecticides (LC Bena, 2011).

§ 4.1.2 – System conditions Bena

Construction of the system has not been finished until now. However, also parts that are finished already are in a poor condition. During the rainy season, several landslides occurred. As a result, the main canal is interrupted at multiple places between structures BB.6 and BB.8. Figure 11 shows the location of the heaviest landslide. All locations below this point do not receive irrigation water from the system. Because of additional influx of water from the Panite system, a part of the Bena A secondary canal is provided with water. In addition to the landslide damage on the main canal, also the headworks are damaged. The Linamnutu Weir suffered from flooding in December 2011 and as a result the construction has been partly destroyed. The amount of water entering the Bena irrigation system has therefore decreased.

Figure 11 - Picture of the landslide interrupting Bena main canal

The 'effectiveness of infrastructure' indicator by Bos (1997) divides the number of functioning structures by the total number of structures. In the main canal, nine out of 22 structures are fully

active. In the secondary system, only six out of 32 structures are functioning. In total, 27,8% of the structures is functional.

The area that is already served by the Bena irrigation system experiences a lack of water. According to the head of the WUAF, water was sufficient before the weir was damaged. Currently the water is in short supply. Other farmers agree that the water is currently insufficient.

Even though there was enough water in the system before the damage at the weir, water was distributed inadequately. The technical knowledge of the gate keeper was not enough. Because there is no clear schedule of water division between the WUAs, water is unevenly distributed over the several fields.

§ 4.1.3 – Public participation Bena

As of June 2012, the coverage of water users associations in the Bena project area is minimal. The regional river basin management centre in Kupang suggested a total of 39 WUAs in the Bena area (Euroconsult, 2010). However, the local consultants state a plan for 22 WUAs in the area (LC Bena, 2011).

In the area that is fully functional, upstream in Linamnutu, five WUAs are currently active, having 415 members in total. These WUAs are united in one WUAF. Only one additional WUA is planned in Linamnutu, but since no land development has taken place yet in that area this is of later concern. The five active WUAs in Linamnutu have not been legalised by the regent (*bupati*) yet, however approval is already given by the agricultural department.

For the downstream area, around Bena village, sixteen WUAs are planned. Currently only one WUA exists. This association, named Bena Jaya, is not active. The association has a total of 1.340 members, which is far too many. As a result, the WUA is not capable of carrying out its tasks. The Bena Jaya association is planned to be reorganised in 2012, and split into twelve new WUAs. Also the four WUAFs and one system level WUAF planned in this area are not active yet.

The WUAs that have already been established in Linamnutu organise meetings every month. In addition, the WUAs organise *kerja bakti* (communal service) two or three times per month on a Wednesday. At these events the members work together, for example for cleaning tertiary canals or building new canals.

The five active WUAs in the Bena irrigation system show an average attendance rate at monthly meetings of 79%. For *kerja bakti* the average percentage is 73%. According to local farmers, usually virtually all members attend meetings. Attendance is encouraged by imposing a sanction for non-attendance, ranging from 10.000 to 50.000 rupiah. The WUAF usually has no meetings for general attendance, its meetings are only attended by WUA managers. However, since the weir is broken the WUAF leader regularly gives orders to all members to work together for temporary dam reconstruction.

According to the local farmers, women are just as much member of the associations as men. The local consultants confirm this. All the WUA management boards are chosen democratically. As a

result, also some women are represented in the boards, however not in all five of the WUAs. Because the boards are chosen by the members, members can influence decision making of the WUA. Before, local managers were chosen by the village head so they complied with the wishes of the village head and government. That WUA boards now have to comply to their members is a serious improvement, according to the local consultants.

Since the existing WUAs have not yet been legalised by the regent, no official income is received. After legalisation, the WUAs are planned to receive money from the APBD. Currently the income for the WUA consists of contributions by the farmers. More or less 100.000 rupiah per year is paid by every farmer, depending on the area of the farm. Additional income is generated from sanctions for non-attendance and a monthly fee of 4.000 rupiah for consumptions at the meetings.

The money is stored at a bank account and all three members of the board have to sign a request for money withdrawal. The funds are subsequently formally used for the management's salary (15%), payment to the village government (10%), salary of supporting staff (15%) and for maintenance, materials and tools (60%). Even though no government subsidy is supplied yet, the WUAs are financially viable and are able to carry out their maintenance tasks. Every month the financial situation of the association is reported to its members by the board.

The influence of farmers and the WUAs is limited to the tertiary system. After the weir was damaged, farmers took initiative to repair it. However, this has been completely independent and no cooperation with the government has taken place. Within the government there is lack of clarity about the responsibilities of different departments. This has to be sorted out in order to start a participatory approach.

According to Mr. Irchamni Soelaiman, the influence of the central government is too far-reaching. As a result, the users of the system are not enough involved and a 'sense of ownership' is lacking. However, Mr. Johannes Kini calls for more government involvement: "There is not enough cooperation by the farmers. They cannot arrange it themselves because of selfishness and a lack of knowledge. More government influence is needed."

§ 4.1.4 – Economic conditions Bena

The poverty rate in South Central Timor regency has fallen over the last years. While the poverty rate was 39,3% in 2006, the rate dropped to 28,7% in 2010. The poverty line for South Central Timor in 2010 has been set at an income of Rp. 179.865 per month (BPS TTS, 2011). In absolute numbers the citizens living in poverty have remained stable, considering the population growth. 53.675 out of 81.859, or 65,6% of the families in the regency are classified by the statistical agency as 'pre-prosperous'. This means these families are not able to meet at least one of the five basic needs that are determined by the Indonesian law, being food, shelter, clothes, health and religion.

The income of local farmers is projected to increase as a result of the irrigation system. Farmers in Linamnutu indicate that their income has improved slightly. According to local consultants the

farmers' income improves only a little, because of an aversion to innovative ways of working, such as SRI. There is a lack of labour in the area, as well as a lack of tools and technical experience. As a result, enthusiastic farmers that follow instructions can improve their situation but the average farmer does not get a result. Mr. Kini: "The farmers are scared for the result if they use SRI. Their family depends on the harvest so they prefer to use their proven way of working instead of trying something new."

Results from demonstration farms already show the possibilities for income improvement. At the demonstration farm in Linamnutu, some farmers tripled their production and as a result their income. Local consultants state: "One of the farmers got such a high income that he could change his house's roof from palm leafs to corrugated iron, and buy a second-hand motorbike! However, most farmers are lazy and their production improves only slightly." General conclusions cannot be made, because of the small size of the demonstration farms. The local consultants in Bena propose the establishment of a demonstration area of at least ten hectares per WUA (LC Bena, 2011).

An increase in rice production has a direct effect on income and welfare of the local population, considering that 96,5% of the working population in Amanuban Selatan district is farmer (BPS TTS, 2011). 54,8 percent of the gross regional product of South Central Timor regency results from the agricultural system (Kabupaten TTS, 2011).

§ 4.1.5 – Social conditions Bena

"Even though there is not enough water now, it is fairly divided", according to one of the local farmers in Linamnutu. Another farmer says: "At first, I hated the leader of the WUAF, because the water was not divided fairly. However, that was not because of the WUAF leader, but because of the gate keeper, appointed by the government." The farmers agree the water is currently divided fairly.

Local consultants say that in reality the distribution of water is not fair. Because the gate keeper has not enough technical knowledge, and there is no clear schedule between the WUAs, the distribution of water is uneven. Complicating factor is the lack of discipline of the farmers. Within a tertiary unit, the time of planting and harvesting is different. As a result, when one farmer needs water, the other one does not. A clear and fair distribution of water is therefore impossible.

Local consultant Johannes Kini explains: "The Timor culture is very hierarchical, and the farmers are on the bottom of that hierarchy. In the irrigation system, the leader of the WUAF and the gate keeper are seen as the 'king'. Even though there are feelings of dissatisfaction, this does not result in conflict, because the farmers do not express their feelings." Feelings of discontent also arise because of the lack of discipline of the farmers. When one farmer wants the field to be dried for harvesting, the other still wants to add water.

Disputes do therefore not occur and sanctions are not needed. The only sanctions imposed are for non-attendance of meetings and *kerja bakti*, as set out in section 4.1.3. According to the local

consultants, however, in downstream Bena this is expected to be more difficult. While the members of the existing WUAs are all part of the same ethnic group, in downstream Bena several groups live together. Instructions by a WUA leader will not be complied with as easily as is the case in the existing WUAs.

§ 4.2 – Toraut

§ 4.2.1 – Agricultural situation Toraut

The Toraut irrigation system has been built in 1986. The system originally irrigated 5.436 hectares of land but because of the deteriorated condition of the system the irrigable land had reduced to 4.794 hectares. The remaining 642 hectares were rain fed. The target of the project is to rehabilitate the entire system, bringing the system size back to 5.436 hectares of irrigated land (Euroconsult, 2011b). According to the agricultural department, circa 70% of the area is currently cultivated. This would give a cultivated area of approximately 3.800 hectares. Local consultants indicate the cultivated area comprises 4.017 hectares (LC Toraut, 2012).

Since Toraut is an existing irrigation system, the cropping intensity was already relatively high before project implementation, with 200% per year, using a cropping scheme of paddy-paddy-fallow. Target of the project is to start production in the second part of the dry season as well. The cropping intensity is then targeted to be 250% per year. Other crops than paddy are usually not grown on the wet fields. The farmers have contracts with rice companies, mostly in Manado. They are sure they can sell the rice they produce, while there is no such guarantee for other crops. However, the leader of the WUAF at system level grows maize to set an example of the benefits of a cropping pattern of paddy-paddy-maize. Based on information from the agricultural department, 70% of the farmers use a cropping scheme of paddy-paddy-paddy, while the remainder carries out paddy-paddy-fallow. This would mean that the original target is being surpassed. Local consultants analysed the situation in Toraut and concluded that a cropping pattern of paddy-paddy-maize would be more advantageous, since this could result in an overall cropping intensity of 292,5% (LC Toraut, 2011).

Production of paddy added up to 38.976 tonnes per year before project implementation. Target of the project is to increase this number to 51.642 (Euroconsult, 2011b). This increase is made possible by an increase in yield per hectare and additional harvesting. The yield per hectare before the project was 4,73 t/ha in the wet season and 2,44 t/ha in the dry season. Target is an increase to 5 t/ha in the wet season and two times 3 t/ha in the wet season. The yearly productivity is therefore planned to increase from 7,17 to 11,00 tonnes per hectare.

Information from the agricultural departments of the three districts and the regency in which the system is located show a considerably lower production. In 2010 the production in the villages of the Toraut irrigation system added up to 29.834 tonnes of paddy (BPS Bolmong, 2011a; 2011b; 2011c). Some of these villages are partly located outside the irrigated area and therefore the actual production of the Toraut system is lower. The productivity varies between 4,0 and 6,5 tonnes per hectare per year, with an average of 5,32 t/ha (BPS Bolmong, 2011d). Also this is significantly lower that the 'pre-project' numbers stated by Euroconsult (2011b).

The information of the government is in line with information from local farmers. Estimates vary from 3,0 tonnes per hectare per harvest in the upstream part of the system to 2,0 tonnes per hectare in the downstream part. Overall judgment is however that a clear increase has occurred in the previous years. Both local consultants and farmers have seen the paddy production growing, and this is attributed to the presence of irrigation. It is therefore likely that the information from Euroconsult (2011b) about the situation before the project implementation has been too optimistic.

§ 4.2.2 – System conditions Toraut

Rehabilitation works for the Toraut irrigation system have been completed. Farmers, local consultants and government officials agree that the system is in a good condition. The structures are sufficient. Only several minor issues limit the functioning of the system. Mud, vegetation and accumulation of garbage reduce the capacity of the canals and inlet gates. Usually, this is solved through a *kerja bakti* for canal cleaning by farmers. A more substantial issue was the occurrence of flooding in May 2012 at the canal following structure BD.Kr 33. A stretch of 21 meters of lining had been damaged by the flooding and heaping of mud resulted in a bottleneck in the canal. The matter has not been resolved permanently yet, but according to the regional river basin management centre the damaged concrete lining will be replaced with stonemasonry.

An additional problem is the functioning of several offtake gates. The regional river basin management centre states that eight gates have to be rebuilt. The budget has been insufficient for commencement of the restoration, however. On several occasions, offtake gates have been damaged or destroyed. Mr. Marva Ibnu states sometimes parts of the constructions are stolen, usually by gold miners who can use the steel parts of the structure. Also farmers occasionally destroy gates. In case they are not satisfied with the amount of water reaching their land, they may try to force the gate to open, which results in damage. The agricultural department stresses that all of these issues are incidents.

Based on the information from the river basin management centre, nearly all of the structures are in a good condition. Considering the eight gates that have to be rebuilt, eighty out of 88 structures are functional. The 'effectiveness of infrastructure' indicator therefore gives a value of 90,9%.

According to the local consultants, the availability of water from the Toraut Weir is insufficient to irrigate an area of 5.436 hectares. However, including the four suppletion weirs Tapadaka, Konarom, Tonop and Doyot a maximal benefit can be reached. Approximately 75 to 80 percent of the available water in the Toraut system is originating from the Toraut Weir (LC Toraut, 2011). All actors agree that technically the availability of water is usually sufficient. Because of substandard operation the availability of water is, especially in the downstream part, inadequate. This is discussed in section 4.2.5.

§ 4.2.3 – Public participation Toraut

In the Terms of Reference document for the Soft Component activities (Euroconsult, 2010) it is stated that 63 WUAs have been established and no additional WUAs are needed. In 2012 there

are 69 WUAs in the Toraut project area, covering an area of 4.017 hectares (LC Toraut, 2012). Since the WUAs do not cover the entire Toraut area, more WUAs should be established. The area of the farmland is very diverse per WUA. While the WUAs named Usaha Bersama and Margo Mulyo have areas of more than 200 hectares, the area of WUA Sido Muncul is only 15 hectares. The WUAs have been divided over four WUAFs, from upstream to downstream named *golongan* I until *golongan* IV. One WUAF at system level is the overarching body of water users associations in the Toraut irrigation area.

Many of the WUAs are not active as of July 2012. Local consultants are carrying out a process of restructuring of the WUAs. Until now 40% of the associations has been restructured, the remainder is planned to be reactivated in 2012. Some of the WUAs are structured on the basis of traditional systems of certain ethnic groups. For example, the WUAs of the Balinese transmigrant community are based on the traditional *Subak* method, while the WUAs of the Minihasa groups follow the *Mapalus* system (LC Toraut, 2011). The WUAFs and the WUAF at system level are already active.

WUAs that are active usually have one meeting per harvesting season. In addition there are *kerja bakti*. Even the inactive WUAs sometimes organise *kerja bakti*, but these activities are not registered nor documented. Also attendance rates are usually low because no sanctions can be imposed for non-attendance. Local consultants attempt to introduce this kind of sanction during the restructuring of the associations. The WUAFs usually meet once per month and these meetings are attended by representatives of the district government. The WUAF at system level has one meeting per three months. The leader of this WUAF is involved in the irrigation commission of Bolaang Mongondow regency, which also has regular meetings.

Figure 12 - Picture of WUAF leader meeting in Mopuya (Toraut)

Considering that not all WUAs have been restructured yet, not all farmers are already member of an association. Also, members do often not show up at meetings. In the WUAs that have been restructured, both men and women are members. Women are not active in the management boards, however. The boards are chosen by the members of the association. This is not done through a voting process but by means of consensus decision making. The members are requested to compose a list of criteria for the board members, for example regarding age and education level. The board is subsequently chosen on the basis of the criteria.

Funding for the WUAs is planned to be from farmers' contribution. However, many members are not able or not willing to pay the contribution. As a result, the budget of the WUAs is small. The money is only used for carrying out *kerja bakti*, there is no money left for a salary for the management board. Additional income could be generated by imposing sanctions for members' non-attendance. This system is also not functioning until now in most of the associations.

Another possible source of funding is a maintenance fund. The regional river basin management centre in Manado plans to set up contracts with all of the associations to state the rights and responsibilities of these parties. In July 2012 the first of such contracts has been signed, with the WUAF at system level. According to the leader of this federation, the final goal for the level of autonomy for the WUAF at system level is *mandiri*. This is the highest level, indicating that fifty percent of the funding will be from the federation itself and fifty percent will be given by the government to the federation. For the WUAs a lower level of *pemula* or *madya* is foreseen. At these levels small parts of the budget are funded by the association or donated by the government. The majority of the funding and authority will be at the government's side.

While farmers are now engaged in operation and maintenance activities in the Toraut irrigation system, in earlier stages of the project there was little public participation. Some farmers were in contact with the government, such as the leader of the WUAF at system level. However, the majority of the farmers was hardly involved in the survey, investigation, design and construction phases of the project. According to the local agricultural department, the farmers are not competent enough for being involved: "They are now involved in O&M activities at the tertiary level. They are not able to be involved in the main and secondary system." Most of the other actors are in agreement that public participation should be expanded. Cooperation between government and farmers is seen as important for the functioning of the agricultural system.

§ 4.2.4 – Economic conditions Toraut

The poverty rate in the Toraut area has fluctuated over the past few years. The poverty rate for Bolaang Mongondow regency has been between 9,7% and 13,4% from 2004 until 2010. The numbers are not fully representative, since several regencies have split off from Bolaang Mongondow in recent years, and the numbers refer therefore to different areas. The poverty line for 2010 has been set at Rp. 225.705 (BPS Bolmong, 2012).

The local farmers experienced an increase of their income because of the irrigation project. According to the local consultants: "The farmers' income has clearly increased, almost everyone in the area is now living in a stone house." Also farmers themselves say that their income is higher than before. As they say their production has increased, so did their income. Local consultants expect that potentially the income can rise further. If the irrigation system is optimally used and the SRI planting method is employed, significantly higher production can be reached. Also, the costs of labour and fertilizers are lower for SRI than for the conventional method. Until now, SRI has been rarely applied. Because it is an unknown technique, people are scared to use it. The only farms that use SRI in the Toraut area are parts of two demonstration farms with a total area of 6,5 hectares.

Despite positive change of farmers' income, the local economy falls behind compared to the provincial and national economy. Indonesia and North Sulawesi have an economic growth of 6% and 7% per year over the last few years, respectively. Bolaang Mongondow regency shows economic growth of only 3% per year. Agriculture has a large part in the economy, accounting for 52,08% of the gross regional product (BPS Bolmong, 2011d). Improvement of agricultural productivity can therefore make a clear difference in the regional economic situation.

§ 4.2.5 – Social conditions Toraut

Even though there is technically enough water in the Toraut system, some of the areas experience water shortages. Especially in the downstream area of *golongan* IV there is often a lack of water because too much water is used in the upstream areas. Local consultants blame this on the functioning of the WUAs: "The majority of the WUA organisations (...) does not divide the water fair and uniformly" (LC Toraut, 2011, p.2/15). Government officials and the leader of the WUAF at system level have the same view.

Additional problems regarding the distribution of water include improper use of irrigation water and the lack of farmers' discipline. Water that should be used for irrigating rice fields is used for other purposes. Water is tapped off the canals for use in fish ponds or for small scale industries. Lack of discipline induces problems both on large and small scale. Planting sometimes takes place at the same time in all of the four *golongan*, therefore irrigation water is needed everywhere at the same time. Local consultants tried to solve this problem by introducing a clear planting schedule with two weeks between the planting times of each group. This has not had effect until now. Also within the groups discipline is a problem, with farmers planting at different moments. As a result, the farmers need water at different moments and it is impossible for the gate keeper to supply the right amount of water.

The aforementioned problems regarding water distribution rarely lead to conflict. Local consultants state that problems and discontent are usually not expressed. They therefore do not culminate into social issues. The local consultants argue that this practice should be changed. When the problems are not expressed they will not be solved and the irrigation system will continue to work inadequately.

Another social issue that is relevant in the Toraut case is the transmigration (Indonesian: *transmigrasi*) programme. As a part of this programme, numerous families from Indonesia's densely populated islands Java and Bali have been moved to the Toraut area. In Toraut, many lands are owned by Javanese and Balinese transmigrants. The living together of Javanese, Balinese, Mongondow, Minahasa and Gorontalo people does not lead to social problems. An assumption that agricultural practices from Java and Bali could be adopted is not the case, however. The original population has difficulties adapting to new practices, such as the Balinese *Subak*. On the other hand, Javanese and Balinese people adapt to the local situation. In that way, they change from their good practices to the inferior local practice. Transmigration therefore neither has a positive influence on the local population, nor on the newcomers.

A problematic issue in the Toraut area is that local consultants state that they are not always trusted. There have been several demonstration farm programmes before, both by the government and other organisations. Since these programmes only consisted of socialisation, without guidance in later stages, the effects have been minimal. Many farmers are not convinced that the current local consultants can really show them a better practice that will work.

§ 4.3 – Paguyaman

§ 4.3.1 – Agricultural situation Paguyaman

The Paguyaman system construction has started in 2005 as part of the DISIMP-I project. Because of a shortage of funds the system has not been completed and is now scheduled to be completed as part of the DISIMP-II project. Before the current project the total area of arable wetland was over 5.000 hectares[1]. In addition, 1.772 hectares of dry land and 2.152 hectares of sugar cane field are found in the area (BWS Sulawesi II, 2011). Target of the project is a total area of irrigated land of 6.880 hectares. The canals and structures are planned to be able to serve an area of 9.032 hectares. To increase the cultivated area to this size is only possible if sugar cane fields are transformed into rice paddies (BWS Sulawesi II, 2011). The irrigation manager of the regional river basin management centre states that the 2.152 hectares of sugar cane field mentioned above is unlikely to be transformed to wet field, since the lands are owned by the local sugar factory.

According to the agricultural department of Boalemo regency, the area used as rice field is decreasing rather than increasing. However, the share of fields that is irrigated increased rapidly over the past few years (BPS Boalemo, 2011). The cultivated area in the Paguyaman project is currently lower than 5.000 hectares so a clear decrease has occurred[2].

Before project implementation in Paguyaman a cropping intensity of 121% was reached. In the wet season paddy (80%) and in the first part of the dry season maize (41%) was harvested. In the second part of the dry season the land remained fallow. The DISIMP-II project targets to increase the cropping intensity to be 300%. In the wet season 100% paddy is foreseen, in the first part of the dry season 65% paddy and 35% maize and in the second part of the dry season 100% maize. However, the regional river basin management centre (BWS Sulawesi II, 2011) states another target of paddy (100%) – paddy (100%) – maize (100%).

Figure 13 - Picture of SRI demonstration farm harvest in Paguyaman

The actual cropping pattern is various. Large areas show a pattern of paddy-paddy-fallow, while small parts of the project area reach a 300% cropping intensity through a pattern of paddy-paddy-paddy. The agricultural department of Boalemo regency states there is an area of 600

[1] The 'pre-project' area of wetland in the Paguyaman area is stated as 5.504 hectares in the explanatory note (Euroconsult, 2011c) and as 5.108 hectares in the overview document by the regional river basin management centre (BWS Sulawesi II, 2011).

[2] According to agronomist Mr. Burhan currently 4.000 hectares within the project area are cultivated. Mr. Moh. Isnaen Muhidin from the regional river basin management centre states a cultivated area of 4.700 hectares. Both figures are lower than the 'pre-project' figure.

hectares where the target of paddy (100%) – paddy (100%) – maize/other crops (100%) is reached. Local consultants also attempt to introduce this cropping pattern (LC Paguyaman, 2011) but currently in virtually the whole area only paddy is cultivated and intensities between 200 and 300 percent are reached. Also in the demonstration farms only paddy is cultivated. Maize and other crops are usually planted outside the wetland area, on dry fields.

The paddy production per hectare before the project was around 2,5 tonnes per hectare. The target of the DISIMP-II project is to improve the production to 4,0 tonnes per hectare (Euroconsult, 2011c). The regional river basin management centre targets 5,0 tonnes per hectare of paddy (BWS Sulawesi II, 2011).

The actual current productivity is disputed. According to the agricultural department of Boalemo regency, the overall productivity has slightly increased. From 2006 to 2010 the productivity of unhulled rice (*gabah*) has increased from 4,2 t/ha to 5,2 t/ha (Dinas Pertanian Boalemo, 2010). Converted to hulled rice (*beras*) a productivity of slightly more than 3 tonnes per hectare is assumed. Interviews with farmers, local consultants and government officials provide various numbers. The productivity before the project is generally estimated between 3 and 4 tonnes per hectare, while the current productivity is assumed to be between 5 and 6 tonnes per hectare. The SRI demonstration farms showed an average productivity of 7,2 tonnes per hectare.

Production per year before the implementation of the project consisted of 13.760 tonnes paddy and 5.642 tonnes maize. The DISIMP-II project targets a significant increase, due to additional harvesting and an increase in yield per hectare. After project completion, paddy production should add up to 45.408 tonnes per year, maize production to 32.508 tonnes per year.

§ 4.3.2 – System conditions Paguyaman

The majority of the system has been constructed as a part of the DISIMP-I programme. The lower part of the right side system is currently under construction as a part of DISIMP-II. The DISIMP-I part of the system is almost entirely functional. The left side ('Paguyaman Kiri') is completely functional, the right side ('Paguyaman Kanan') is working from the headworks until structure BPKn.16. The part downstream from that structure has partly been constructed but the canal has been blocked in order to avoid flooding. According to farmers and local consultants, the functional system is in a good condition. The only critical comments that are made concern the drainage system and waste accumulation. Sometimes floods occur as a result of insufficient drainage. In addition, several farmers mention that some structures, such as a siphon, are regularly blocked by heaped up garbage.

The 'effectiveness of infrastructure' indicator gives a value of 71,5% for the Paguyaman system. The left system is 100% effective, since all 56 structures are functional. At the right side 32 out of 67 structures are functional as of now, being 47,7%.

All interviewees agree that there is enough water for both the left and the right side of the system. Some farmers state there is 'more than enough' water. As a result, the surplus of water sometimes results in floods.

§ 4.3.3 – Public participation Paguyaman

In the Terms of Reference document for the Soft Component activities (Euroconsult, 2010) it is stated that 190 WUAs have been established in the Paguyaman project area. In 2012, however, the local consultants in Paguyaman state that a total number of 47 WUAs is existing. The typical size of the WUAs is 100 to 200 hectares (LC Paguyaman, 2012). Local consultants say that four more WUAs are planned to be established in 2012. Usually one WUA is established per tertiary irrigation unit. However, if units are too large or too small, there may be deviated from this practice. A new target for the Paguyaman area is a final number of 57 WUAs (LC Paguyaman, 2011). In addition to the WUAs, twelve WUAFs are planned and two WUAFs at system level (one for Paguyaman Kanan and one for Paguyaman Kiri). The WUAFs are still in the process of being established. The WUAFs at system level are planned to be established in 2013.

The existing WUAs in the Paguyaman area usually organise one meeting per harvesting season, hence twice or three times per year. The meetings are attended by the majority of the WUA members. All WUAs mention they impose sanctions on members who do not attend a meeting, usually 25.000 to 50.000 rupiah. Sometimes, the departments for public works and agriculture of the regencies send representatives to attend the meetings. In addition to the meetings, where planting schedules and water distribution is discussed, *kerja bakti* are organised. The WUAs organise these community service gatherings once or twice a month, anticipating on the necessity for canal building or cleaning.

The WUAFs have a monthly meeting which is attended by the management boards of its member WUAs, the village head and government representatives. In case of urgent matters additional WUAF meetings are organised.

Since all farmers within the tertiary units are members of WUAs, both men and women are members. However, it is widely admitted that the involvement of women is not enough. Even though all WUA management boards have been chosen democratically, women have no management functions. Both local consultants and farmers state there are plans to involve women in organisational functions as well.

The financial situation of the WUAs depends on the payment of member contribution. No funding from the government is received and therefore the contribution is the only income. Typical contribution for a WUA is 5 kilogram of hulled rice (*beras*) per 0,25 hectares of wetland per harvest. Several farmers state that for them the financial situation of the WUA is not important: “It is important that there is enough water, we do not care about the money.” The funds of the WUAs are usually used for board member salary, assets for the group and a percentage is paid for main canal maintenance.

According to the Boalemo regency agricultural department, not every farmer is able to pay the contribution. As a result, the financial viability of the WUAs is limited. Small activities can be carried out by the WUAs but if bigger plans are made financial assistance from the government is needed. The goal is that the WUAs can completely finance themselves, but as of now that is not the case. Mr. Burhanuddin Aboi stresses that the pro-activity of the farmers leads to cost

reduction: “If the agricultural department plans to build a new 250 meter long canal, the cooperation of farmers makes it possible to realise a 400 meter long canal for the same price.”

The opinions about the involvement of farmers in the early stages of the irrigation project are diverse. Local consultants and government officials state that farmers have been involved since the early stages. A representative from the agricultural department of Boalemo says: “The farmers know more of the local area than we do, so at small area scales their opinions were taken into consideration since the beginning.” Farmers have a different experience of the course of events. All of the interviewed farmers say the government has been working on its own in survey, design and construction phases: “Because the farmers were proactive, we could have some influence, but the government never consulted us by themselves.”

Currently, the involvement of farmers in operation and maintenance aspects is clear. While the official tasks of WUAs are only related to the tertiary system, farmers say there is good cooperation with the government and they are ready to help with issues regarding the main and secondary canals as well. This gives a ‘sense of common ownership’ of the system and farmers are very willing to work together with each other and with the government to improve, maintain and operate the system.

Both WUA and WUAF leaders and the agricultural department agree that the responsibilities of the farmers associations should be extended. The leader of WUAF Pelita Abadi states that the PPA (water gate keeper) and PPB (weir gate keeper) are appointed by the government in Limboto. “That does not work well, since no quick response to the local situation is possible.” The WUAF leader says he already told the government a couple of times to transfer responsibility to the WUAF. In that way, a local person can be appointed to be PPA/PPB. This gate keeper is expected to be better able to respond quickly to the local situation. Until now, there has been no response from the government. When asking government officials about this matter, they state they agree about this plan. However, the statutes and regulations of the WUAF should be changed first.

§ 4.3.4 – Economic conditions Paguyaman

The poverty rate in the Paguyaman area has steadily declined over the past few years. For the year 2007, the regencies Boalemo and Gorontalo showed a poverty rate of 29,21% and 32,07%, respectively. These rates have dropped to 19,84% and 18,87% in 2010. The poverty line for 2010 is set at a per capita income of Rp. 212.873 in Boalemo regency and at Rp. 225.732 in Gorontalo regency. In the five districts Paguyaman project is located in, 10.125 out of 28.765 families, or 35,2%, are classified by the statistical agencies as ‘pre-prosperous’, which means they lack access to basic needs (BPS Boalemo, 2011; BPS Gorontalo, 2012).

Local farmers indicate that their income has increased considerably. Because the irrigation allows for multiple harvests per year, income levels show a clear growth. As one farmer points out: “Before, it was very difficult to pay for my children’s school. We only had enough money for food. Now the income has risen so I can pay for the school, and also buy a motorbike.” While rice

farmers used to do additional work in other sectors, such as holding cows or working for the sugar factory, rice farming now provides a sufficient income.

60 to 75 percent of the population of Boalemo and Gorontalo regencies is active in the agricultural sector and agriculture accounts for 41,24% of the gross regional product (BWS Sulawesi II, 2011; Dinas Pertanian Boalemo, 2010; TKPKD Boalemo, 2011). Improvement in production and income therefore has a considerable impact on the general income level of the local population.

§ 4.3.5 – Social conditions Paguyaman

According to the agricultural department of Boalemo regency, the farmers and WUAs are not entirely able to arrange the water distribution themselves and take full advantage of it. The government tries to help with this in order to increase fairness of water distribution and prevent conflicts. Mr. Burhanuddin Aboi: "Before project implementation, people used to be selfish. There was not always enough water so conflicts arose about the water division. Now there is enough water so conflicts occur not regularly anymore. However, the farmers still need help in order to arrange the water distribution adequately and fairly."

Farmers are generally content with the distribution of water and state that conflicts are not common. Shifting of responsibility for the water distribution from the government to the farmers' associations is seen as a valuable possible change.

As in Toraut, transmigration is an issue in Paguyaman. In Paguyaman, negative associations with the transmigration programme are not present. Local farmers state that Javanese, Sundanese, Balinese and Gorontalonese people are living together in good harmony. The original Gorontalonese population is inspired and motivated by the disciplined and hard-working newcomers. Local consultants see the same trend and say that the transmigrants are usually more advanced in the operation of the irrigation system and the employment of innovative planting methods. Mr. Burhan: "A mix of local people and transmigrants is useful to increase the agricultural production."

§ 4.4 – Jurang Sate

§ 4.4.1 – Agricultural situation Jurang Sate

Because Jurang Sate is an old irrigation system, virtually the entire project area has been cultivated. The infrastructure improvement component focuses on an area of 6.100 hectares (DGWR, 2008). The total system currently irrigates 10.646 hectares of farmland (BPS Lombok Tengah, 2011). According to the public works department an additional 167 hectares could be cultivated. This is however no target of the project.

The cropping intensity before implementation of the project, in 2006, has been 204,1% per year. In the wet season, paddy is harvested on 100% of the land. In the first part of the dry season, paddy (39,8%), maize (11,8%), soybean (8,0%) and peanuts (9,8%) are cultivated. In the second part of the dry season no paddy is produced and the harvest consists of maize (16,3%), soybean (8,2%) and peanuts (10,2%). This means that 30,6% of the land is left fallow in the first part of

the dry season and 65,3% in the second part of the dry season. The proposed cropping intensity for after project completion is 250%. This would be made possible by a slight increase of the cultivation of paddy and a significant growth of the production of other crops. In the wet season, still at 100% of the land paddy is targeted to be harvested. In the first part of the dry season, the production should consist of paddy (50% of the land) and other crops (50%). In the second part of the dry season on 50% of the land other crops should be harvested, while the remaining 50% remains fallow. The production of the other crops is planned to consist of 30% maize, 10% soybean, 45% peanuts and 15% mung bean (DGWR, 2008).

Currently the statistics show that 94,7% of the Jurang Sate area is harvested at least twice a year (BPS Lombok Tengah, 2011). Local farmers and consultants confirm this. In the upstream area usually a cropping pattern consisting of three times paddy is applied. Further downstream the water availability is less and farmers typically crop two times paddy and another crop in the second part of the dry season. Other crops include maize, soybean and peanuts. Local consultants state that it is not common in Jurang Sate for land to remain fallow in any of the seasons. However, in areas with less water it happens sometimes that the third harvest fails. Although farmers are discouraged to crop exclusively paddy, this is common practice in the upstream area. The economical value of a paddy harvest is larger than for other crops.

The productivity in Jurang Sate is targeted to increase. The average production of paddy per hectare has been 4,1 tonnes before the project. This is planned to be raised to an average of 5,0 tonnes per hectare. For other crops also increases are proposed. For maize the productivity should rise from 2,2 to 4,0 t/ha, for soybean from 0,8 to 1,5 t/ha and for peanuts from 1,6 to 2,0 t/ha. Mung beans have not been cropped before. The proposed productivity for mung beans is 1,5 tonnes per hectare (DGWR, 2008).

In areas where the system has been rehabilitated, the productivity has increased significantly. Farmers and local consultants estimate productivities around 5 to 6 tonnes per hectare. The agricultural department gives a yield rate of 5,2 t/ha (BPS Lombok Tengah, 2011). Local consultants stress however that several areas still show productivities below 3 t/ha because of a poor state of the infrastructure.

First results of SRI demonstration farms show significantly higher productivities. At two dem-farms in the Jurang Sate area respectively 8,15 and 6,75 tonnes of paddy per hectare was harvested in July 2011. The areas around but outside the demonstration farms showed average productivities of 5,1 and 4,5 tonnes per hectare (Euroconsult, 2012). One year later the SRI productivity values have increased further, to 9,2 and 8,0 tonnes per hectare in the two demonstration farms. Farmers outside the demonstration farms have started to adopt SRI and now 285 hectares in Jurang Sate use SRI (LC Jurang Sate, 2012a). A continuation of this trend is expected to raise the total production drastically.

§ 4.4.2 – System conditions Jurang Sate

The Jurang Sate weir and main canal have been rehabilitated as a part of DISIMP-I programme. The DISIMP-II programme focused on part of the secondary canals. From all of the structures in

the Jurang Sate system, approximately 65% has been rehabilitated as a part of the DISIMP-I and DISIMP-II programmes. According to local consultants almost half of the secondary canals are not rehabilitated yet. This, in combination with a largely broken tertiary system, impairs the functioning of the system. There are sedimentation and leakage problems in the tertiary canals and part of the secondary canals. In addition, some canals are broken because of strong water flows in the raining season.

Figure 14 - Picture of Jurang Sate main canal

Even though there is technically enough water in the system, some areas experience water shortage. This is foremost because of the state of the system with broken canals, sedimentation, garbage accumulation, vegetation in the canals and landslides. An additional issue is that farmers in the upstream area use extra water because they crop three times paddy per year. As a result the amount of water is the downstream area is limited. Another problem is that farmers have been constructing illegal offtakes in order to withdraw more water from the system. The water efficiency is reduced by this practice, thus the government aims to repair the illegal holes made by farmers. After reparation farmers often make the hole again, however. In order to avoid these incidents and to take better control of the situation, some of the illegal offtakes have been replaced by official offtakes. The local consultants state that, while it remains an issue, the incidence of illegal water tapping has reduced because of the system rehabilitation.

In short, all stakeholders agree that the situation has significantly improved since the beginning of the DISIMP-I project in 2005. While problems were apparent at the system scale before, now the main problems occur on the tertiary level. The problem of the tertiary system is that the farmers and WUAs are officially responsible for the maintenance. According to local consultants, the farmers are not financially capable of maintaining the canals and as a result many of the canals are left broken.

§ 4.4.3 – Public participation Jurang Sate

In the Terms of Reference document for the Soft Component activities (Euroconsult, 2010) it is stated that 76 WUAs have been established in the Jurang Sate area. The total target for the area is 132 WUAs, which means that 56 additional associations are proposed to be established. In June 2012, the number of WUAs has increased to 87 (LC Jurang Sate, 2012b). 8.253 hectares within the Jurang Sate area are covered by WUAs, meaning that for more than 2000 hectares no WUAs are established yet. The number of WUAs is therefore targeted to rise further. Considering that several WUAs still have high numbers of members – more than 400 – it is likely that some of the associations will be split.

Not all of the WUAs are active. However, most of the WUAs organise one meeting per paddy harvesting season. At the meetings usually the planting schedule and water distribution is discussed. If other crops than paddy are planned not always a meeting is held. Because less water is required for other crops a meeting is then not considered necessary. *Kerja bakti* are also organised several times per year, usually before planting.

Participation in WUA activities is by both farmers and local consultants estimated to be 50 to 75 percent. Some WUAs have official rules sanctioning non-attendance, other WUAs have informal rules that usually mean that non-attendees should take care of food and drinks at the next meeting. Officially men and women have equal opportunities for participation in WUAs. However, usually the head of the household is member of the WUA and in the majority of cases that is a man.

All of the WUA management boards are chosen democratically by the association's members. There are no women in the function of WUA leader, but several WUAFs and WUAs have women as secretary or treasurer.

While the WUAFs are already established, legalised and active, there is no WUAF at system level yet. The WUAFs work together to assume the tasks of the WUAF at system level. They regularly visit leaders of other irrigation schemes in southern Lombok and government officials in order to lobby for more water: "We go to Lombok Barat regency and give them food and cigarettes, so we can request more water from the HLD for our system." Farmers and local consultants agree that a formal WUAF at system level is needed to take on this type of activities.

Funding of the WUA activities is problematic. The only income of WUAs consists of farmers' contribution. However, with an average land ownership of 0,3 to 0,5 hectares per farmer their financial ability is low and therefore contributions are small. Currently virtually all of the collected money is used to pay the gate keepers who are appointed by the village government. There is no funding available for the WUA management board, system maintenance or other WUA activities. Farmers estimate that 85% of the WUA's money is spent on the gate keepers' salary. Local consultants plan to ensure the legalisation of all WUAs in the second half of 2012. This would enable the WUAs to have a bank account and take better control of the financial situation. For maintenance activities it is expected however that government funding remains necessary.

The involvement of farmers and WUAs in the irrigation project is rather limited. The plan making for and implementation of rehabilitation works of the main and secondary system is entirely done by the government. At the level of the tertiary system participation has taken place. Activities of *masuk lapangan bersama* ('entering the field together') have been organised in order to discuss plans with representatives of the farmers. In the current stage of operation and maintenance, the public involvement is also largely limited to the tertiary system. While WUAs or WUAFs sometimes take initiative to perform small maintenance at secondary canals, this is done without government cooperation. Farmers state they want to be involved, but the government

invariably works solitary without farmer involvement. As a farmer says: “Outside people make the decisions for us, we do not have anything to say about it.”

Operation and maintenance of the tertiary system is left by the government to the farmers. There is no participation as the government retreated completely from involvement in the tertiary system. Considering the low financial ability of farmers the maintenance is deteriorating. Farmers regularly perform canal repairs but because of shortage of money and technical knowledge the repairs are usually short-lived. Local consultants aim to reach a *mandiri* form of public participation, with government and farmers sharing the costs of O&M equally. However, currently the farmers are not financially capable and it appears that the government is not prepared for a participatory approach.

§ 4.4.4 – Economic conditions Jurang Sate

The poverty rate in Lombok Tengah regency has shown a steady decline since 2006. While the poverty rate was 28% in that year, the rate dropped to 19,9% in 2010. The poverty line for rural areas in West Nusa Tenggara province has been set at Rp. 210.046 per month. 45,9 percent of the population of Lombok Tengah regency is classified as ‘pre-prosperous’ and has no access to basic needs (BPS Lombok Tengah, 2011).

According to the DGWR (2008) the average income of farmers in the Jurang Sate area before project implementation was 5.775.000 rupiah per year. Directly after project completion this is targeted to have risen to 7.200.000 rupiah, while five years after the completion of the project the average farmer income should be 8.630.000 rupiah. Current income levels are not available. Farmers say their income is very small. The average land ownership per farmer is 0,3 to 0,5 hectare and most of the crops produced are for own use. Local consultants and farmers say that the additional harvests made possible by the improved irrigation make that a larger part of the production can be put on the market, which raises the income level. In the areas where the secondary system has not been rehabilitated yet, an increase of income did not take place.

In Lombok Tengah regency, agriculture counts for 32,6% of the gross regional product. This makes it the most important economic sector (BPS Lombok Tengah, 2011). An increase of agricultural production has a significant effect on the regional economy.

§ 4.4.5 – Social conditions Jurang Sate

Before the implementation of the DISIMP projects there were many conflicts in the Jurang Sate area. It was common practice for farmers and farmer groups to illegally tap off water from canals and take water that was intended for others. The leaders of the WUAFs state that currently there is good cooperation between the WUAFs and WUAs, and there is clear communication between the upstream and downstream area of Jurang Sate. As a result, conflicts are rare and if conflicts occur they can be solved easily. Within the tertiary units problems are more common. Because of the deteriorated state of the tertiary system, water distribution is faced with difficulties. Local consultants argue that clear WUA statutes should be created that state the method of handling conflicts between members of the association.

According to Ayi Sutari, farmers in the Jurang Sate area are experienced. In Lombok there is a 'paddy tradition' similar like in Java and Bali. For ages the population has been living from paddy farming so they are well able and motivated to adopt innovative agricultural methods like SRI. However, local consultants stress the importance of long-term guidance to farmers, both for SRI and institutional issues. Many farmers have been motivated to adopt SRI in recent years but the majority of their efforts failed because of a lack of guidance. The local consultants are afraid that the same will happen again if the guidance will stop at the end of the dem-farm project.

Chapter 5

Comparative analysis

The findings from the four case studies that have been described in chapter 4 provide insights in the situation of the irrigation projects and the advancement of public participation in irrigation management. In this chapter these cases, with mixed approaches and performances, will be compared and analysed. Lessons will be drawn on what led to success or failure in each of the cases. This is done in comparison with the literature and the Indonesian regulations (explored in chapter 2), in order to answer the sub research question *"To what extent are theoretical, regulatory and actual situations of PIM consistent?"* The first section compares the outputs and effects of the four irrigation systems. This includes the conditions of the systems, the agricultural production and the effects on the economic situation. In the second section the organisational characteristics are analysed, focusing on the establishment and functioning of water users associations. Section 5.3 handles public participation in relation to the theories of IMT and PIM. The fourth section discusses remaining issues that may influence the performance of irrigation projects in Indonesia. Finally, section 5.5 summarises the positive and negative issues encountered in each of the case studies.

§ 5.1 – Outputs and effects

§ 5.1.1 – System conditions

The scope of construction works has been different for the four case study projects. The subprojects Toraut and Jurang Sate consisted of the rehabilitation of an existing system. Both of these projects have been completed. Bena and Paguyaman covered the expansion of irrigation systems and the construction of new canals. These projects are still ongoing at the moment of study.

The systems of Paguyaman and Toraut are in a good condition. In both areas farmers only experience minor negative issues such as sedimentation and garbage accumulation. In Toraut some gates have been destroyed by farmers and miners. In Paguyaman insufficient capacity of some drainage canals causes incidental flooding. In Jurang Sate the parts of the system that have been rehabilitated are in a very good condition. Problem in this area is however that considerable parts of the secondary system and the entire tertiary system have not been rehabilitated and are in a deteriorated condition. Virtually the entire Bena system is in a poor condition, since the weir is broken and the main canal is interrupted because of landslides. The area that still receives water is in a good condition.

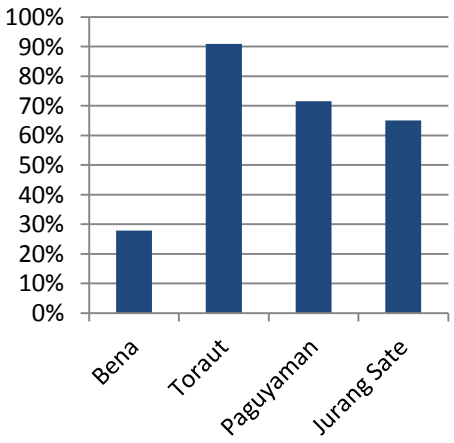

Figure 15 - Effectiveness of infrastructure values

Bos (1997) introduced the 'effectiveness of infrastructure' indicator for assessment and comparison of system conditions. The indicator does not give information about the importance of functional and dysfunctional structures nor about the extent to which a structure works properly. However, it gives an indication of the status of a system as a whole. Figure 15 shows the values for the effectiveness indicator. The values for Paguyaman and Bena will rise because of the still ongoing construction works.

The adequacy of water delivery differs per case study. In Paguyaman there is more than enough water, even resulting in floods once in a while. In Toraut and Jurang Sate the availability of water is sufficient, but because of suboptimal distribution of the water there are areas within these systems that experience water shortages. In Bena there is not enough water in the system. Even though only a small area is cultivated, water shortage is experienced which is caused by the broken condition of the weir.

§ 5.1.2 – Agricultural production

The target of the DISIMP-II programme is to increase the cultivated area in the project areas. For Jurang Sate no increase is planned since the whole area is already cultivated. In the other three case study locations land development should take place. Until now the programme does not have the desired effect. In Bena, Toraut and Paguyaman the cultivated area is smaller than in the situation of 2007 as stated by JICA. The situation in Bena is especially problematic considering that less than 30% of the targeted area is currently cultivated. The cultivated area in hectares is visualised for the four case studies in figure 16.

The cropping intensity is another issue that influences the agricultural production. In all of the DISIMP-II locations the cropping intensity is targeted to grow by adding more harvests per year of both paddy and other crops. In Toraut and Jurang Sate the cropping intensity targets appear to be reached and even surpassed. In Toraut only paddy cropping is planned, in Jurang Sate a mixed cropping pattern of paddy, maize and other crops is intended. These cropping patterns are carried out according to plan in both of the case studies. In Bena a cropping intensity of 270% is foreseen, cropping both paddy and maize, but in the cultivated area only paddy is being cropped and on average not more than two harvests per year are performed. The proposed intensity of 300% in Paguyaman is only reached in small areas. While the cropping pattern is planned to consist of both paddy and maize, most of the farmers only crop paddy. This may be a reason for the lower cropping intensity than was intended.

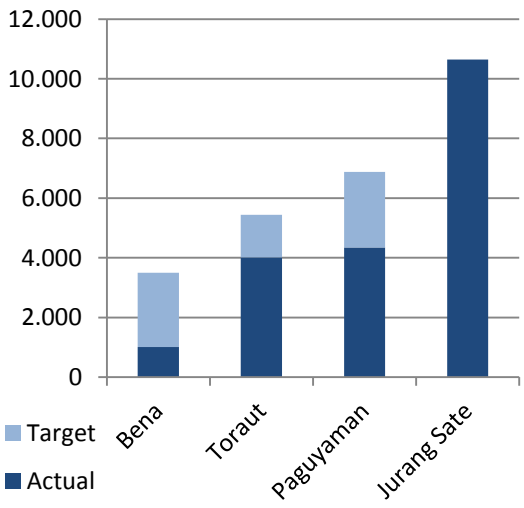

Figure 16 - Cultivated area in hectares, current situation and targets

The third aspect that determines the agricultural production is the productivity. Information about productivity is in particular available about dried unhulled rice (GKP)[3] but other sources give productivity information in hulled rice (*beras*). While some institutions, and farmers themselves, measure the productivity per harvest, other institutions measure the productivity per year. These issues make that different values are given that are difficult to compare. The change in percentage gives a more reliable indication of the situation.

The target of the DISIMP-II programme is to increase the average productivity in the fourteen subprojects from 4,0 tonnes per hectare to 4,6 tonnes per hectare, an increase of 15%. The average productivity of wetland paddy in Indonesia was 5,14 tonnes per hectare in 2011. In base year 2007 the productivity was 4,71 tonnes per hectare (DGFC, 2012). The average increase in Indonesia is therefore 9,1%.

Based on information from regional governments, local consultants and farmers, the productivity has increased in all of the case study locations. The most significant increase is experienced in Jurang Sate, where it is said the productivity was less than 3 tonnes per hectare before rehabilitation. Now the yield rate is 5 to 6 tonnes per hectare with an average of 5,2. It should be remarked that several areas of the system that have not been rehabilitated yet still show productivities below 3 tonnes per hectare. In Paguyaman and Bena increases are recorded, respectively from 4,2 to 5,2 t/ha and from 3,0 to 4,0 t/ha. The official numbers in Toraut show a decrease in productivity, from 7,17 tonnes per hectare per year to 5,32 t/ha/year. However, farmers and local consultants experienced an increase in production so an error in the official numbers is likely. In figure 17 an overview of productivity increase is given. The percentages are indicative only since numbers are partly based on farmers' experience. The result for Toraut is omitted since quantitative and qualitative data radically contradict. General conclusion is that the average growth in productivity is higher than the DISIMP-II target and far higher than the Indonesian average.

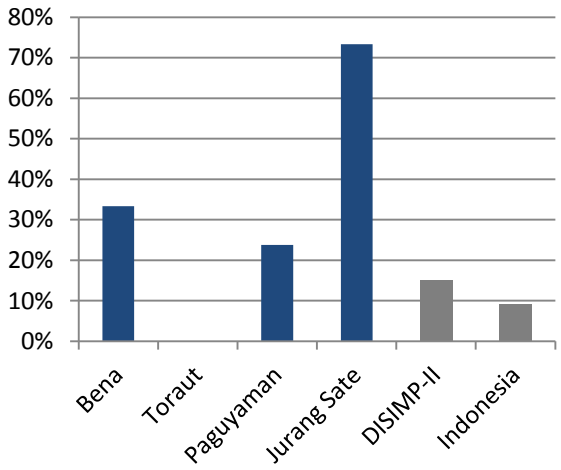

Figure 17 - Increase in productivity

Since the production is determined by the cultivated area, cropping intensity and productivity, these issues have been considered. In addition, the cropping pattern is examined and compared to the initial plan. Most positive outputs are found in Jurang Sate where the cultivated area is maximal, the cropping intensity and productivity increased and the cropping pattern complies with the target. The other projects show some positive aspects, in Bena especially regarding the

[3] In English, the word 'rice' is used for the plant, the crop and the food. The word 'paddy', a loan word from Malay and related to the Indonesian word *padi*, is sometimes used to describe the plant and the crop. In Indonesian, there are different words for the plant (*padi*), the crop (*gabah*), the crop after hulling (*beras*) and the food (*nasi*). Productivity is usually measured in tonnes per hectare for *gabah kering panen* (GKP, dried unhulled rice harvest). The moisture content of GKP is determined between 18 and 25 percent.

productivitiy and in Toraut and Paguyaman the increase of cropping intensity. Most alarming issue is the decrease in cultivated area in these three subprojects and in Bena the total disobedience of the planned cropping pattern. The total production has grown in all case studies except Bena.

§ 5.1.3 – Economy and poverty

Donor organisation JICA set up economic monitoring indicators for the DISIMP-II programme. Between 2007 and 2018 the average annual farmers' income should rise from 4.154.000 to 10.252.000 rupiah. In the same timeframe the poverty rate in the project areas should decrease from the average 32% recorded in 2007

The poverty rate in the DISIMP-II project areas in 2007 is far higher than the poverty rate of 20,4% in rural Indonesia in that year (SAPA, 2011). The poverty rate in rural Indonesia has showed a steady decline since, making 16,56% in the year 2010. While JICA's indicator simply aims reduction of the poverty rate, the development of the poverty rate in relation to the autonomous development in rural Indonesia is more relevant. As Hussain et al. (2006) concluded, irrigation reduces the incidence and depth of poverty. Table 4 shows the poverty rates for the four case study locations in 2007 and how these changed by the year 2010. It is clear that in all of the locations the decline in poverty rate was greater than the Indonesian average. It can be assumed that the DISIMP-II programme succeeds in poverty alleviation. In figure 18 the development of poverty rates in the four case study locations and average rural Indonesia is visualised.

Table 4 - Changes of poverty rates

	DISIMP-II	Rural Indon.	Bena	Toraut	Paguyaman	Jurang Sate
2007	32	20,37	37,43	13,2	30,64	25,74
2010	-	16,56	28,71	9,7	19,36	19,92
Change	Reduced	-18,7%	-23,3%	-26,5%	-36,8%	-22,6%

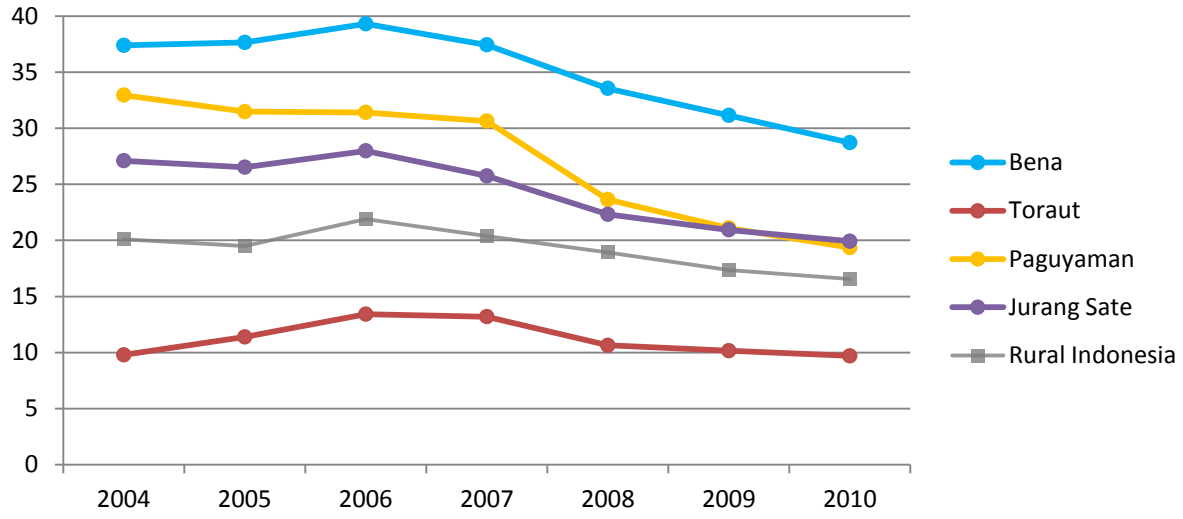

Figure 18 - Graph of poverty rates

The poverty rate in Toraut is well below the average, the other three locations are however considerably poorer than average. Especially Bena shows a very high poverty rate and poverty is a serious issue here, based both on numbers and observation. The DISIMP-II programme shows its ability to alleviate poverty. In all four of the case study locations experiences are positive regarding the increase of farmers' income. The income mainly grew because of added harvests per year. SRI has shown its potential of income growth in all of the case study locations but in Bena and Toraut only at a small scale of a few hectares. Concrete and widespread effects of the DISIMP-II project are not yet present in Bena. The irrigation system works only partly and productivity is limited by a lack of knowledge and motivation, water delivery issues, insects and plant diseases. However, results on a small scale up to 12 tonnes per hectare show the potential.

Improved agricultural production is in all of the case study locations important for the regional economy at large. Agriculture is the largest contributor to the gross regional product and the largest absorber of the labour force. The share of the gross regional product resulting from agriculture per case study location is presented in figure 19. The situation for the GDP of Indonesia as a whole is given for comparison (BPS, 2012). The lower value in Jurang Sate is caused by the strong tourism sector in Lombok Tengah regency. The percentage of the working population working in the agricultural sector is in all of the project locations higher than 50%. In Amanuban Selatan district, in which Bena is located, 96,5% of the population works in agriculture.

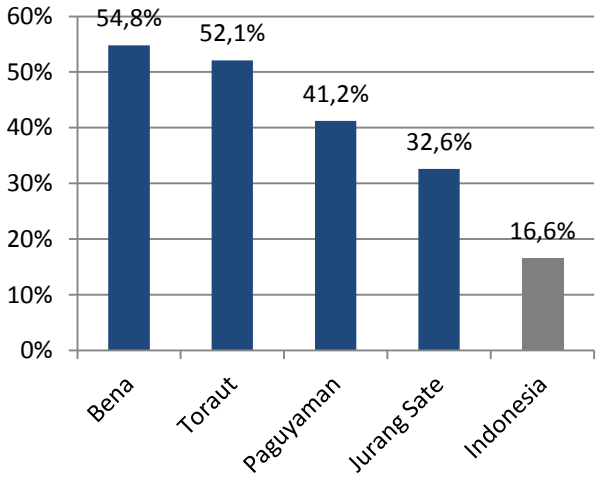

Figure 19 - Share of gross regional product resulting from agriculture

§ 5.2 – Organisation

§ 5.2.1 – WUA coverage

The importance of WUAs is acknowledged in international literature as well as Indonesian regulations. The establishment of WUAs and WUAFs is mandatory for every irrigation system in Indonesia.

According to Euroconsult (2010) the average size for a WUA is supposed to be 80 to 85 hectares. Uphoff (1986) however states that a farmers' organisation should not exceed 40 hectares. Subramanian et al. (1997) say that opinions about optimal WUA sizes differ widely, between 2 hectares and 80.000 hectares. Irrigation schemes in Southeast Asia tend to have smaller WUAs than irrigation systems in Latin America, for example. Several local consultants have indicated that the most favourable size for a WUA in Indonesia is around 80 to 100 hectares. A size of 85 hectares therefore appears to be a reasonable benchmark value.

Figure 20 presents a visualisation of the current active and proposed WUAs and the number of WUAs that would be planned based on the area of the irrigation system. In Toraut all WUAs that have been planned are already established. Not all of these associations are active, however. For the other three case studies not all of the planned WUAs have been established and especially in Bena the percentage of active WUAs is low. The planning for WUAs in Toraut and Jurang Sate is in line with the average organisation size stated by Euroconsult. In Paguyaman and Bena there are less WUAs than the area would suggest, meaning that the WUAs in these systems have a large average size. Activation of WUAs is planned to be well advanced in Bena, Toraut and Paguyaman by the end of 2012. In Jurang Sate there are no concrete plans for the activation of the remaining associations.

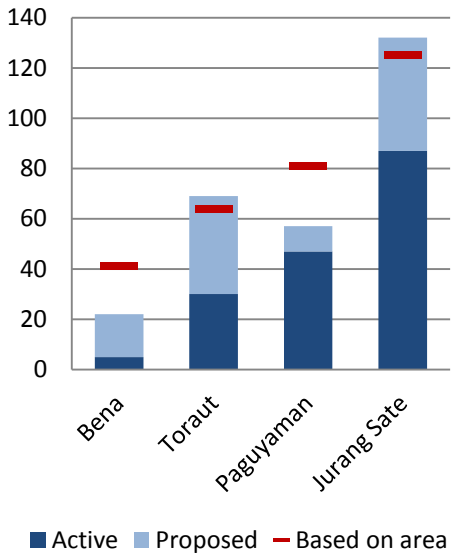

Figure 20 - Number of WUAs

The proportion of WUAFs established is various as well. In Toraut and Jurang Sate all of the planned WUAFs have already been established, respectively four and ten. In Bena only one out of five planned WUAFs is established and in Paguyaman two out of twelve. Toraut is the only subproject where a system level WUAF is active. In Paguyaman two system level WUAFs are planned to be established in 2013. In Bena there is a plan for a system level WUAF but no schedule for implementation yet. In Jurang Sate there is no concrete plan for the establishment of a system level WUAF, however both local consultants and farmers endorse the need for such a federation.

§ 5.2.2 – Regular meetings

Figure 21 shows an indication of the average number of meetings and kerja bakti that are organised by the associations in the four case study locations per year. The active WUAs as identified in the previous section all organise meetings and *kerja bakti*. The number of meetings differs widely. While there are not many WUAs in Bena, the existing associations are very active and organise a meeting every month and *kerja bakti* two or three times per month. In the other case studies a meeting is held once per harvesting season and in Jurang Sate the meeting of the third season is often considered unnecessary. While *kerja bakti* are held at least once per month in Toraut and Paguyaman, in Jurang Sate this happens only "several times per year".

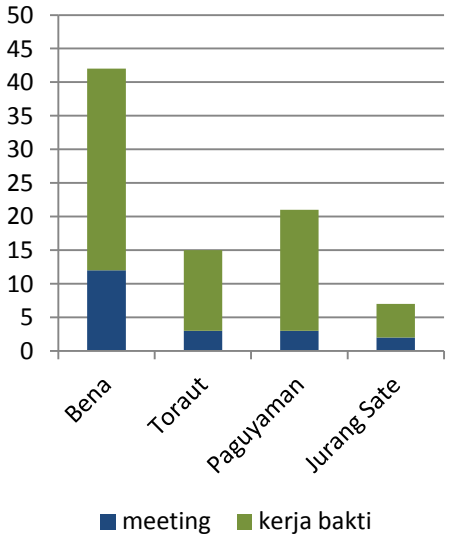

Figure 21 - Average number of WUA meetings and kerja bakti organised

Although two or three meetings per year might be enough in order to arrange the water distribution and planting schedule, it may be advisable to organise more meetings in order to increase the cohesion of the association. In that way emerging problems may be identified in an early stage and conflicts can be avoided.

In all of the subprojects the WUAFs usually organise one meeting per month. These meetings are attended by WUA board members and government officials. WUAFs normally do not organise *kerja bakti*, with the exception of Bena where a WUAF manages gatherings for repairing the weir.

§ 5.2.3 – Participation in WUAs

WUA membership is usually determined per household. The head of each household in the farming community is member of the association. In all of the subprojects except Toraut all of the farmers, or someone else in their household, are member of a WUA. In Toraut not all WUAs have been restructured and as a result not all farmers are included in the associations yet. Since the head of the household is usually a man, more men than women are WUA members. This is in line with the risk as pointed out by Meinzen-Dick and Zwarteveen (1998), who also stress that formal non-involvement does not necessarily mean that women have no influence. In all of the case studies it is said that the member involvement is the same for men and women, so it is apparent that women act as 'back-stage actors'. It should be considered to adjust membership rules in order to formalise the involvement of women, for example by allowing two memberships per household.

In the management boards of the WUAs women are less involved than men. In Toraut there are no women in management boards at all and in Bena and Paguyaman farmers agree that the involvement of women is not enough. Jurang Sate is a positive exception with many women involved in the boards. No women are WUA leaders but many associations have women as secretary or treasurer.

The disadvantage of citizen participation that several groups are usually more involved than others has not proven applicable in the case studies. This issue, called 'the power of wrong decisions' by Irvin and Stansbury (2004) is feared in case some citizens are higher-educated, wealthier or more powerful than others. In the case study locations it appears that involvement is more or less equally shared. Farmers are fairly similar with regard to education, ownership and wealth. Therefore, the only inequality that needs attention is gender inequality.

The attendance at meetings is high in Bena, satisfactory in Paguyaman and Jurang Sate and low in Toraut. In Bena, Paguyaman and Jurang Sate sanctions are imposed for non-attendance. This increases the attendance rate at meetings and *kerja bakti*. The attendance rates are therefore low in Toraut since no sanctions are imposed. A typical sanction is a sum of money with a value of one day labour, usually between 10.000 and 50.000 rupiah, or an alternative task such as the arrangement of consumptions at the next meeting.

§ 5.2.4 – Financial viability of WUAs

It is essential for sustainable participative irrigation management that farmers meet their financial obligations (Hamada & Samad, 2011). Financial obligations could include an irrigation water fee to the government but in the situation of the case studies there is no anticipation of such fee collection. A financial obligation is however the payment of a membership fee for the WUA. According to the literature, WUAs often face difficulties in the collection of fees and as a result they experience financial weakness. An additional problem is that it results in unfair cost sharing, since not all of the farmers pay for the delivered service. Reasons for difficulties in fee collection include:

- Lack of awareness about the reason to pay. "If people know that things can be received for 'free', they tend to spend their energy and skill chasing free products" (Herbel et al., 2012, p.80).
- No sanctions against farmers who do not pay. It is vital that non-members and non-payers can be excluded from the service (Vermillion & Sagardoy, 1999).
- Lack of capacity to collect membership fees, and a lack of awareness among the members that they need to pay. WUA managers do not always have the skills and competence necessary to undertake a fee collection process (Le Gal et al., 2003).
- Problems of rice and cash availability: Since membership fees are usually paid in cash or in rice, the farmers need to have this available in order to be able to pay. However, in poor rural areas the available resources might be needed for sustenance of the family, making the payment of membership fees of lesser importance for them.

The financial viability differs for the four case studies. In Bena and Paguyaman the financial situation of the existing WUAs is thought to be healthy. In Bena farmers pay on average 100.000 rupiah per year and in Paguyaman the membership fee is 5 kilogram *beras* (white rice) per 0,25 hectares of farmland per harvest. In both locations the WUA uses the money for the salary of the management, salary of supporting staff, payment to the village government and (mostly) for assets for the group, such as tools and construction materials. Although the WUAs are financially viable, the participation level of *mandiri* (see section 2.3.2), which is foreseen by the Indonesian government, is not reached. The WUAs are able to carry out small maintenance but for more substantial activities funding by the government is necessary.

The situations in Toraut and Jurang Sate are deficient. In these case studies the amount of money collected from the farmers is insufficient. In Toraut it is said that many farmers are not able and not willing to pay. In Jurang Sate the average land ownership per farmer is small and as a result their ability to pay is little. The WUAs do not have the required funds to pay for all matters related to the WUA's tasks. In Toraut the WUAs use all of their money to buy tools and materials for the *kerja bakti*. In Jurang Sate all money is used for the payment of the gate keepers. The issue in Toraut that farmers are not willing to pay can be solved by increasing awareness, for example by the local consultants. Farmers' inability to pay is more difficult to solve.

Financial support from the government to the WUAs, which is also a goal in ministerial regulation 33/PRT/M/2007, is not provided in any of the case studies. In Toraut the government

says it aims to set up contracts with all of the associations for maintenance funds, but until now this only took place for the system level WUAF. In Bena the government promises that the WUAs will receive government funding as soon as the associations' statuses are legalised. In Paguyaman and Jurang Sate there is no plan for government donations.

§ 5.2.5 – Water distribution

In addition to the availability of water, discussed in section 5.1.1, also the actual distribution of the water influences the functioning of the system. The water distribution generally depends on the skills and knowledge of the gate keeper and on the cooperation, probity and discipline of the water users.

A main problem in the case studies is the discipline of the farmers. Gerards (1995) states that imposition of order and discipline is necessary for providing reliability and equity of water distribution. Figure 22 shows a schematic example of farmers' discipline. In case of disciplined planting (example *a*), all farmers within a tertiary unit (or higher level group) plant paddy at the same time. In this way, they need irrigation water for their crops in the same amount at the same time. There is a clear schedule whit tertiary units planting at different times, so that farmers from different units need water at different moments. Example *b* shows inter-group disorganisation. While the farmers within the units are organised and disciplined, there is no clear water distribution schedule possible, since several units planted at the same time and therefore need water at the same time. Intra-group disorganisation (example *c*) encompasses the lack of discipline within tertiary units. Not all farmers within the group plant at the same time. While the majority of the group follows the schedule of planting, which makes water distribution between tertiary units possible, some farmers are not disciplined and therefore the water delivery may not suit the stage of their crops. Example *d* shows a situation of total chaos in which both inter-group and intra-group discipline is lacking. This makes it impossible for a gate keeper to make a beneficial division of water.

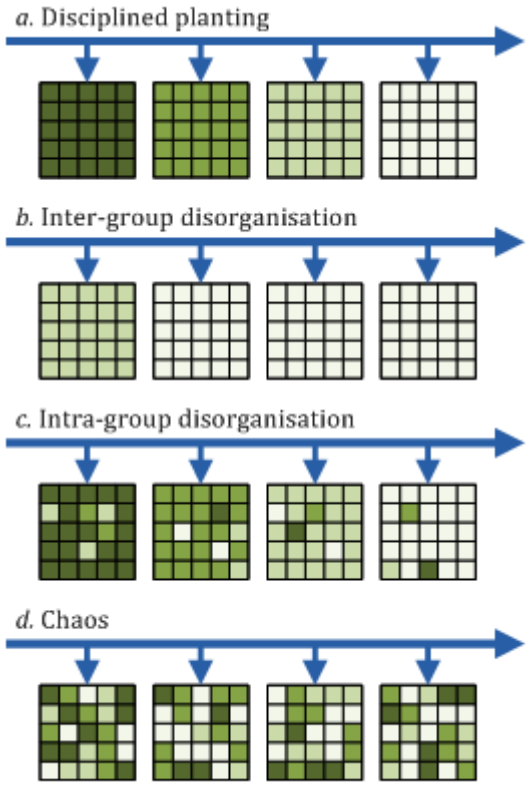

Figure 22 - Schematic example of farmers' discipline

In all of the case studies there are disorganisation issues. Intra-group disorganisation is especially a major issue in the downstream area of Toraut (*golongan* IV). Farmers in the area do not follow a schedule. Water is scarce in this area and because of the lack of discipline the available water is used inadequately. In Jurang Sate farmers are well able to organise intra-group

discipline, but inter-group disorganisation makes that fields in the downstream area often experience a lack of water. In both Bena and Paguyaman the inter-group and intra-group organisation is not optimal and the gate keepers are unable to provide water adjusted to the situation.

The knowledge and skills of the gate keepers are insufficient in some of the cases as well. In Bena it is said that water delivery is inadequate because of a lack of technical capability of the gate keeper. The gate keeper for the upstream area in Bena shirks from his responsibilities and lets the WUAs and WUAF carry out his tasks. Obviously, within the associations the capability is insufficient too. In Paguyaman discontent is felt towards the water distribution because the farmers feel the gate keeper is too far away. The gate keeper is a government official who stays "far away in the city". Concrete and urgent issues of water delivery are not easily handled. Farmers would prefer that the WUAFs take responsibility over gate keepers.

A final issue in water distribution is the cooperation of water users. While the irrigation systems are designed for a specific distribution of the water, water users attempt to alter the system in order to receive more water themselves. In Paguyaman and Jurang Sate there are cases of farmers constructing illegal offtake gates or boring holes in the canals. While this is an issue of civil disobedience, it might also signify shortcomings in the original canal design since farmers believe the water distribution is not fair. In Toraut there have been incidents of farmers forcing offtake gates to open. This indicates discontent with the operation of the system. In addition, water is taken from the irrigation system for non-agricultural activities, such as fish ponds and small factories. These cases of water theft lead to a water shortage for the agricultural activities.

§ 5.2.5 – Conflicts

Conflicts and disputes may arise as a result of unfair water distribution. Mukherji et al. (2009) presume that participatory irrigation management reduces the frequency of disputes. WUAs are expected to allow for discussion and open problem solving, which prevents conflicts to arise. In case conflicts do occur, WUAs should have the power to apply sanctions against members for non-compliance with rules (Vermillion & Sagardoy, 1999).

In Bena, Toraut and Paguyaman it is said that conflicts do not arise because of local culture. It is uncommon to express negative feelings (Toraut and Paguyaman) or to show dismay to superiors (Bena). However, in all of these locations feelings of discontent do exist, towards other farmers or to the gate keeper. Even though the local cultures prevent conflicts to arise, WUAs should discuss any feelings of discontent in order to be able to solve problems in an early stage. This takes away negative feelings, improves functioning of the WUA and enables to improve the system and increase production.

In Jurang Sate many conflicts occurred prior to the rehabilitation of the system. Currently there is good cooperation on the main canal level and conflicts do not arise. However, on the tertiary system level there are many conflicts since the water delivery is insufficient. There is agreement that the WUAs are the appropriate body to solve these issues but at present the associations are unable to do so. Ministerial regulation 33/PRT/M/2007 points out that every WUA should have

bylaws which state what kind of sanctions will be applied for violations. In none of the cases a WUA has ever imposed sanctions, except small sanctions for non-attendance at meetings.

§ 5.3 – Public participation

The participation of farmers in the planning, operation and management of irrigation systems is theoretically a way to reduce costs and improve performance. As a result, in many countries farmers' participation has been promoted. Indonesia has formally been introducing participation since 1999. As explained in chapter 2, participation can take many forms and can be implemented to different extents.

§ 5.3.1 – Participation in the tertiary system

The Indonesian laws and regulations leave the responsibility for the tertiary system level entirely with the WUAs. A participation level of *mandiri* (level IV) is foreseen. This means that the government retreats from involvement in the tertiary system, except for financial aid in the form of a donation of 50% of the required funding. The other half of the payment should be done by the WUA itself. In the spectrum of participation introduced in chapter 2, substantively *mandiri* is a form of 'autonomy' (which is the literal meaning of *mandiri*), since the government transfers the entire responsibility to the farmers while maintaining some basic influence through regulatory arrangements and possibly giving advice to the farmers. Although the costs are supposed to be equally shared between the government and the farmers, this does not mean this can be qualified as 'partnership'. Government funding is done in the form of a donation to the WUA, meaning that the farmers' association has the responsibility for the use of this money.

In all of the case studies WUAs are involved in the tertiary system. This is however not done according to the regulations. Operation and maintenance of the tertiary system is in all of the case studies the responsibility of the farmers or the WUAs. Planning and construction however have been undertaken by the government in several instances. In Jurang Sate the government has been active in the tertiary system, only involving farmers by means of *masuk lapangan bersama*, in which government plans were discussed with representatives of the farmers. Financially the situation is nowhere near the *mandiri* level. In all of the case study locations WUAs do not receive financial support by the government. Farmers are not able to finance large maintenance activities. Therefore, in the case that large maintenance has to be carried out this is financed and implemented by the government. In practice therefore, we can say that the level of citizen participation at the tertiary system is 'autonomy'. However, in the case that the WUA is not able of carrying out a certain tasks, the government applies this task by itself, falling back merely on a level of 'consultation'.

Although there are differences between the case studies, the general situation is similar. The government is willing to give farmers the responsibility over the tertiary system, but not to provide the required financial aid. As a result, the farmers are unable of carrying out the vital tasks. Instead of partnering with the farmers in order to fulfil these tasks, government bodies take over the entire task and implement it with very low levels of citizen participation.

§ 5.3.2 – Participation in the main and secondary system

The main and secondary canals are handled together by the Indonesian law. These are the responsibility of the government. Depending on the size, importance and location of the irrigation system the responsible government level is national, provincial or regency. Farmers and WUAs do not have any official responsibility or influence upon the main and secondary system. However, the regulations also state that farmers should be encouraged to participate in all stages of development and management of the system. The extent to which farmers should be involved is rather vague. The regulation PP 20/2006 gives suggestions for participation but leaves open room for interpretation. Basically it is said that participation can involve donations of thoughts, ideas, time, energy, materials and funds, it can be done through a WUA but also by farmers individually, and it can be done if farmers are willing and able to cooperate. Every statement in article 26 of the regulation uses phrasing that keeps the possibility for the government to eliminate participation. As a result, the regulation is nothing more than an encouragement for participation.

Even though the obligation for farmer participation in the main and secondary system is limited, the regulation shows an approach that rules out pure bureaucratic decision-making. The regulation says the participation gives a "spirit of partnership and autonomy". 'Partnership' or even 'autonomy' as meant in the participation spectrum is however not enabled. Depending on the enthusiasm and commitment of the relevant government agency, the participation level in the main and secondary levels will be 'consultation', 'involvement' or 'collaboration'.

The extent of participation differs for the four case studies. In Bena and Jurang Sate, there has been no participation in the development phase of the systems. A farmer in Jurang Sate says: "Outside people make the decisions for us, we do not have anything to say about it." This means the actual participation level has been 'bureaucratic decision-making' or 'informing'. In the operation and maintenance phase the approach of the government remained the same. Farmers are dissatisfied and in order to improve O&M sometimes they take own initiative. For example, in Bena farmers worked together to repair the weir and in Jurang Sate farmers undertake cleaning activities in secondary canals. In the O&M phase the participation level is therefore both 'bureaucratic decision-making' or 'informing' (by the government) and 'individual management' (by the farmers). Both the government and farmers are involved, but without cooperation.

In Toraut and Paguyaman farmers have been involved in the development phase of the irrigation project. However, the participation has been limited. In the case of Toraut the government was in contact with some representatives of the farmers, in order to discuss the plans. In Paguyaman farmers took initiative to discuss with the government about the developments. The participation level in the first stages in these two subprojects can be described as 'consultation'. The government listened to the farmer community but did not surrender any control. In the operation and maintenance phase, the situation in Toraut and Paguyaman is different. In Toraut a government official states that farmers are incompetent to participate in activities at the main and secondary system level. Within the government there is disagreement about the need for more farmer participation in the future. In Paguyaman on the other had both government and

farmers say that there is good cooperation. The farmers have a 'sense of common ownership' regarding the main and secondary canal. Although the government is responsible, it is willing to let famers participate and farmers are enthusiastic to be involved. This participation level is 'collaboration'.

§ 5.3.3 – Participation level

In section 2.1 the functional and physical scopes of irrigation management have been set out. Even though six functional aspects have been introduced, in practice this number can be reduced to two for the analysis. Operation and maintenance will be combined in one aspect (O&M). Financing and evaluation is included in both of the aspects (i.e. financing for and evaluation of system development are included in the development aspect). Decision-making is discussed in the next section. Physically, the main and secondary system level can be combined because both the Indonesian law and the actors in the case studies consider these system levels together.

Figure 23 gives an indication of the levels of participation in the four case studies. The situation in Bena and Jurang Sate is similar so these are combined. The black dotted lines indicate the desired situation according to government regulation, as introduced in section 2.6, and the green shading designates the participation level.

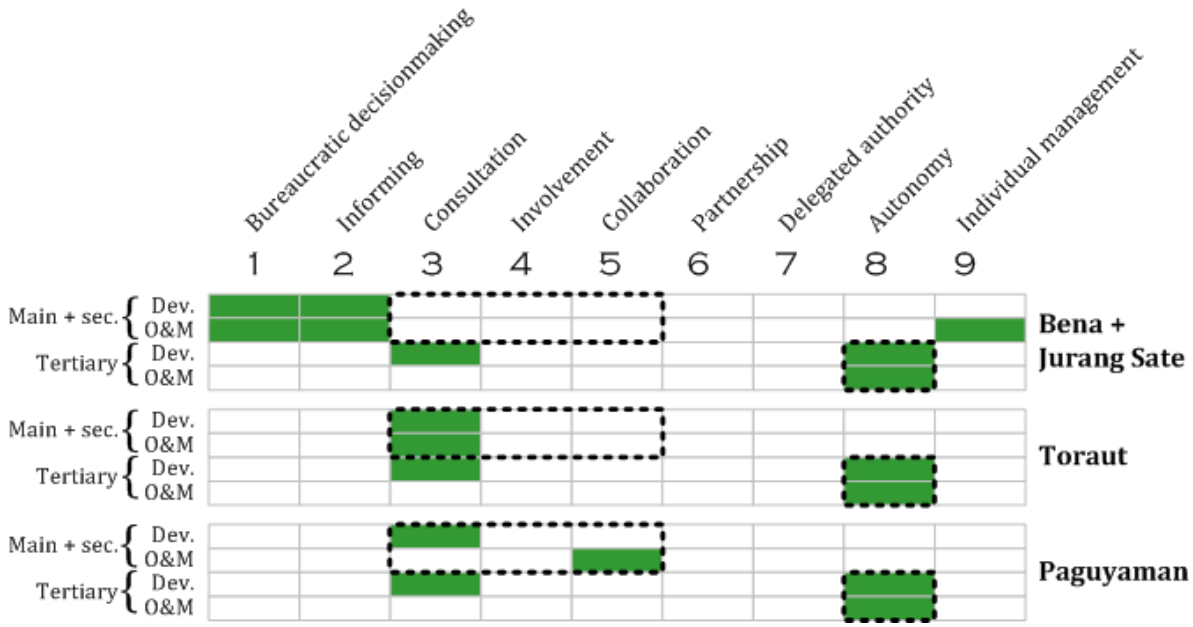

Figure 23 - Participation levels in the case studies

The situation in the tertiary systems is to a certain extent in line with the government regulation. However, the government abruptly jumps to a non-participative approach, such as 'consultation', in case the farmers are not able to pay for canal building or large maintenance. The situation for the main and secondary canal level is different per case study. In Bena and Jurang Sate no participation is carried out, hence the green shading in the figure is located outside the dotted line. In Toraut and Paguyaman the situation is in line with government regulation. While participation in Toraut is minimal, in Paguyaman collaboration between government and farmers is as desired according to the government regulation.

In general it can be concluded that the participation of farmers is less than planned in the governmental regulations. An obvious reason is the aversion of government officials to surrender part of their power. This issue is mentioned by many scholars (Irvin & Stansbury, 2004; Svendsen et al., 2000). It is expected that these sentiment are existing in many government agencies, although officials are not likely to admit this. Another reason, which is given in all of the government organisations, is the expectation that farmers are not able to manage the system well. According to Howarth and Lal (2002) this can result in a vicious circle: government bodies feel they have to build or rehabilitate a system themselves, because farmers are not able to do so. As a result, farmers will believe that their involvement is not necessary since the government will take care of the irrigation system. The expectation by Sehring (2007) that farmers sometimes think WUAs are special departments of the local government has proven to be not true in the case studies. Farmers are well aware of the fact that the WUA is an independent organisation, so this is no reason for lagging participation.

§ 5.3.4 – Decision-making

Decision-making, or governance, includes organisational aspects such as the election of representatives, the establishment of associations' bylaws and operational policies. In all of the case studies these activities are carried out through the WUAs. There is no government interference in these issues. The election of representatives is done by consensus decision making in Toraut. In the other case studies a voting process is carried out.

The factors that are essential for sustainable WUAs, as described in section 2.3.3, are generally met. Although the objectives and functions of the WUAs are commonly limited, it is clear what they are. Also, the WUAs are autonomous in the sense that the government does not have control over the association's activities and accountability is assured because leaders are chosen through a democratic process. The risk mentioned by Van Vuren et al. (2004), Bruns (2005) and Sehring (2007), that WUAs are dominated by local elites such as village heads, has not become reality in any of the case studies. Several of the farmers mention that the influence of village heads and other local elites has decreased since the existence of the WUAs. Although financial resources are limited the WUAs usually have a clear administration of their finances, and there are sufficient measures for protecting the money (for example that the money can only be taken from the bank if all of the board members sign a request).

The necessary legal status for WUAs, also introduced in section 2.3.3, has not been reached for many of the associations. Basic activities, such as the operation of the tertiary system and collecting membership fees, can be carried out. However, because many WUAs have no legal status they cannot enter into contracts or own property. Although most of the WUAs are known by local consultants and the regency's agricultural department, it appears to be difficult to arrange legalisation. This may be partly caused by the administrative confusion (discussed in section 5.4.2) since it is not always clear on which level the WUA has to be legalised. For example, in Toraut several WUAs have been legalised by the district head (*camat*), while in Paguyaman WUAs have been legalised by the regent (*bupati*).

§ 5.4 – Other issues

In addition to the issues above, based on the indicators used during the case study research, also other issues appear to be influencing the success of irrigation systems. In this section consecutively the issues of 'paddy culture', transmigration, administrative confusion and SRI adoption are discussed.

§ 5.4.1 – Paddy culture and transmigration

In Jurang Sate it was brought up that the local population has a real 'paddy culture'. Rice has been the staple food in Lombok, and also in Java and Bali, for centuries. Other islands, including Sulawesi and Timor, used to have other staple foods such as potato, cassava, maize and sago. In Lombok this is seen as a reason that Javanese, Balinese and Lombok people are more advanced in paddy farming and better capable of adapting to innovations. This might be an explanation for the relatively high adoption of SRI in Jurang Sate, compared to the other case studies. This is further explored in section 5.4.3.

Considering the 'paddy culture' of Java and Bali, the transmigration programme by the Indonesian government could disseminate this culture to the outer islands. Major goals of this programme have been to reduce the population pressure in Java and Bali, to alleviate poverty and to utilise the potential of the outer islands. The transmigration programme has been criticised strongly by national and international scholars and organisations. The main goals of the programme are hardly reached and the movement of people leads to pressure on the natural environment and local cultural values in the outer islands (Adhiati & Bobsien, 2001). However, a positive effect of transmigration could be the transfer of knowledge from advanced Javanese and Balinese farmers to improve the less sophisticated farming techniques of local populations in outer islands.

Transmigration has taken place in two of the case study locations, being Paguyaman and Toraut. The experience in Paguyaman confirms the suggestion above that transmigration has a positive effect. The local population is inspired and motivated by the hard-working transmigrants, and the mix of local people and transmigrant is thought to increase agricultural production. In Toraut the opposite is true and the transmigrants adopt the inferior practices of the local population, instead of vice versa. Since this proves that transmigration can have positive effects, but not necessarily, it is advisable that transmigration in an irrigation area is guided. Trainings for farmers could be organised in order to increase their capabilities to the level of the transmigrants, after which they can be directed by the newcomers. This can avoid that the transmigrants fall back to inferior agricultural methods.

§ 5.4.2 – Administrative confusion

Especially in Bena, but also in the other case study locations, the problem of administrative confusion is mentioned. The authority and responsibility of different government departments and agencies is not always clear and officials dismiss responsibility because it is easy to blame other departments. Figure 24 gives an overview of actors in the development and operation of irrigation systems in Indonesia, based on the experience of the four case studies. This is largely

in line with the situation as set out in government regulation PP 20/2006. District and village governments are not legally involved in the irrigation sector but in practice they become involved, especially in issues related to farmers' training and participation. In addition to the governmental actors mentioned in the figure, many other actors may be involved. In the case of the DISIMP-II project these are most notably the donor organisation JICA and the supervising consultant.

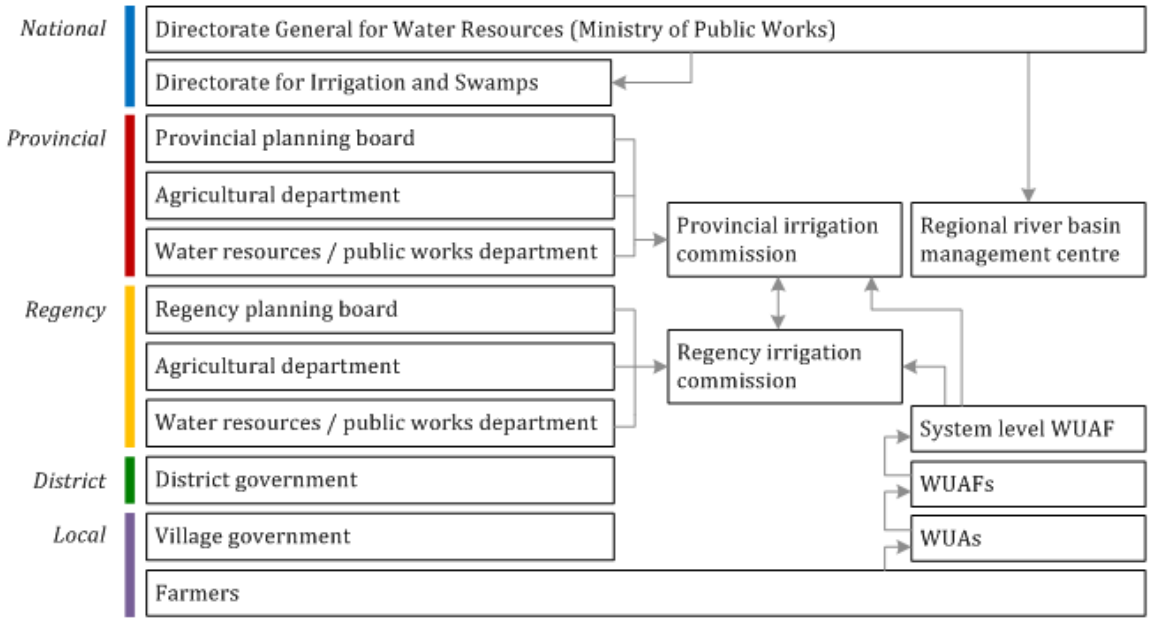

Figure 24 - Actors involved in development and operation of irrigation systems in Indonesia

Exel and Soffer (2007) point out that administrative confusion may lead to slow processes and substandard outcomes of policy and implementation. This is true in the case of irrigation projects in Indonesia. There is uncertainty about the responsibility for several issues. For example, government officials in South Central Timor regency are ambiguous about the responsibility for land development in Bena, with the agricultural and public works departments pointing at each other. This is not defined in government regulations, in which is just mentioned that the development of irrigation systems located within one regency is "the authority and responsibility of the regency government" (PP 20/2006). In the case of Paguyaman the official responsibility lies with the provincial government, considering that the irrigation system is located in multiple regencies. However, in reality the provincial government is not involved.

Clearer division of responsibility and authority is desirable. Aggregating responsibilities to a limited number of agencies diminishes uncertainty, increases commitment, reduces possibilities for corruption and can speed up processes. For the central management of the irrigation projects, in the case of DISIMP-II the ministry of public works, donor organisation JICA and the supervising consultant, coordination will become easier if the number of government actors decreases.

§ 5.4.3 – SRI adoption

The system of rice intensification (SRI) is a method that can simultaneously raise the productivity of the land, labour, water and invested capital in irrigated rice production. SRI leads to an increase in paddy yield and a higher quality of the harvested paddy. It is a sustainable innovation considering that it is a low-cost method that does not rely on environmentally unfriendly external inputs (Uphoff, 2008). The spread of the use of SRI is one of the goals of the soft component of the DISIMP-II programme (Euroconsult, 2010).

Introduction of SRI is done through the establishment of demonstration farms (dem-farms) in which farmers voluntarily cooperate. The method of SRI is carried out on several hectares of farmland, aiming to make the remainder of the farmers interested in adopting SRI as well. In all of the case studies dem-farms are operational with implementation of SRI ranging from 6,5 hectares in Toraut to 30 hectares in Paguyaman. In Bena and Toraut the demonstration farms did not have the desired effect until now. Outside the dem-farm locations there are no farmers that adopted SRI. In Paguyaman SRI has been adopted on a small scale while in Jurang Sate already 275 hectares of SRI is employed outside the dem-farm location. An explanation for the relatively high adoption of SRI in Jurang Sate may be the 'paddy culture', which is set out in section 5.4.1. An overview of the percentages of farmland used for SRI per case study is given in figure 25.

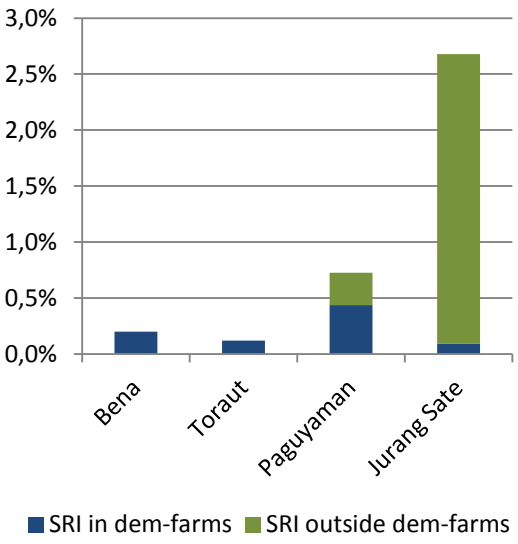

Figure 25 - Percentages of farmland used for SRI

Uphoff (2008, p.7) states that SRI is usually disseminated through 'farmer-to-farmer extension'. He argues that this is a proof that SRI is beneficial "since any innovation that farmers are willing to commit their own time and money to sharing with others must have considerable merit." The sharing from farmer to farmer did not take place yet in Bena and Toraut, but in Paguyaman and Jurang Sate this seems to work out. Hasan and Sato (2007) set out that for successful introduction of SRI, the involvement of local government offices and experts or consultants is necessary for giving good technical support and advice. Local consultants for all of the case studies say that their guidance is essential for the success of SRI. In Jurang Sate it is thought that the time of availability of local consultants is insufficient. The local consultants argue that at least five years of guidance is needed before farmers can maintain SRI independently, while spreading it to other farmers. Government officials have shown their support for SRI at several of the dem-farms by attending harvest events. Instead of enduring guidance by local consultants it would be beneficial if government officials are able to take over guidance. Bruns (2008) and Bassi (2010) acknowledge the need for this as they say that without strong government support there will be overdependence on the donor organisation, and in this case the local consultants.

§ 5.5 – Summary of positive and negative points

In this section an overview of the key positive and negative aspects encountered in the four case studies is given.

§ 5.5.1 – Bena

The performance of the Bena irrigation project is seriously limited by technical issues, most notably the broken weir and the interrupted main canal. As a result, only a small area can be cultivated. In combination with the disobedience of the planned cropping pattern and the aversion towards SRI these are reasons for the low production. The local population is very poor, although the poverty rate has decreased over the last couple of years.

The number of established WUAs is very low. However, the associations that are already active work very good. There are very frequent meetings, which are attended by a large minority of the members. Participation in the WUAs is extensive and equal. Women are involved in the associations, both as ordinary members and management board members, although there is still a dominance of men. Farmers are positive about their growing influence in the irrigation system. The farmers' influence is nonetheless limited to the tertiary system and cooperation between farmers and government is insufficient.

§ 5.5.2 – Toraut

The Toraut irrigation system is in a good condition, and the amount of water is sufficient. Only a small number of structures needs reparation and at some places there are sedimentation and garbage issues. Notwithstanding, the cultivated area decreased since the rehabilitation of the system. There is confusion about the increase of paddy production, but in general farmers say they experienced an increase in their income. Poverty rates have been relatively low in Toraut for the previous years. Production could grow more if farmers would implement SRI, until now this is hardly done.

Many WUAs are not active yet. Some of the associations organise meetings but attendance rates are usually low. Farmer participation is incomplete and unequal. Not all farmers are member and especially women have a minor role. Financially the WUAs are barely viable, considering farmers' unwillingness and inability to pay. The government has started however to sign contracts with associations for maintenance funds. The involvement of farmers is mostly limited to the tertiary system, but the government has attempted to discuss plans for the main and secondary systems with farmer representatives.

Water distribution is felt to be uneven and unfair, which is blamed on the dysfunctional WUAs. This leads to a lack of farmers' discipline and a waste of water. Feelings of discontent about these issues are not expressed and therefore do not result in conflict. The transmigration programme did not affect the irrigation practices positively. Rather the transmigrants adopted inferior practices of the local population.

§ 5.5.3 – Paguyaman

The part of the irrigation system that already has been constructed is in a good condition, except for some minor issues such as garbage accumulation and small flooding. The available amount of water is more than enough, and its distribution is fair. Nevertheless, the cultivated area has decreased. The productivity has increased but less than would be possible, considering that most of the farmers do not follow the projected cropping pattern. Because of the increase in productivity, the farmers' income has increased and the poverty rate in the area has fallen.

Most of the foreseen WUAs are already active, and their meetings are attended by the majority of the farmers. Both men and women are WUA members but women are not involved in the management boards. Financially the associations are viable, but for large maintenance activities government funding remains necessary. Farmers are very positive about the WUA involvement in the irrigation system, and the collaboration between government and farmers is good. Paguyaman is the only case study where the level of farmer participation is similar to the goals stated in government regulations.

As opposed to the situation in Toraut, transmigration has a positive influence in Paguyaman. The original local population is inspired and motivated by the hardworking nature of the transmigrants from Java and Bali.

§ 5.5.4 – Jurang Sate

While the rehabilitated part of the system, i.e. the main canal and part of the secondary canals, are in a good condition, other parts are in a poor condition. There is enough water, but this is not equally shared. Farmers in the upstream area use too much water, limiting the availability in the downstream area.

Jurang Sate is the only system where the entire projected area is in fact cultivated. In most of the area farmers follow the desired cropping pattern and cropping intensities are high. As a result, productivities are high, with the exception of fields depending on secondary canals that have not been rehabilitated. The adoption of SRI is relatively high and motivation for expansion of SRI fields is great, which further increases production. Even though farmers' incomes are still low, they have increased because of the irrigation project.

Most of the WUAs are active, but attendance rates are rather low. Participation equity is good however, considering that Jurang Sate is the only case study where the management boards are not overly dominated by men. Financially the associations are in a poor condition. Because the farmers' incomes are low many of them are not able to pay membership fees. As a result, WUAs cannot take their responsibility over the tertiary level and these systems are deteriorating. No farmer participation has taken place at main and secondary canal level.

While conflicts were common before the irrigation project, currently there is good cooperation between farmers and WUAs. However, problems remain at parts of the system that have not been rehabilitated.

Chapter 6
Conclusions

This chapter aims to draw conclusions and provide recommendations. The conclusions focus on the answer to the main research question: *"What are the critical success and failure factors for participatory irrigation management projects in Indonesia?"* The recommendations translate these factors to 'lessons learned' for the future. Success and failure factors identified cannot be considered as direct formulas that can be used for the management of every irrigation system. Good and worse practices are linked to their contexts. However, although successes and failures cannot be directly disseminated, some lessons can be extracted and provide a framework for general application. The added value of these 'lessons learned' is that they illustrate principles deducted from real case studies, that possibly can be applied to other cases and give general ideas about the implementation of participatory irrigation management.

§ 6.1 – Conclusions and recommendations

A widespread support for participatory approaches to irrigation management is apparent in global literature. Many scholars have written about PIM and set forward ideas about ideal methods for the implementation of irrigation projects.

Indonesian regulations have converged with international ideas about irrigation management since 1999. Law UU 7/2004, government regulation PP 20/2006 and several ministerial regulations by the Ministry of Public Works have made the Indonesian irrigation sector in theory decentralised and participative. Responsibilities and authorities are shared among the public sector and the farmers, usually in the form of a WUA. The tertiary system has entirely become the responsibility of the WUAs, while the government is still in charge of main and secondary canal systems. Farmer involvement at these system levels is voluntary.

Advantages of PIM include reduced government expenditures, improved system maintenance, transparency in system management and improved production. Execution of the regulations is likely to lead to achievement of these goals, but because the regulations are vague on the main and secondary level, the extent to which the goals are reached remains unclear. Adding to this uncertainty is the concept of policy conformance. As Fudge and Barrett (1981) argue, policies and regulations do not directly and unequivocally lead to implementation. In practice, the management of irrigation projects in Indonesia is indeed different from the regulations.

A first step in securing farmer participation should be to clarify the regulations. Instead of voluntary options for involving farmers, the regulations should provide guidance for the degree and method of participation. In that way regional and local governments have less possibilities for bureaucratic decision-making and farmers have a stronger legal position towards the government. Farmer participation has shown the potential of creating a sense of common ownership and responsibility for the system in Paguyaman. Regulations should provide direction

towards such experiences in all irrigation systems, raising the interaction between government and farmers to a participative level such as 'collaboration'.

In addition to clarification of the tasks of farmers, also the division of tasks of the government should be simplified. Many different government bodies and agencies are involved in the irrigation system, complicating procedures and slowing down processes. A strict division of responsibilities over a limited number of departments can diminish uncertainty, increase commitment and speed up processes.

Involvement and influence of farmers has not been at the desired level until now, for several reasons. Farmers are expected to be involved in irrigation management through WUAs, but in many locations no such associations have been established yet, or the existing associations are inactive. Even if WUAs are active, farmer participation is often deficient. Meetings are attended by only a fraction of the members, while membership often excludes women. Especially the occupation of organisational functions in WUAs is no reflection of the population and is dominated by men. Activity and involvement of farmers has turned out to be larger if more meetings are organised. Farmer groups are more coherent if meetings take place more often, and WUAs are able to carry out more tasks in addition to standard water division and planting schedules.

An additional proven manner to increase participation in WUAs is to impose sanctions for non-attendance. Even rather low penalties are an incentive for farmers to attend meetings. Ensuring large attendance at WUA meetings guarantees that decisions related to irrigation are made at formal meetings and the chance of informal farmer groupings, which leads to a decrease of farmer discipline, decreases.

Financially, WUAs currently depend on the contribution of members. Even though some government agencies promised to help the associations money-wise, this has not been done. Many WUAs are able to survive and provide basic services, although their funding is minimal. However, because of inability to provide major tasks and maintenance, the government is eager to take over the tasks entirely, ruling out farmer involvement whatsoever. Maintenance funds as proposed in Toraut are potentially a good way to overcome this problem. Government regulation should be clearer in the rights and responsibilities of both farmers and government. While it is good if the government gives financial support, this should not lead to the exclusion of farmers in decision-making. Maintenance fund contracts ensure a clear and fair distribution of financial responsibilities, which can also encourage farmers to pay their membership fee. This is because the contract provides clarity about the reason for their contribution.

A main reason of limited farmer participation is also the reluctance of government officials to involve farmers. Main reasons are the aversion towards loss of power and the expectation that farmers are unable of managing the system well. It is therefore important that not only farmers, but also government officials are convinced of the importance of WUAs. Farmer participation can have considerable advantages to the government, being reduction of government expenditures and better management of the system. Where farmers are currently involved, in the tertiary

system, farmer involvement often means complete withdrawal of the government. Advantages of farmer involvement are offset, since farmers are financially and technically not capable of system management and maintenance without government involvement.

The government should not only be involved in large maintenance, but also in operation of the system. Even though farmers are capable of carrying out operation, often there are problems regarding to proper operation. Farmers' discipline is frequently insufficient, resulting in lower productivity. Local consultants are capable of improving the farmers' discipline, but enduring guidance is necessary for lasting effects. Government officials are designated to take on this task. Also guidance related to cropping patterns and planning methods such as SRI has to be guided by the government in the long term.

A final issue is only relevant in areas where transmigration takes place. The presence of transmigrants that are capable of innovative agriculture potentially improves practices and increases production. Also this process should be guided in order to avoid loss of motivation of transmigrants and encourage the adoption of innovations by the local population.

§ 6.2 – Lessons learned

Based on the conclusions in the previous section, the following list of 'lessons learned' can be composed.

- The government should have clear regulations that clarify the rights and responsibilities of farmers in irrigation management, in order to preclude the opportunities for government agencies to act independently.
- Responsibilities in the public sector should be clearly defined.
- WUAs should organise regular meetings, at least more than once per season, in order to increase cohesion and capacity.
- All WUAs should impose sanctions upon non-attendees.
- Maintenance fund contracts should be created between the government and all WUAs, in order to determine the rights and responsibilities of both actors.
- The government should involve farmers in irrigation management, but not entirely withdraw its own involvement.
- The government should be dedicated to continuing guidance of farmers in the operation of the irrigation system and farming techniques.
- Transmigration is potentially beneficial for agriculture, but it should be guided in order to take the advantage.

Considering these points, the most important issue is that the responsibilities of the different government bodies become clear, and that preferably one single agency is dedicated to the participation of farmers. Participation of farmers should not mean the withdrawal of the government, and the government should continuously guide the farmers and WUAs in their activities.

§ 6.3 – Perspective

As set out in the introduction of this thesis, irrigation projects needlessly repeat the mistakes of the past. The 'lessons learned' in the previous section provide a framework for future irrigation projects to avoid these mistakes. Dedication of both farmers and government is essential for success.

Problems encountered in all of the case studies show that ready-made solutions for irrigation projects are not available. Because of different contexts and cultures the appropriate approach is different for every project. This thesis tries to provide lessons that can be applied in all situations, but continuing research is needed for the improvement of Indonesian irrigation.

As discussed in the theoretical framework, participation in irrigation management is aimed to bring several benefits. These include reduction of government expenditures, decrease of infrastructure deterioration and increase in agricultural production. In practice no straightforward relationship between successful participation and achievement of the benefits has been revealed. Participatory approaches have shown to be beneficial for the creation of a 'sense of common ownership' in Paguyaman, improving maintenance practices. Well-functioning participatory structures in Bena, on the other hand, have not resulted in benefits. Farmer participation has to coincide with enabling conditions on other factors, such as the physical condition of the irrigation system. In conclusion, participatory approaches as encouraged by theory and Indonesian regulations are desirable, but will only be successful in combination with positive additional circumstances.

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Annex 1

List of interviews and meetings

List of interviewees

Mr. Alwi
Leader
WUA Mekar Indah
Paguyaman (Gto), 26 June 2012

Ms. Baiq Manik Sofian
Institutional Specialist
Local consultant Jurang Sate Hilir
Praya (NTB), 25 July 2012

Mr. Burhanuddin Aboi
Sector head Land and Water Cultivation
Agricultural Department Boalemo Regency
Tilamuta (Gto), 27 June 2012

Mr. Idham Halid
Institutional Specialist
Local consultant Jurang Sate
Praya (NTB), 25 July 2012

Mr. Irchamni Soelaiman
Institutional Specialist
Quality Control DISIMP-II Nusa Tenggara II
Kupang (NTT), 3 June 2012

Mr. Lalu Tarpi
O&M and Asset Management Specialist
Local consultant Jurang Sate
Praya (NTB), 25 July 2012

Mr. Marva Ibnu
Team leader Canal Implementation Works
River Basin Management Centre Sulawesi I
Manado (Sulut), 2 July 2012

Mr. Naray Cornelius Dendeng
Operation and Maintenance Specialist
Local consultant DISIMP-II Toraut subproject
Mopuya (Sulut), 3 July 2012

Mr. Ot. Neonane
Secretary
Agricultural Department TTS Regency
Soe (NTT), 29 May 2012

Mr. Ayi Sutari
Agronomist
Local consultant DISIMP-II Jurang Sate
Mataram (NTB), 23 July 2012

Mr. Burhan
Agronomist
Local consultant BWS Sulawesi II
Paguyaman (Gto), 29 June 2012

Mr. Hendrayadi
Agronomist
Local consultant DISIMP-II Toraut subproject
Mopuya (Sulut), 3 July 2012

Mr. Ihsan
Leader
WUAF Jonggat II
Pringgarata (NTB), 24 July 2012

Mr. Johannes Kini
Agricultural Specialist
Local consultant DISIMP-II Bena subproject
Bena (NTT), 30 May 2012

Mr. Lot Richard Sine
Operation and Maintenance Specialist
Local consultant DISIMP-II Bena subproject
Bena (NTT), 30 May 2012

Mr. Moh. Isnaen Muhidin
Manager Irrigation and Swamps
River Basin Management Centre Sulawesi II
Limboto (Gto), 25 June 2012

Mr. Nyoman Tekek
Area coordinator Dumoga North and West
BP3K Bolaang Mongondow Regency
Mopuya (Sulut), 5 July 2012

Ms. Ratmianti
Agronomist
Local consultant Jurang Sate
Praya (NTB), 25 July 2012

Mr. Saridin
Leader
WUAF Jonggat I
Pringgarata (NTB), 24 July 2012

Mr. Soeponto
Leader
WUAF at system level Toraut
Mopuya (Sulut), 4 July 2012

Mr. Sulaiman
Board member
WUA Mulya Jaya
Paguyaman (Gto), 26 June 2012

Mr. Suwandi
Sector head Agricultural Infrastructure
Agricultural Department Gorontalo Regency
Limboto (Gto), 28 June 2012

Mr. Yuliantoro
Water Resources Engineer
Local consultant DISIMP-II Toraut subproject
Mopuya (Sulut), 3 July 2012

Mr. Slamet Hidayatullah
Leader
WUA Tirto Abadi
Paguyaman (Gto), 26 June 2012

Mr. Suhaili
Leader
WUAF Jurang Sate Hulu
Pringgarata (NTB), 24 July 2012

Mr. Sutyono
Leader
WUAF Pelita Abadi
Paguyaman (Gto), 26 June 2012

Mr. Yeremias Jemani
Institutional Specialist
Local consultant DISIMP-II Bena subproject
Bena (NTT), 30 May 2012

Meetings attended

- *WUA meeting Linamnutu* (Bena, 30 May 2012), organised by local consultants and attended by WUA and WUAF board members, several other farmers and community organisers.
- *SRI socialisation Bena* (6 June 2012), organised by local consultants in order to explain the advantages of SRI, attended by the village head and several local farmers.
- *Panen Perdana Paguyaman* (26 June 2012), celebration of the beginning of the harvest of the demonstration farms. Attended by representatives of regency and provincial government, WUA and WUAF board members, local farmers and community organisers.
- *Training-of-trainers Dumoga* (Toraut, 4 July 2012), training session at the district agricultural education office, aimed to instruct about SRI, WUA management and other agricultural issues. Attended by government representatives, WUAF board members, local consultants and an agronomist from the DISIMP-II central team Jakarta.
- *Farmer-to-farmer training Dumoga* (Toraut, 5 July 2012), training session at the district agricultural education office, aimed to instruct about SRI, WUA management and other agricultural issues. Attended by government representatives, WUAF board members, dem-farm farmers and local consultants.
- *WUAF leader meeting Jurang Sate* (24 July 2012), assessment meeting for Bappenas. Attended by WUAF leaders and a representative from Bappenas.

Annex 2

Performance indicators