WATER USER'S ASSOCIATIONS IN THE CONTEXT OF SMALL HOLDER AGRICULTURE

A systematic review of IFAD funded Water Users Association in Asia

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Executive Summary

IFAD's investments in agricultural water management promote organised user groups as essential for solving irrigation management problems and sustaining the physical infrastructure of the system. Accordingly, all 24 IFAD funded interventions which form the basis of this study, endorsed the formation of Water User Associations (WUAs) and the devolution of management authority and associated costs for irrigations systems to these beneficiary-led groups. This policy approach is referred to Participatory Irrigation Management (PIM) and has ruled irrigation reform discourse for the past 50 years. In a quest to know whether this investment strategy has been paying off, IFAD commissioned an evaluation of its PIM-related activities in Asian member countries.

This report is the fruit of that endeavour and builds on efforts by IWMI, IFAD and many others to document and understand the impacts of PIM. Through the systematic review of 24 IFAD-funded PIM interventions and field observations from 5 project sites in the Asian region this study sheds new light on what works, where and why. Our study examines WUAs that have been created by IFAD projects and those which pre-date it's interventions but are the main focus of capacity building or restructuring. Our use of the term WUAs encompasses a variety of organizations, such as Community Organizations (COs), Farmer Water User Communities, Irrigation Associations, Self-Management Boards, Village Management Groups and User groups. Although these organisations assume different names, their basic structure and functions (as endorsed by IFAD) conform to a singular, somewhat idealised model of organised user management.

Material presented in this report examines both the quality of IFAD's project documentation and the socio-technical, legal and political factors which are hypothesised to increase the chances of WUA success. It makes several important contributions: First, it highlights the strengths and weakness of IFAD's project documentation, suggesting methods to enhance or consolidate learning. Second, it provides empirical support to some prevalent hypotheses regarding the enabling conditions for successful WUAs. Finally, it sheds light on how IFAD's PIM investments have played out in the field as opposed to what was expected under an idealized condition. In doing so, it draws attention to WUAs emphasis on infrastructure maintenance vis-à-vis water distribution. However, the generalizations that can be derived from IFAD documents and field data are very limited and this reemphasizes the role of context. As a result some of the key arguments of the paper remain hypotheses rather than conclusions and must be verified with more extensive and robust field research and analysis than the mandate of this study dictated. However, a central argument of this report – that imposing 'blue-print,' one-size fits all

institutional models will not fix the complex and diverse management problems of irrigation systems – remains a robust conclusion.

Introduction

As the potential for creating new irrigation capacity approaches closure, investments in the Asian irrigation sector focus more on enhancing the productivity and performance of existing systems though rehabilitation and reforming management processes (Shah, 2001; Merry et. al 2007). For its part, IFAD's investments in the Asian region generally follow this two-pronged approach, focusing on rehabilitating or modernizing small-scale irrigation infrastructure, in tandem with creating Water User Associations (WUAs) and promoting the devolution of management authority and associated costs for irrigations systems to these beneficiary-led groups. In this way, IFAD's institutional investments in irrigation conform to a broader policy strategy termed Irrigation Management Transfer (IMT) or Participatory Irrigation Management (PIM) which forms the central tenant of institutional reform in the irrigation sector, worldwide.

However, a growing amount of research raises questions about the actual effectiveness of this strategy in terms of improving irrigation and management efficiency (Mukherji et al. 2009; Shah et al. 2002; Vermillion 1997). This is partly due to the lack of comprehensive and rigorous impact assessments that causally link improvements in scheme performance and PIM policies. It also reflects the 'difficulty of transplanting institutions from one context to another' when local situations vary significantly in terms of technology, water availability, cropping patterns, market development, social capital and government policies (Meinzen-Dick, 2007: 15200). Without doubt, PIM policy has generated some success stories, particularly in the commercial farming sectors of Africa, China and Northern Mexico. However on the whole, research on case studies and later meta-reviews of policy impact (Mukherji, 2009: FAO, 2007; Vermillion 1997) reveals outcomes of PIM are mixed and the positive impacts of the devolution program, ranging from financial viability to improved technical and managerial efficiency, show great variability across and within locations.

Thus, on the whole this approach has failed to live up to expectations. It is against this back-drop, that IFAD commissioned a systematic review of its PIM investments in the Asian region. A systematic review differs from a literature review in that it tends to be more evidence oriented and creates a uniform template against which evidence from multiple PIM interventions can be measured and compared (often called the review protocol). The value of such systematic review is established in the works of Petrosino et al. (2001); Farrington (1998, 2003); Welsh and Farrington (2006) and Van der Knapp et al. (2008) who argue that when done well and with full integrity, they provide the most reliable and comprehensive statement about what policy interventions work, under which conditions and why.

Given these objectives, this report examines the experience of 24 IFAD-funded PIM interventions. It begins with an analysis of IFAD's project documents and then gives further insights on the conditions that shape the effectiveness of institutions for irrigation management**.** Five field studies of WUAs in Sri Lanka, Cambodia, Philippines, Nepal and Bangladesh show how IFAD's institutional interventions have played out on the ground and how farmers' have the ability to create alternative paths to address their development needs beyond single-policy solutions.

Objectives and Research Questions

The goal of this research is to present a systematic review of IFAD sponsored PIM interventions in Asia. This involved following a predetermined review protocol (Mukherji, 2009) which set out the classification, coding and analysis of projects. While this protocol acted as a template for analysis, suitable changes were made taking into account the kind of information available from IFAD documents. Our study also considers the social and contextual mechanisms that underlie effective or promising interventions. Our review considers evidence from 24 projects to answer the following questions:

1. How well have the impacts and outcomes of PIM funded by IFAD been documented and what has IWMI learnt from those studies? ('learning')
2. How can IWMI evaluate the impact and outcomes of IFAD funded PIM and differentiate the successful cases from 'not so successful' ones? ('typology')
3. What are the (enabling) conditions under which successful IFAD sponsored WUAs are found and are those conditions replicable? More specifically, is there a link between hard "infrastructure" and "soft" institutions and if so, how do they causally relate to success/failure of WUAs? Similarly, is there any evidence to show that WUAs that provide 'water plus' service through horizontal differentiation perform better than ones that do not? Also, is there evidence to show that vertical integration to higher levels through federation of several WUA's result in better uptake and success?

Methodology

Desk-top Review

Inclusion criteria

Projects for our review were pre-selected by IFAD, based on the following criteria:

a) Projects were limited in geographic scope to the Asia-Pacific region.

b) Records reflect aggregate project performance. We did include a few regional level studies that had enough disaggregated data for our purpose.

c) Performance assessments focused on the PIM initiatives that accompanied irrigation system construction or rehabilitation (usually as part of multi-component projects with broad mandates).

d) Projects were implemented post-2000. A similar review of IFADs investments in WUAs was published by in 2001. Based on the assumption that IFAD's PIM initiatives in the pre-2000 era have been adequately studied and documented, we review only the post-2000 case studies so as to reduce duplication in results and make our review more up to date and focused.

Table 1: Characteristics of IFAD funded Irrigation/PIM interventions

SR	Country	Project	Type of scheme	Total No. of schemes	Size of scheme (ha)	Major crop(s)	Population benefitting from Irrigation (HH/farmers)
1	Cambodia	Community based rural development project	diversion, storage and pump	9	3960	Rice and soya, water melon, sesame	5306
2	Cambodia	Rural Poverty Reduction Project in Prey Veng and Svay Rieng	diversion and storage	93	22390	Rice	12,500
3	Indonesia	Rural Empowerment and Agricultural Development Programme (READ)	diversion	5	n/a	Rice , maize, Rubber	1607

SR	Country	Project	Type of scheme	Total No. of schemes	Size of scheme (ha)	Major crop(s)	Population benefitting from Irrigation (HH/farmers)
4	Mongolia	Rural Poverty-Reduction Programme	diversion, storage and pump	549	2,389,000	fodder crops (for livestock) and some vegetable cultivation	10031
5	Nepal	Western Uplands Poverty Alleviation Programme	diversion and storage	104		cereals (rice, maize and wheat)	3844
6	Pakistan	Southern Federally Administered Tribal Programme	diversion, storage and pump	310	25,000	cereals and fodder crops as well as tomato, potato and onion and apple	24,000
7	Pakistan	Community Development Programme	diversion, storage and pump	79	2154	Wheat, maize, off-season vegetables and flowers	18,801
8	Philippines	Northern Mindanao Community Initiatives and Resource Management Project	diversion and storage	n.a	460	Rice, maize, coffee	55,907

SR	Country	Project	Type of scheme	Total No. of schemes	Size of scheme (ha)	Major crop(s)	Population benefitting from Irrigation (HH/farmers)
9	Philippines	Secon Cordillera Highland Agriculture Project	diversion and storage	n/a	4800	paddy, coffee, legumes/beans, carrots, root crops and other cash crops	7,200
10	Sri Lanka	Dry Zone Livelihood Support and Partnership Programme	diversion and storage	750	6600	paddy	10,200
11	Viet Nam	Rural Income Diversification Project	diversion and pump	227	n/a	maize and paddy	29466
12	Viet Nam	Ha Giang Subproject: Decentralized Programme for Rural Poverty	diversion and storage	65	n/a	maize, paddy, soybean, cassava	8,956
13	Viet Nam	Quang Binh Subproject: Decentralized Programme for Rural Poverty	diversion and pump	23	1356	paddy and maize	11,511

SR	Country	Project	Type of scheme	Total No. of schemes	Size of scheme (ha)	Major crop(s)	Population benefitting from Irrigation (HH/farmers)
14	Viet Nam	Ha Tinh Rural Development Project	diversion and storage	28	5 039	rice and groundnuts	25,200
15	China	West Guangxi Poverty Alleviation Project	diversion and storage	20186 tanks and 553.74 km of canal	13687	Paddy, maize, soybean, sweet potato, vegetables	250,000
16	China	Ningxia Environment Conservation and Poverty Reduction Programme	diversion, storage and pump	3821 (+ 60km of canal lining)	10779	Rice, Maize and Wheat	117,000
17	China	Shanxi Environment Conservation and Poverty Reduction Programme	diversion and pump	68 (+197 km of built and rehabilitated canals)	6277	walnuts, fruits, vegetables, mushrooms	85,000
18	China	South Gansu Poverty-Reduction Programme	diversion and storage	68	14867	fodder, cereals, potatoes (the project promotes cash crops: fruit)	14,570

SR	Country	Project	Type of scheme	Total No. of schemes	Size of scheme (ha)	Major crop(s)	Population benefitting from Irrigation (HH/farmers)
19	India	Chhattisgarh Tribal Development Programme	storage	1119 (+ 30 gully plugs)	2214	paddy, groundnut, wheat and vegetables	6992
20	India	Jharkhand Tribal Development Programme	diversion and storage	791 (+ 3514 Gully plugs)	225.8	Rice, maize, pulse, tuber crops	34109
21	Laos	Oudomxai Community Initiative Support Project	diversion, storage and pump	102	1365.3	Rice, maize, coffee, tree farming	1,935
22	Laos	Attapeau Rural Livelihoods Improvement Programme	diversion and pump	39	222	maize, rice, also vegetable gardens , sugar cane, legumes	n/a
23	Laos	Sayabouri Rural Livelihoods Improvement Programme	diversion	19	n/a	maize, sesame, ginger and peanuts, rice	272
24	Bangladesh	Small-Scale Water Resources Development Sector Project	diversion and storage	273	164,700	paddy and non cereals	142,300

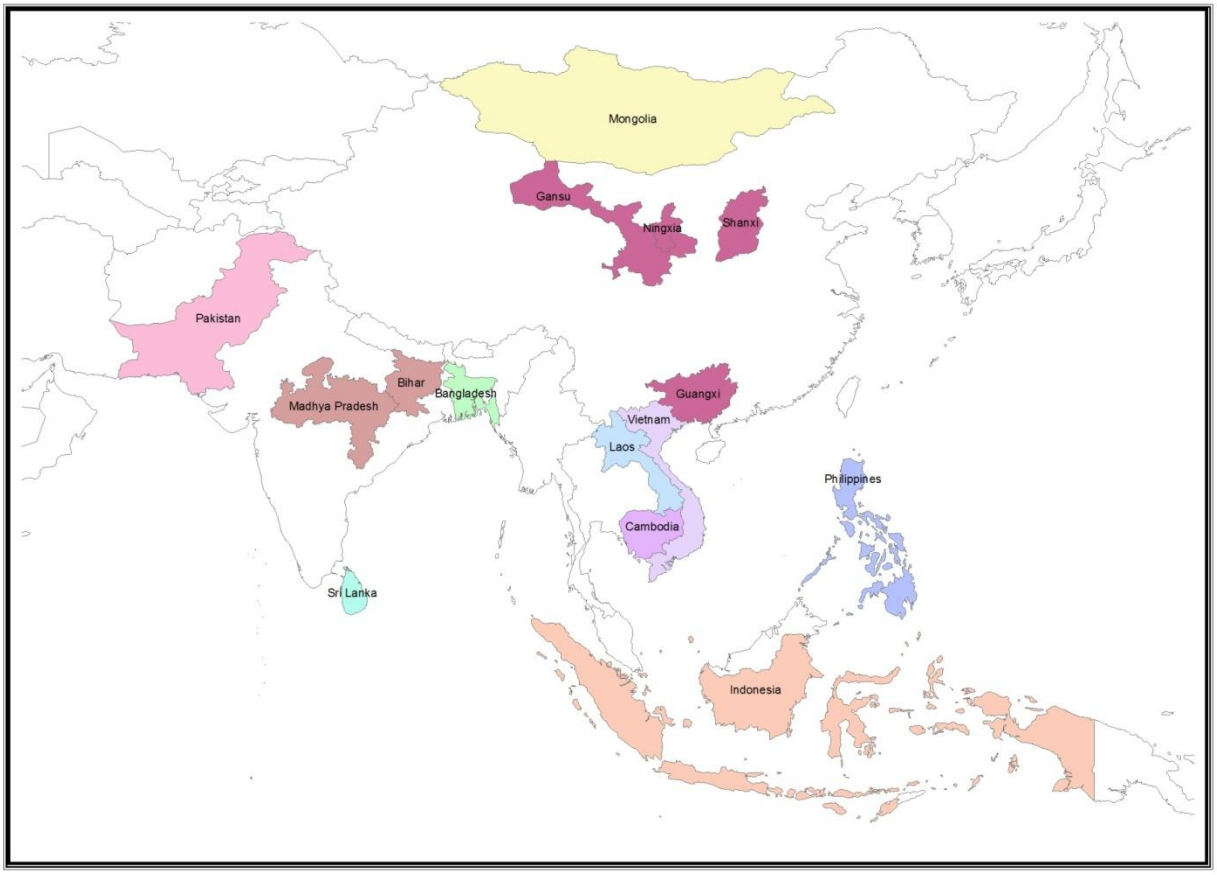

Figure 1: Location of Project sites

Document and Data Summary

We reviewed well over 100 individual documents and from these analysed 20 projects. In 4 cases,[1] project documents contained enough disaggregated data to evaluate intra-project performance (at the provincial level). Our coding database was compiled from various types of reports, as can be seen in Figure 2. Most data were sourced from Appraisal, Supervisory or Progress Reports. Finally, it should be noted that all projects were evaluated using multiple reports, which document progress at various points of the projects lifespan. We used all sources for coding project characteristics, and only post-implementation sources for coding outcomes and impacts. If two papers provided information on the same indicator, then data from the most recent source was used for evaluation.

[1] These were: Rural Livelihoods Improvement Programme (Laos); Tribal Development Programme (India); Environment Conservation and Poverty Reduction Programme (China); Decentralized Programme for Rural Poverty (Vietnam)

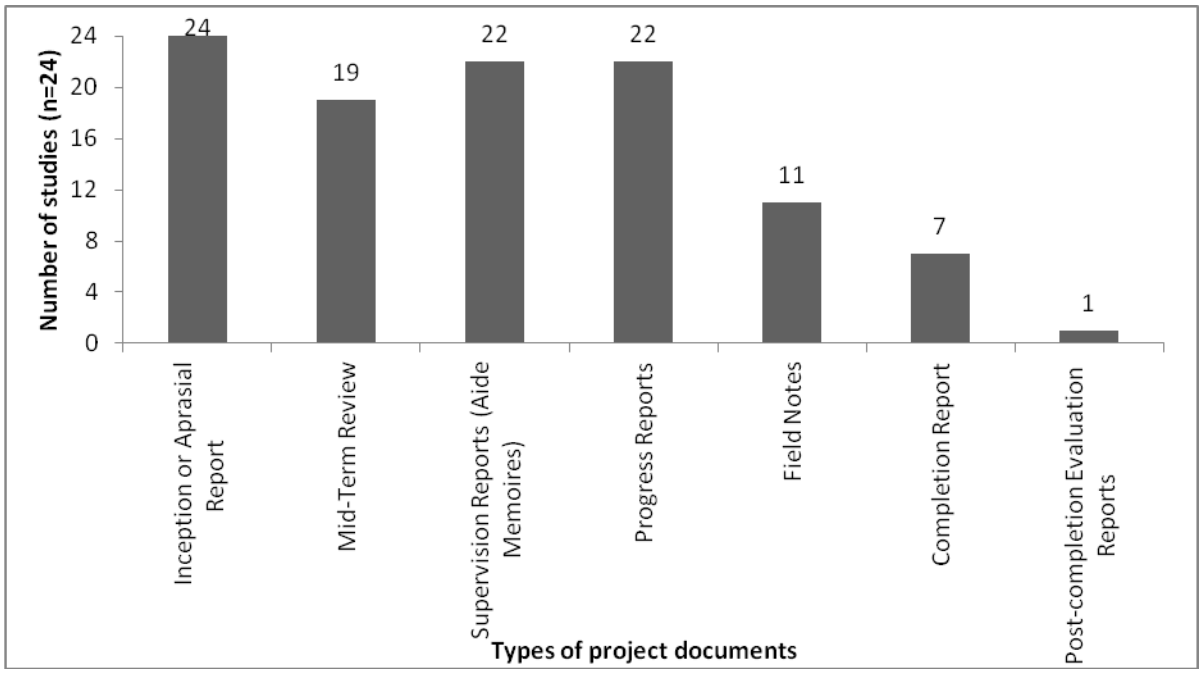

Figure 2: Document Summary

Coding and performance indicators

We coded projects on a range of methodological, descriptive and outcome/impact indicators (for a full list refer to Appendices). The purpose of the coding was to make comparable a number of seemingly disparate projects. Coding was based on the Institutional Analysis and Development (IAD) framework which draws on various disciplines such as political science, economics, anthropology, game theory and law, to study common property resources (CPR). In short, this framework attempts to identify "key working parts of typical situations facing participants in various circumstances" (Tang, 1992:13). In this study we draw on Oakerson's (1986) triadic interaction framework which analyses the physical attributes of the resource, the community attributes of the people managing them and the attributes of the institutions that have been formed to manage the resource. Following this approach, projects were coded on the parameters listed in Table 2:

Table 2: Coding context specific factors

CONTEXTUAL FACTORS	INDICATORS
Location specific indicators	Project name; Year of intervention, type of project; nature of intervention etc.
Methodological indicators	How was the data collected? How was it analyzed? Period of evaluation
Technical specification of schemes	Type of scheme, size, complexity, rehabilitated, investment amount.
Socio-economic and agricultural characteristics	Population served, major crops, per capita GDP, access to credit, markets, importance of agriculture, social cohesion, land rights, water rights.
PIM implementation indicators	Level of transfer, training, political will, legislation, election to WUAs; water plus services, federation to higher level

This data was used to systematically:

1. Assess the quality and strength of evidence used in project documents
2. Measure interventions in terms of their outcomes and impacts
3. Identify factors that impact the likelihood of the success or failure of an intervention.

Classifying IFAD Interventions

A primary objective of this review was to differentiate successful interventions from 'not so successful' ones. To do this we applied a composite success score (CSS) of post intervention impacts and outcomes adapted from Mukherji et al. (2009).[2]

The first step was to code outcome and impact indicators according to the schema laid out in Table 3.

[2] For a discussion on the strengths and limitations of this scoring method refer to Mukherji et al (2009); pp. 13-14.

Table 3: List of outcome and impact indicators used for construction of success scores

Sr. No.	Name of the indicator	Scoring system	Number of cases where this indicator was present (Max=24)
A.	**Outcome indicators**		
1.	Financial viability of WUA	1= if it has improved 0= no change or deteriorated n/a = not available	17
2.	Functional condition of infrastructure	1= if it has improved 0= no change or deterioration n/a = not available	17
3.	Equitable distribution of water	1= if it has gone up 0= no change or declined n/a = not available	1
4.	Reliability and adequacy in water distribution	1= if it has gone up 0= no change or declined n/a = not available	8
5.	Community Participation (frequency of meetings, effectiveness of planning and implementation)	1= Yes 0= Otherwise n/a = not available	13
6.	Gender Participation (Are women farmers participating in WUA activities, percentage of women participating)	1= if it has gone up 0= no change or declined n/a = not available	14
7.	Empowerment and technical capacity (no. of trainings administered, content, outcome)	1= Yes 0= No or got worse n/a = not available	17
B.	**Impact indicators**		
1.	Livelihoods and household parameters (income, wage, employment, poverty reduction, reduction in forced migration)	1 = if any of these have gone up after transfer 0=Otherwise n/a = Not available	22
2.	Productivity related impacts (changes in yield, Cropping intensity and cultivated area)	1 = if it has gone up after transfer 0=Otherwise n/a = Not available	24

The construction of the score was simple enough and involved adding up all positive scores and dividing this sum by the maximum possible score. Here, the challenge was to deal with

missing values in each case (as the data availability among projects varied between 3-9 outcome/impact indicators). We decided that whenever data was not available, we would leave it out from our calculation. For example, if outcome and impact indicators were available for 6 out of 9 (maximum) possible indicators, then we calculated the CSS assuming a maximum possible score of 6 (and not 9). If out of these 6 indicators, three were positive (therefore getting a cumulative score of 3) and 3 were negative or neutral (getting a cumulative score of 0), our CSS would be 3 out of 6 or 0.5 which can be converted to 5 on a 10 point scale.

All cases that got a value above 5 in our CSS scale were categorized as effective and those with scores of 5 or less were categorized as ineffective interventions. While it may be argued that using a score of 5 as the cut-off point is rather arbitrary, we justify it on the grounds that a lower cut off point flattens our data-set and does not allow for meaningful evaluations (in short, the overwhelming majority of projects scored more than 4). However, since our database is publicly available, it is always possible for other researchers to choose their own cut off point and re-do the analysis.

In short, every case study was scored and ranked on a uniform scale of 0 to 10. In cases which scored 0; the intervention produced *no* positive changes in performance. In cases that scored 10, the intervention produced *only* positive changes in performance.

Limitations and sources of bias

There are obvious limitations with some of the indicators used it our system of classification. This is particularly true for the impact indicators. Very often, increase in crop yields, incomes or area under acreage, even, if it happens after the intervention, may not be directly attributable to greater farmer involvement in O&M per se. Rather, many factors exogenous to PIM interventions such as, changes in fertilizer application rates, higher crop prices, rainfall patterns and more favourable market conditions can affect the performance of irrigated agriculture. Furthermore, it should be pointed out that IFAD's investments in farmer management were part of a wider set of economic and agricultural interventions, including promoting marketing and micro-credit, high-yielding seed technology and better on farm management. However, because IFAD project documents do not explicitly examine casual links between PIM interventions and project performance our system of classification is forced to draw on these problematic but very well documented indicators (over 90% of project documents measure success or failure of irrigation and PIM interventions based on crop and livelihood related impacts). This may mean that our evaluation of IFAD's investments in PIM appear to be more positive than might actually be the case.

The scope of IFAD funded projects is vast, often covering multiple administrative, agro-ecological and socio-economic zones. Not surprisingly, the conditions which shape the design, implementation and ultimately the performance of interventions vary significantly *within* as much as *between* projects. In 4 cases there was enough disaggregated data to compare *intra*-project performance, most often at the provincial or district level. In no cases, was it possible to meaningfully evaluate the performance of *individual* WUAs or irrigation schemes rehabilitated or constructed under IFAD projects via project documents. As such, *intra*-project variation in terms of descriptive attributes and project impact is not adequately captured in our desk review. Rather this study teases out performance trends at an aggregate or macro level and provides a broad brush stroke account of what works, where and why.

An additional source of bias with our database stems from the fact that these evaluations are snapshots of projects at particular points in time ranging from 2000 to 2011. In some cases, we do not have any information on the current status of these schemes. It is possible that interventions classified as success stories in our analysis might well fail over the years or our failed cases might turn around and become successful later on. In short, this type of review gives expression to static perspectives: performance is measured at one point in time. However, we recognize that target schemes and WUAs may be at different stages of maturity and that IFAD's interventions are impacted by spatial and temporal dimensions. For this reason we also include some historical and institutional analysis of project success and failure, and from this data draw qualitative insights at a later point in this review.

Finally, in some instances we relied on subjective judgment while coding. Coding of outcomes and impacts was relatively straight forward where explicitly stated in IFAD documents. However, in some cases, we had exercise judgment in determining if the outcome/impact was positive, negative or neutral. In order to minimize personal bias, coding was done simultaneously by the three researchers. Whenever, there was a discrepancy in coding, it was sorted out through re-reading the text and discussions with other co-authors. This, we believe, reduced the chances of personal biases creeping into the scheme of coding.

Field Verification

We also verified the impact and outcomes of IFAD's PIM investments via field work in 5 projects. These were: *Western Uplands Poverty Alleviation Programme* (Nepal); *Small-Scale Water Resources Development Sector Project* (Bangladesh); *Northern Mindanao Community Initiatives and Resource Management Project* (Philippines); *Rural poverty reduction project* (Cambodia); and *Dry Zone Livelihood Support and Partnership Programme* (Sri Lanka).

Field study sites incorporated both failed and successful case studies, however due to restrictions of time and resources, covered limited geographic scope.

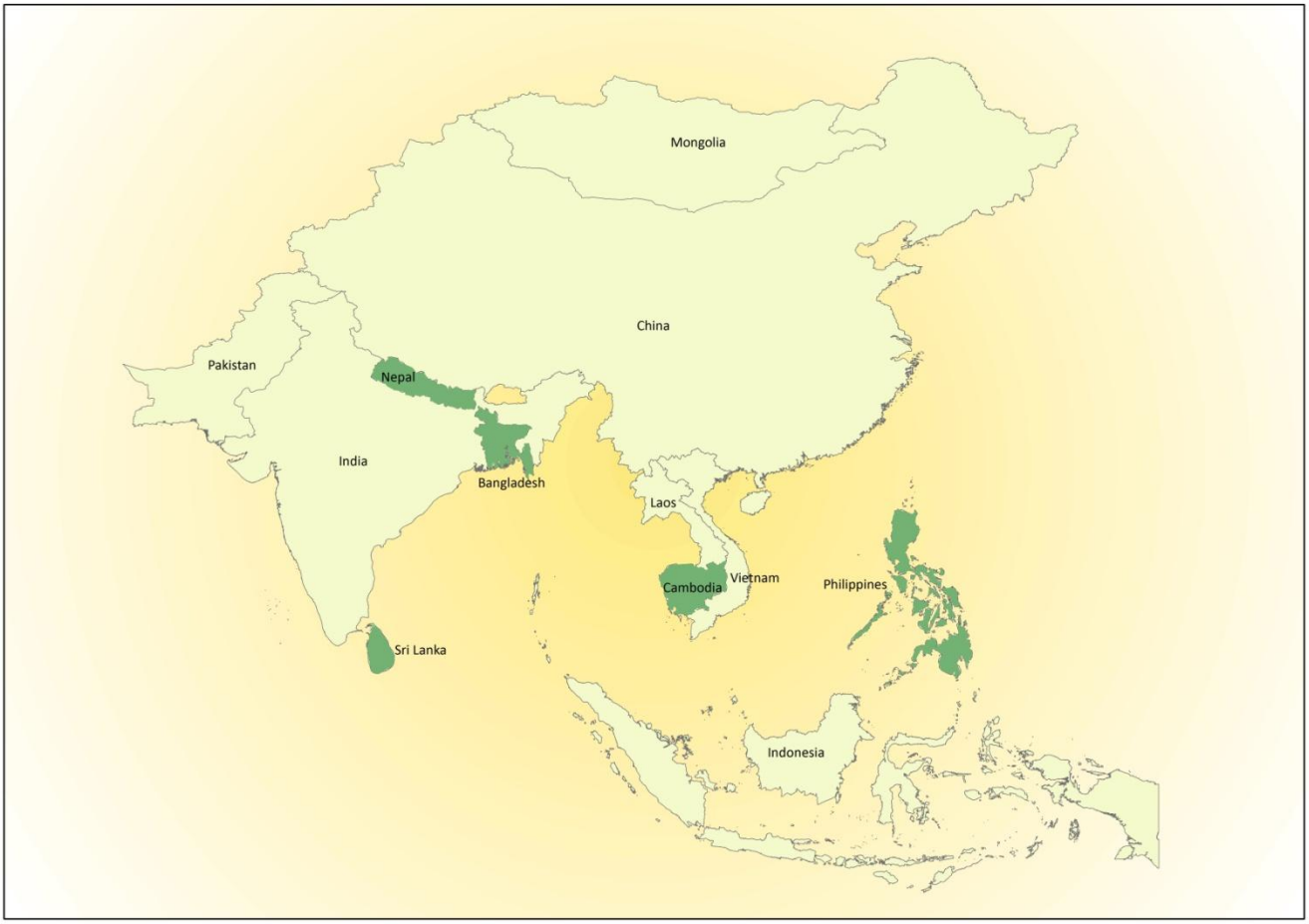

Figure 3: Location of field work

Our fieldwork was rapid (occurring over a maximum of one week) and largely qualitative, drawing on the following sources of data:

a) Secondary data from IFAD field offices (both baseline and post intervention data on yields, cropping intensity and income for an analysis of performance changes). We also collated some descriptive data at a disaggregated level, such as number and content of trainings administered to individual WUAs etc.

b) Focus group discussions with water users (WUA members, officials and key people associated with the setting) which fed into a qualitative assessment of the performance and sustainability of WUAs. Interviews focused on WUA's management efficiency (in terms of the operation and maintenance of the system), quality of irrigation service, functions and financial sustainability.

c) Field inspections of the irrigation structures funded under the project in study sites.

Our methods are consistent with Vermillion's (1997) standards for PIM impact assessments. This involved evaluations based on certain performance indicators such as operational efficiency, financial viability, cost of irrigation to farmers, WUA organizational functioning and the quality of maintenance systems. To do this we drew mainly on before and after comparisons and in some cases, with-without analysis. Our fieldwork also investigated the social and contextual mechanisms that underlie high performance, with particular reference to existing governance structures and WUA organizational functioning in determining the modes and outcomes of PIM interventions.

Quality of Evidence: A Review of IFAD's project documentation

Over a decade ago, IFAD's own office of evaluation claimed project 'reports do not directly link WUA performance to specific project impacts and the time elapsed between project completion and evaluation is [too] short' (2001:xi). At the heart of these criticisms are problems of causal attribution which arise as a result of post-hoc fallacies, fallacies of induction and short-term impact assessments. Our review, ten years on, is frustrated by these very shortcomings and as such it is difficult to provide accurate assessments of IFAD's investments in PIM. We are however able to systematically assess the quality of evidence regarding these impacts with reference to performance measures and the quality of research methods used in IFAD's project documents.

Data availability

The availability of data varied across projects. As can be seen from Figure 4, most descriptive attributes such as the type of irrigation technology, cropping systems and land rights were consistently well documented. However, in the case of other descriptive indicators such as crop value, water rights, service contracts and the importance of irrigated agriculture to farmers' livelihoods, data is sparsely recorded. Unfortunately many of these poorly documented indicators have been linked to the high performance of PIM in other literature.[3] The lack of data on these key descriptive indicators limits the insights which this review can draw on the enabling conditions for successful interventions and may mean that variables which can significantly influence the probabilities of success have been left out of our discussion.

[3] Refer to: Samad et al. 1995; Vermillion, 1997; Vermillion, 2001; Shah et al 2002; Kamara et al.. 2002.

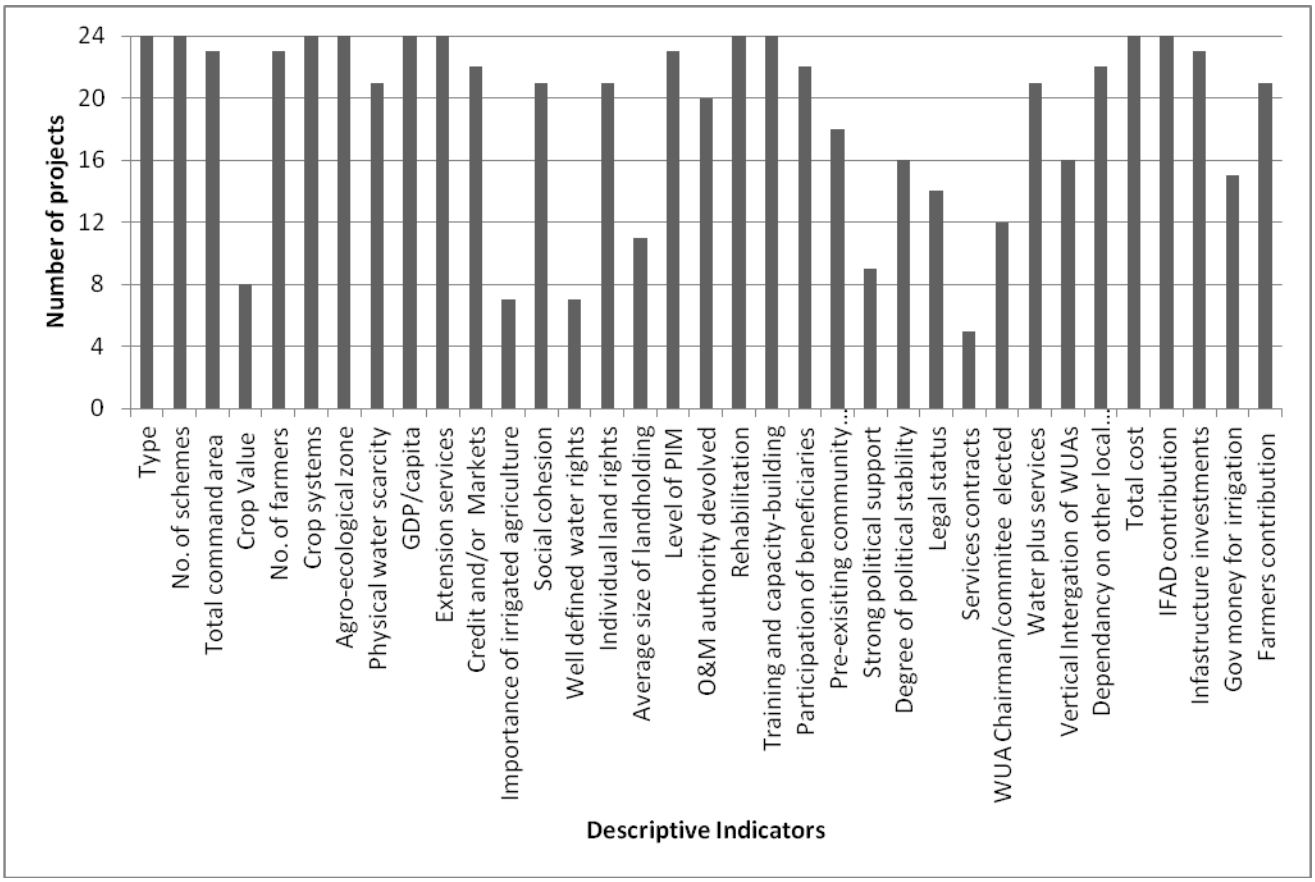

Figure 4: Frequency distribution of descriptive indicators

The data available in terms of impact and outcome indicators show pronounced trends. From Figure 5 it is evident that the best document indicators are that of crop and livelihood related impacts. However, we find that in some vital technical indicators, such as changes in the reliability, adequacy and equity of water supply, data is missing for most cases.

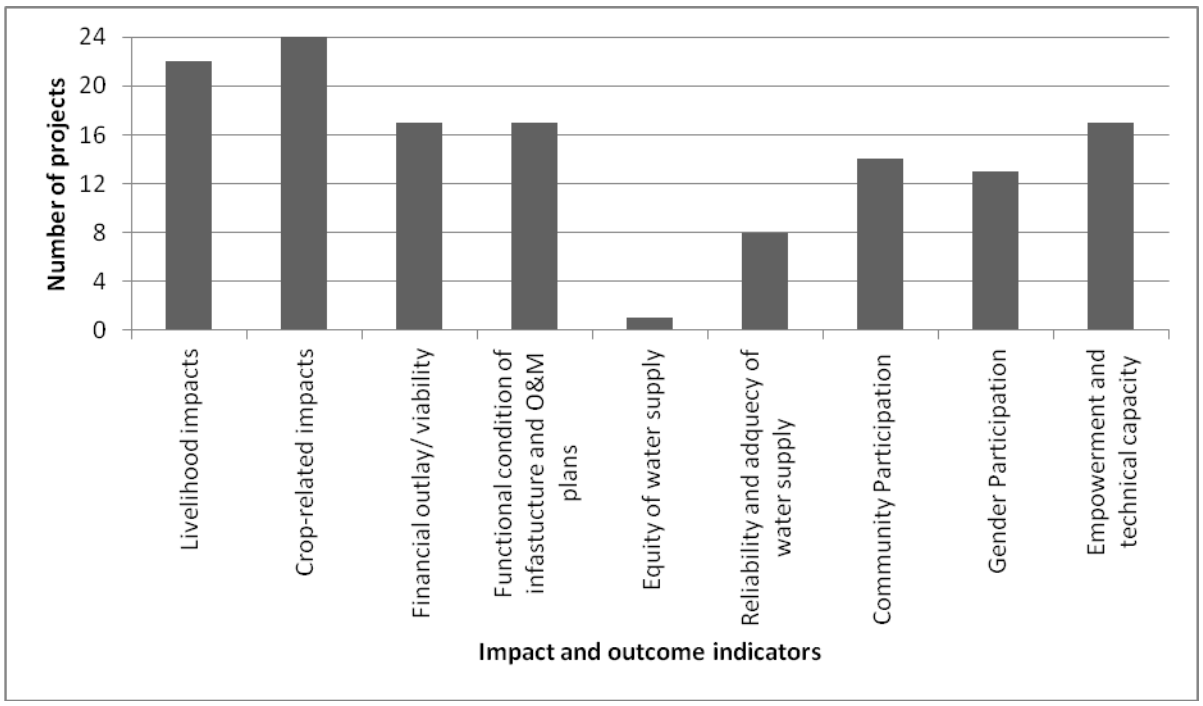

Figure 5: Frequency distribution of impact and outcome indicators

On the whole, individual IFAD documents only contained data on two or three indicators of performance and as such success or failure of PIM interventions was often evaluated using unbalanced performance criteria which either neglect important technical, financial or agricultural impacts of the intervention. The limited number of assessment criteria used in most project reports, makes it extremely difficult to assess trade-offs between key performance measures, such as changes in short-term productivity versus long-term reliability and adequacy of supply (Vermillion, 1997). Indeed, the fragmentary nature and methodological problems of the available data make it impossible to develop a more nuanced classification of success and failure.

Data disaggregation

Data collated in IFAD documents was not uniformly disaggregated across projects. In particular, the geographic scope of impact assessments and the degree to which documents differentiate between the impacts of particular project components (Irrigation or Rural Infrastructure Development) and sub-components (PIM) varied significantly. In some cases, such as the *Environment Conservation and Poverty Reduction Programme* in Ningxia and Shanxi provinces, there was enough disaggregated data to evaluate and compare performance trends in different administrative units (provinces) *within* the project area. However, in the overwhelming majority of cases, this was not possible. Also problematic, was the failure of almost all documentation to isolate the impact of particular project components and subcomponents. Rather, available data on key performance indicators,

such as yield, water availability and income reflects the impact and interaction of various interventions. Finally, simple, descriptive data, such as the number and content of trainings administered specifically to WUAs (as opposed to projects investments in farmer field schools or 'institutional and social development') were few and far between. In short, the reliance on data of varying degrees of disaggregation presents a number of challenges for a review of this kind including lack of comparability, problems regarding the representativeness of data and as will be discussed below, problems of causal attribution. As a result, the generalizations that can be derived from IFAD documents and data are very limited.

Data collection methods

Figure 6 summarizes the extent to which different data collection methods were used in IFAD's documents.

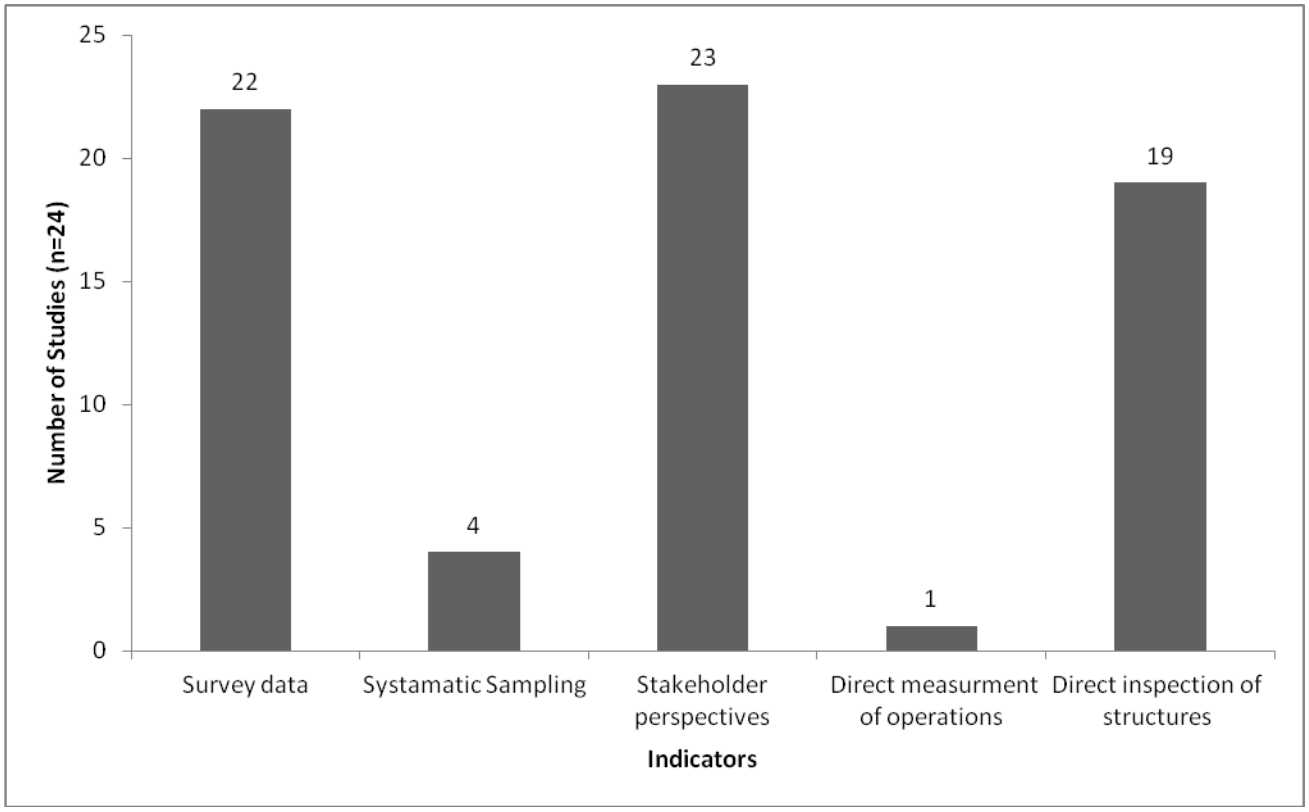

Figure 6: Frequency distribution of data collection methods

The graph suggests several common tendencies. First, less than one fifth of projects which conducted farmer interviews selected participants through systematic, random sampling methods. As a result, the conclusions drawn and perspectives expressed on the basis of farmer interviews may not represent the general perception or actual performance of the entire project. Most supervisory reports or mid-term reviews based their impact

assessments on the performance of a handful of individual WUAs and schemes without any indication of how representative these cases are, and what (if any) generalizations may be applied to *all* PIM interventions under the project.

However, the overwhelming majority of documentation did harness various stakeholder perspectives and out of 24 cases we found that 18 involved the direct inspection of irrigation infrastructure. Taken together, these trends suggest that in many cases, IFAD documents include a range of perspectives on the impacts of interventions and some independent verification of results via physical inspections of infrastructure. On the other hand, in many cases, these impact assessments may have either overestimated or underestimated performance levels in particular projects. For example, interviews or surveys which only report the perspectives of upstream farmers or WUA leaders may risk overestimating positive changes in terms of water distribution and equity (especially when only one project complimented farmer's perceptions with independent measurements of water distribution operations). In short, our analysis indicates that most documents failed to adequately verify their conclusions about *all* outcomes and impacts of PIM intervention.

Methods of analysis

We assessed project impact evaluation according to its methodological design, use of time series and statistical analysis. It is clear from Figure 7 that all projects were independently evaluated, most often through periodic Supervision Missions in which a small team of experts conducted field visits and stakeholder observations. The design of these assessments, however, shows less consistency. Most projects were evaluated by a mix of methods; some indicators, such as crop and livelihood impacts, were evaluated using before and after or with or without analysis, while others such as financial viability, and community participation often relied solely on post-impact observations and data. Assessments which claim interventions produced changes in performance without providing a reference point for those comparisons are inherently problematic. Only one project included evaluations using *both* before and after and with or without analyses, which is the basic requirement of a rigorous impact assessment (Vermillion, 1997; Welsh and Farrington, 2006 and Van der Knapp et al., 2008).

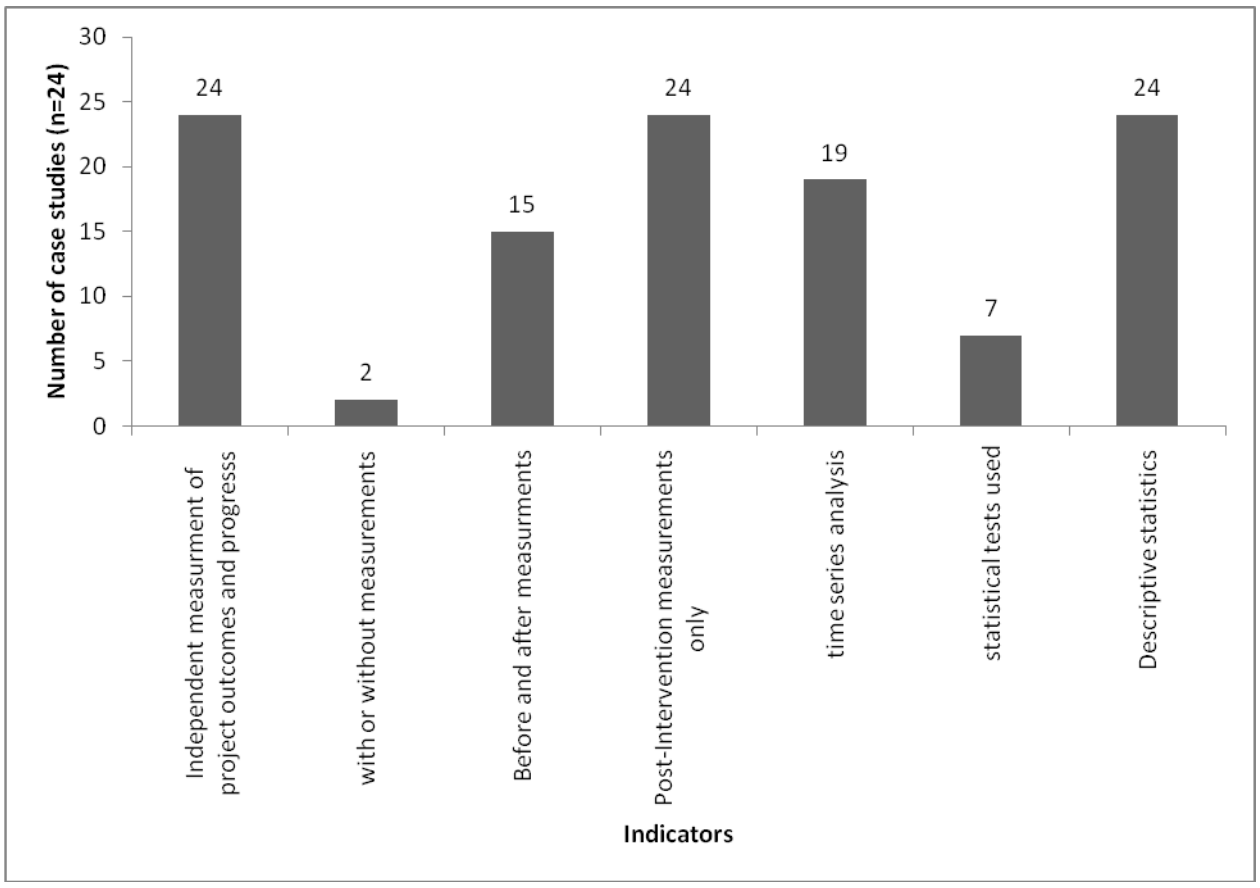

Figure 7: Frequency distribution of analytical methods used in project documents

The majority of IFAD documents did however; include data on consecutive time periods, usually through annual supervisory or progress reports. However, this data was not uniformly collected for all outcome and impact indicators, but rather was again concentrated in crop and livelihood performance indicators. Furthermore, although data was collected and documented at various points in time, meaningful analysis was conspicuously absent. In short, no documents drew on data from consecutive time periods to establish the timing of impacts, to control for alternative causes of change or most crucially, to identify the extent a particular PIM intervention has influenced the outcome .

The low rates of quantitative analysis also exacerbate the problems of casual attribution in project impact assessments. Only 7 cases used statistical tests compared to the documentation of all 24 projects which quoted descriptive statistics.[4] Statistical and econometric analyses may help to overcome some of the methodological shortcomings

[4] Statistical analysis was used in assessments of *Quang Binh Subproject: Decentralized Programme for Rural Poverty* to argue that in a particular case study, 25 per cent of the benefits achieved, were attributable to improved crop management and 75 per cent due to improved irrigation (data gathered from interview in the field). This approach was used to isolate the benefits attributable to better crop management alone (Aide Memoire, 2010).

identified in this review. For example, combining with and without and before and after analyses with difference in difference analysis will help establish a causal link between intervention and impact. Using other quasi-experimental methods such as an instrumental variable approach will similarly help in identifying casual attribution and therefore resolve the most pertinent methodological weakness in project impact evaluations.

Period of evaluation

Our projects also varied in terms of the number of years that had elapsed between the project start date and the latest impact assessment/documentation carried out by IFAD, we refer to this as the period of evaluation. For the purpose of our review we categorized projects as either, short term (3 or less years) medium term (4-10 years) or long term (over 10 years) evaluations. Figure 8 shows the frequency distribution of studies by period of evaluation.

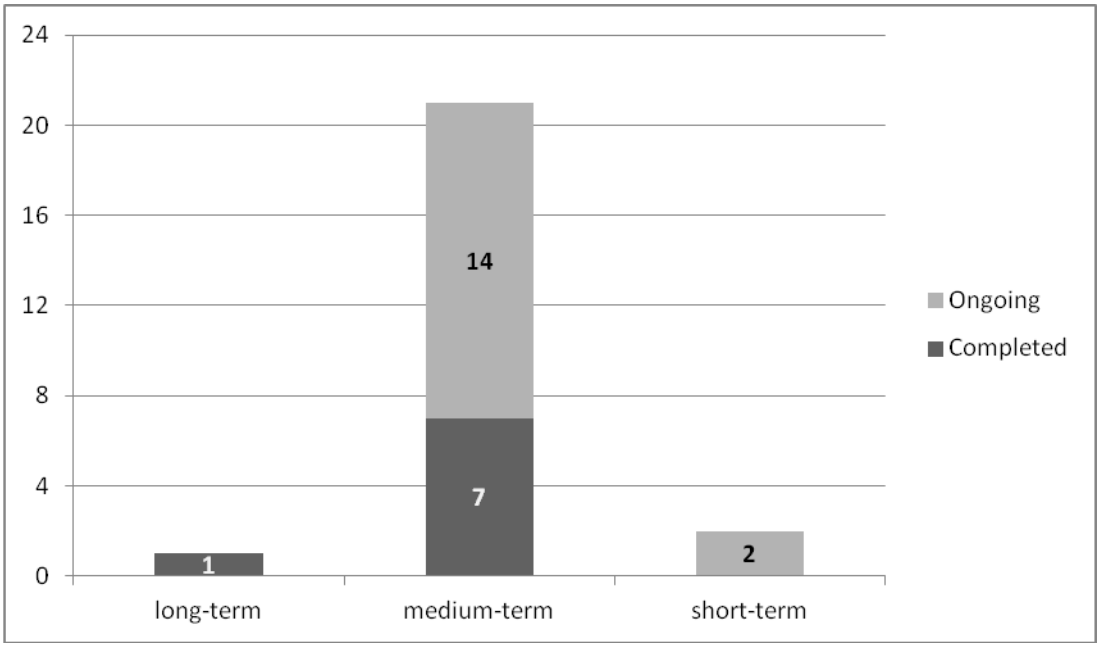

Figure 8: Frequency distribution of period of evaluation and current status of projects

While interpreting this data it is important to bear in mind that in some cases there was a significant lag between the official start date and the implementation of irrigation and PIM interventions. For instance, in the *Jharkhand-Chhattisgarh Tribal Development Program* (India), although the official start date was June 2001, field work only effectively started in 2004, and the implementation of the irrigation component still lags behind project targets (MTR, 2006). Furthermore, the implementation of PIM and irrigation interventions is often staggered over the project's lifespan. In the *Dry Zone Livelihood Support and Partnership Program* (Sri Lanka) for instance, 219 irrigation schemes were constructed/rehabilitated till 2008, 171 in 2009, and another 201 in 2010. Impact assessments do not differentiate

between the performance of a three-year old scheme and a one-year old scheme, but rather give an aggregate picture of performance trends at the date of the evaluation. Thus, the distinctions between short and medium term evaluations are not so clear cut.

It is also important to emphasize that short term evaluations are highly problematic, because it is often too early in the projects lifespan for interventions to have achieved anything more than a nominal level of impact. For instance, in *Jharkhand-Chhattisgarh* (India) and *CHARM II* (Philippines), documents cannot use technical indicators to evaluate performance because in many cases infrastructure is not yet built. Problems of causal attribution, discussed above, are also more pronounced in short-term impact assessments, and assessments of on-going projects. This is especially the case when PIM interventions are accompanied by the rehabilitation of physical infrastructure (which often produces immediate improvements in efficiency etc.) and when temporary but often substantial project inputs (such as extension services) and the work of project staff boost performance.

Of those 8 completed projects only the *Small-Scale Water Resources Development Sector Project* (Bangladesh) was evaluated post-completion. The documentation of the other 7 completed projects gives little evidence of the sustainability of IFADs investment's in PIM in the long-term. Long and medium term assessments of *completed* projects, have the potential to contribute new and useful insights into our understanding of PIM impacts and if integrated with more systematic research methods, permit conclusions about the conditions under which interventions could be expected to succeed or not.

Taken together, our review and analysis of IFAD project documents reveals that data on the impact and outcomes of PIM interventions is weak in terms of rigor and method. Having said that, IFAD's documents do include a range of perspectives on the impacts of interventions and some independent verification of results via physical inspections of infrastructure. Ultimately, these documents are the only available sources of information on the impact of PIM in IFAD project sites and we rely solely on the information contained therein to construct our CSS and to evaluate and classify each of the projects as successful or failed interventions.

Impact Assessment: A Review of IFAD's investments in WUAs

Pre-intervention context and IFAD's approach

IFAD's approach to, and investments in the irrigation sector are generally two-pronged, focusing on building, rehabilitating or modernizing small-scale irrigation infrastructure, in tandem with improving rural people's institutional capacities to obtain, allocate, use and manage water sustainably and productively (IFAD website)**.** In particular, IFAD promotes

PIM by strengthening water users' institutions, or where these are absent, by supporting the creation of water user groups.

Overall, the pre-existing irrigation technology in project sites is simple and operates on a relatively small scale. Pre-existing water management systems in these sites, however vary significantly, some have formal organizations (albeit of varying institutional strength) while others have local informal ones or no management systems at all.

Some of the principles that guide IFAD's approach to irrigation infrastructure and management are given below:

1. When and where feasible, IFAD promotes delegation or turnover of the management of schemes, or of the schemes themselves, to the groups – with attention to gender equality issues in management and O&M responsibilities.
2. The target group should participate pro-actively from the earliest possible stages of the life of irrigation developments, from design, through O&M to rehabilitation and reconstruction.
3. Irrigation development projects must be compatible with the physical resource base and complemented by, or complementary to, up- and downstream activities. Development plans should address issues raised by present efficiency. Irrigation proposals for a given area should match mid- and long-term, up- and downstream, agricultural and non-agricultural developments.
4. Poor rural men and women should be assured of equitable, reliable and sustained access to, use and control of land and water, also of equitable distribution of the benefits of water use.
5. Local and customary laws and regulations for resource allocation, costing/cost recovery, as well as local institutions and organizations governing irrigation management decision-making, should be duly taken into account (adapted from IFAD website).

The underlying objectives of this approach are to complement or strengthen the livelihood and coping systems of the rural poor and to promote food security and equitable access to resources. But it remains an empirical question as to whether IFADs interventions actually achieve this. We assess the evidence below.

Evaluation of PIM interventions using composite success scores (CSS)

Based on our CSS, 17 of 24 projects were successful. Table 4 and Figure 9 show the country and region wide distribution of failed and successful projects.

Table 4: Composite success score of PIM intervention in different countries

Country	Success	Failure	Total number of cases
China	4	0	4
Mongolia	0	1	1
East Asia	**4**	**1**	**5**
Bangladesh	1	0	1
India	2	0	2
Nepal	1	0	1
Pakistan	1	1	2
Sri Lanka	1	0	1
South Asia	**6**	**1**	**7**
Cambodia	0	2	2
Indonesia	1	0	1
Laos	0	3	3
Philippines	2	0	2
Vietnam	4	0	4
South east Asia	**7**	**5**	**12**
Total	**17**	**7**	**24**

The table shows that rates of success are highest in East and South Asia. All of the four projects implemented in China were successful. As discussed later in this paper, Chinese projects, operate in a somewhat unique incentivized, entrepreneurial context. South-east Asian projects were the worst performers with five failed cases (out of 12), however here poor performance was concentrated in only two countries, Cambodia and Laos, all others performed highly according to our system of classification.

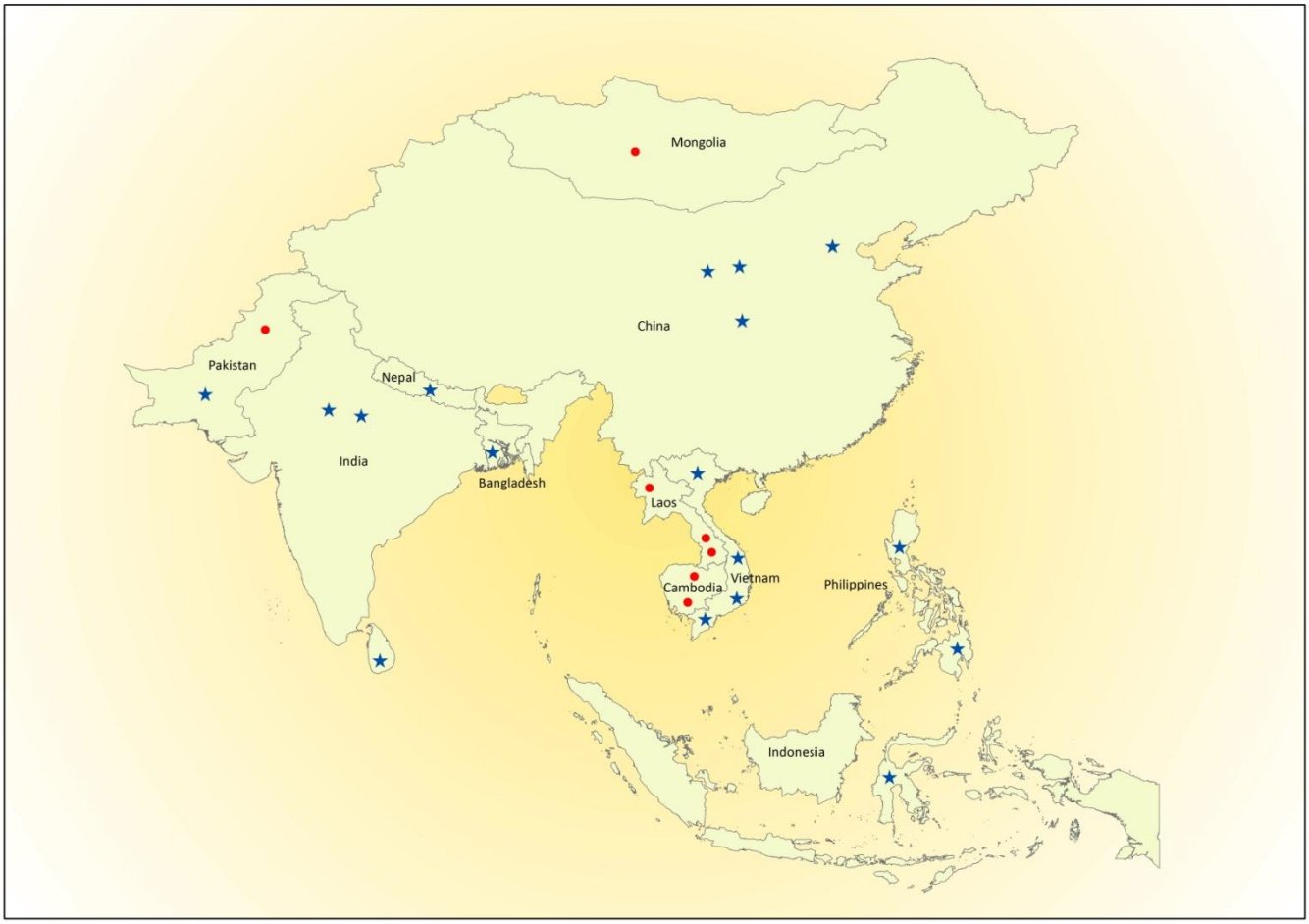

Figure 9: Distribution of successful and failed PIM interventions

As already mentioned, we used 9 impact/outcome indicators for assessing success or failure of IFAD's PIM initiatives in Asia. Figure 10 shows the performance of our case studies in terms of these indicators.

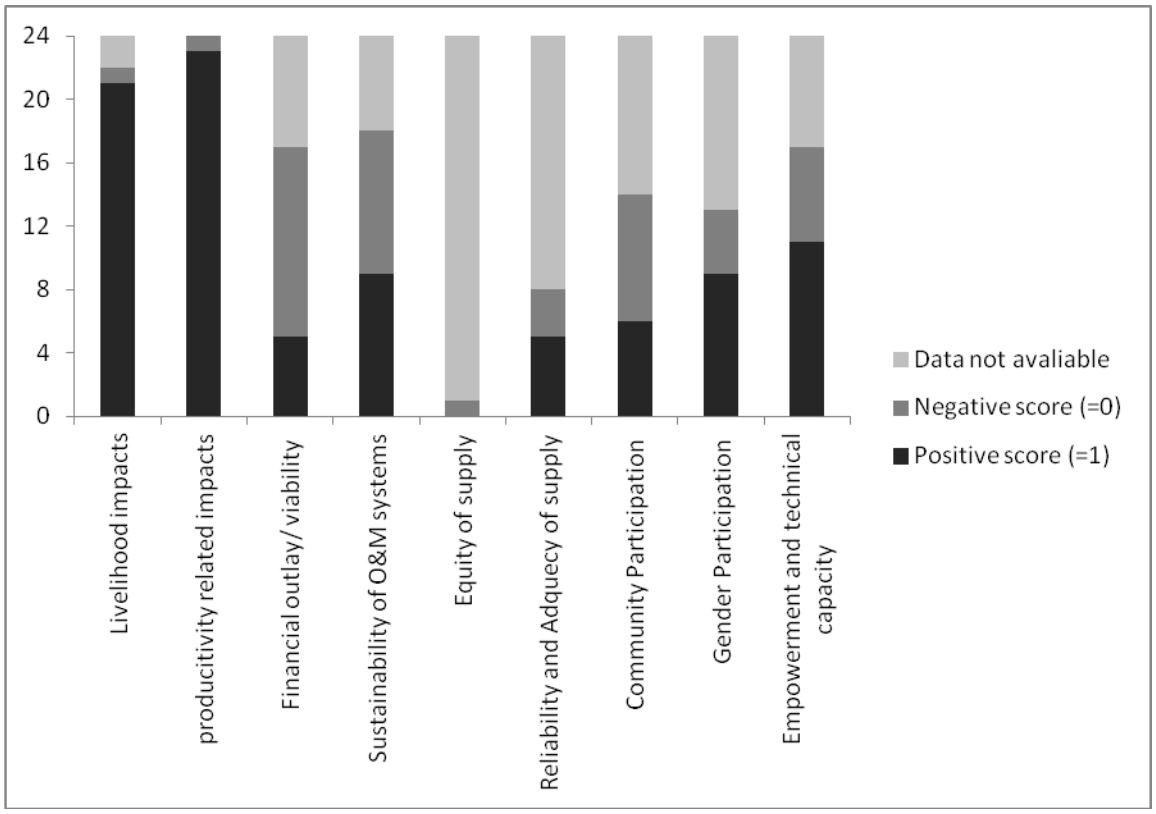

Figure 10: Performance of projects in terms of outcome and impact indicators

In 5 indicators, performance tended to improve after the intervention. These are crop and livelihood related indicators, reliability and adequacy of supply, gender participation and empowerment and technical capacity. However, as already mentioned, crop and livelihood related impacts are problematic because they may not capture the impact of PIM *per se* and there is evidence to show that they are often more related to rehabilitation and other project components (marketing, extension and micro-finance) than to the organised user management of systems. Negative and neutral scores outweigh positive scores in financial viability of WUAs, sustainability of O&M systems, equity of supply and community participation, showing that on an average, more projects perform the same or worse after the intervention than projects which improve on these counts.

Robustness of classifications

How robust are the impact assesments and conclusions drawn from IFAD project reports? What are the chances that our CSS overstates or underestimates the actual impacts and

outcomes of IFAD's PIM interventions? To test the robustness of data we compare trends from desktop and field analysis in 5 project sites.[5]

Table 5: A comparison of trends from desk-top and field analysis in 5 projects sites

ROBUSTNESS OF IMPACT ASSESSMENTS (DESK vis-à-vis FIELD)			
IMPACT/OUTCOME INDICATORS	**HIGH CONSISTENCY OF TRENDS**	**LOW CONSISTENCY OF TRENDS**	**DATA N/A IN DESKTOP REVIEW**
Improved community participation in WUAs	1	1	3
Improved women's participation in WUAs		3	2
Empowerment and technical capacity	1	2	2
Cost of irrigation/PIM to the farmers			5
Local financial self-sufficiency for O&M budget			5
Water reliability and adequacy	1	1	3
Equity of water allocation			5
Financial sustainability of infrastructure	1	2	2
Functional condition of infrastructure	**5**		0
Agricultural productivity	**5**		0
Livelihood impacts	**4**		1

This table suggest several interesting trends. First as already elaborated on above, a lack of data and detail prevents meaningful analysis in many cases. Second, performance changes in those well documented, easily measurable indicators – crop productivity, livelihood related impacts and infrastructure quality – is consistent and favourable across both desk and field analysis in all 5 projects, confirming the robustness of impact assessments on these fronts. In contrast, the documentation of socially dynamic and qualitative changes such as beneficiaries' or gender empowerment was less robust. Here discrepancies may arise due to the difficulties inherent in measuring qualitative social change. While, this emphasis on quantitatively measurable results is understandable it could be complimented and framed by more qualitative assessments of socio-political processes.

Taken together, we can conclude that in terms of IFAD's underlying objectives – strengthening livelihood and food security – the overwhelming majority of projects

[5] Fieldwork was undertaken in 5 sites. These were: *Western Uplands Poverty Alleviation Programme* (Nepal); *Small-Scale Water Resources Development Sector Project* (Bangladesh); *Northern Mindanao Community Initiatives and Resource Management Project* (Philippines); *Rural poverty reduction project* (Cambodia); and *Dry Zone Livelihood Support and Partnership Programme* (Sri Lanka).

achieved positive results. IFAD's impact in terms of increasing equitable access to resources, in this instance water for irrigation, is harder to assess due to the lack of data in IFAD reports, though we do take up this issue later on in our insights from the field. Of course, it is again very difficult to isolate the contribution of PIM initiatives to these results due to the methodological shortcomings of our data set *and* the complex interactions and overlap of different projects components.

Patterns of success

A primary aim of this review is to gain insights into how effective PIM interventions work (or why they fail). By correlating success and failure with well documented descriptive attributes, we were not only able to examine the relationship between a range of 'enabling' factors and rates of successful interventions but also to determine how consistently IFAD's guiding principles were applied on the ground and to what effect.

Success as a function of socio-technical specification

It is commonly hypothesised that socio-technical parameters, such as the irrigation technology, cropping system, extent of physical water scarcity, and land tenure rights, affect the management possibilities of irrigation systems and the range of functions and responsibilities that can be assumed by beneficiary farmers. Drawing on our rich dataset we test these hypotheses below.

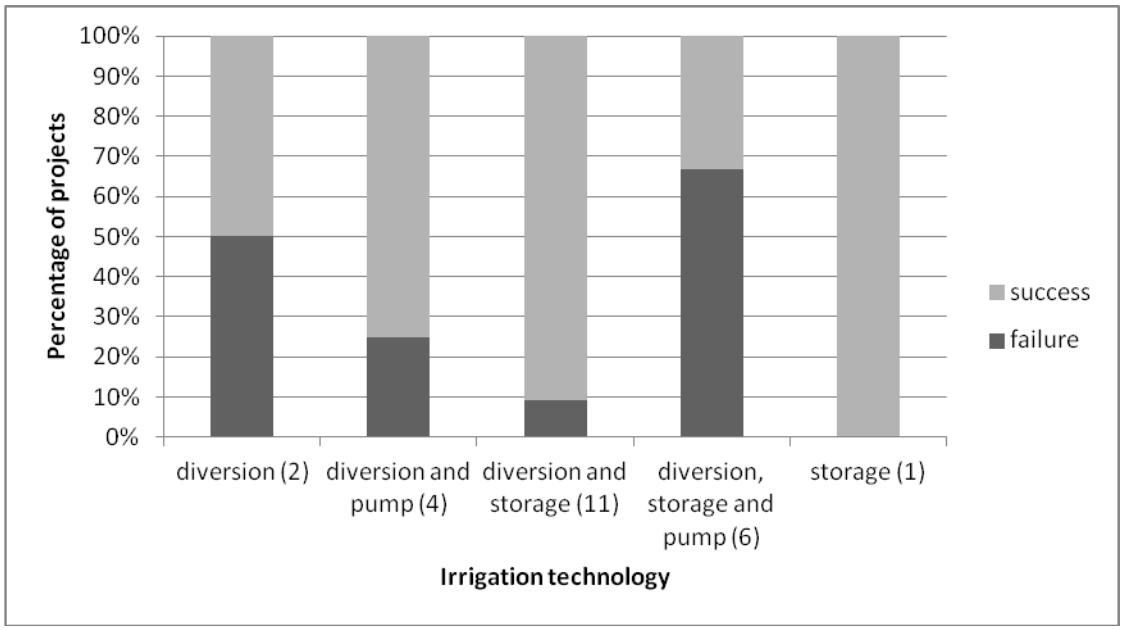

Figure 11: Success as a function of the type of scheme

Those projects which invested in a mix of technology; pump, diversion and storage recorded most failures. In particular, investments in often untested solar pump schemes,

appear to have a higher likelihood of failure relative to other irrigation technologies. In the *Attapeau Rural Livelihoods Improvement Programme* (Laos), for instance, the installation of solar pumps has not translated into technical efficiency or management gains because they provide low flows and are costly to repair and maintain. Solar powered tube wells may appear attractive because of the free energy; however according to the 2009 Supervisory Mission, 'the procedures for repairing these new, technically sophisticated systems appear cumbersome and are untested. The procedure of repair could take a minimum of two weeks during which time the farmers would have no water and likely suffer significant loss of vegetable crops. Outside of warranty there is reported to be one local private technician in Attapeau town – but in the absence of any effective fee collection it would be impossible to use this service (7).'

Similarly, in the *Rural Poverty-Reduction Programme* (Mongolia) solar power pumps were installed with mixed results. A Supervisory Mission (2009) visited 2 wells where the small pump is powered by solar energy with support of the project. In these sites, the pump, solar panels, batteries, AC & DC invertors and plastic pipes were found to be laying by the herders *Gers* (felt-lined tents) as they were difficult to transport in rural conditions. The same mission observed that the use of solar powered pumps were not really efficient, and very slow compared to using simple traditional rubber basket for hand lifting of water from hand wells, because of the low capacity and the possibility of freezing during the cold winter season. For the same amount of expenditure more lands could be irrigated, using cheaper technology. In short, a mismatch of system technology and the O&M capabilities and resources of WUAs prevents many beneficiaries from taking advantage of the managerial advantages and better water control offered by pump schemes. Theoretically, solar pump technology offers a cheap, environmentally friendly solution to the irrigation inefficiencies of local systems. In practice, however they are inefficient and expensive to repair, which results in their abandonment by farmers in favour of traditional practices. These examples illustrate the importance of *thorough* beneficiary consultations and stock-takes of existing local arrangements for water conveyance, distribution and infrastructure maintenance *before* new technological interventions are introduced.

Similarly, the *Rural Livelihoods Improvement Programme* (Laos) illustrates the problem of building sophisticated and expensive capital structures without paying sufficient attention to local capacity for repairs and existing O&M systems. In principle, permanent weirs were considered by many engineers to be robust solutions for intakes which would otherwise have to be reconstructed annually. However, the construction of permanent intakes is expensive and their eventual replacement is as yet, beyond the capacity of beneficiaries. According to the 2010 Aide memoire, given the hilly terrain of the project sites, chances are that spates or flash floods will wash away the permanent structures. Temporary headworks, reconstructed annually by beneficiaries with locally available materials, are

perhaps the more sustainable option in small-scale hill irrigation (Aide Memoire, 2010). Furthermore, as argued by Ostrom and Gardner, such interventions can potentially disrupt 'the mutual dependencies and reciprocal relationships among farmers …. [for example] the presence of permanent headworks is positively related to a inequality between the water availability achieved at the head and the tail. Presumably one reason is because permanent headworks increase the bargaining position of head-enders, relative to tail-enders' (1993:110). In such contexts, interventions inadvertently violate one of IFAD's guiding principles, as investments are *not* complimentary to existing and/or equitable up-downstream activities.

Overall, however, the irrigation technology installed or rehabilitated in IFAD sites was quite simple and did not represent a substantial departure from traditional practices. This approach has several benefits. First, for the most part farmers had the capacity and know how to undertake the day to day O&M of newly constructed or rehabilitated systems, without recourse to outside assistance. Second, these interventions do not increase the capital or resources required to run the system and thus are not a source of additional financial burden for farmers. A case in point is the rehabilitated micro-tank irrigation systems under IFAD's *Dry Zone Livelihood Support and Partnership Program* (Sri Lanka). In these schemes, IFAD most often funded the reconstruction or repair of earthen tank bunds or the installation sluice gates, which are in keeping with the local capacity for repairs and back-up systems.

On the whole, infrastructure designs should look beyond robustness to options for sustainability that are consistent with farmers' operation and maintenance systems. More specifically, IFAD's investments in irrigation technology should be guided by two key questions: 1. after the life of the project, will farmers be able to manage the system reasonably well without outside support? And 2. Do physical investments alter or disrupt local arrangements for maintenance and distribution, with negative implications for equity? Any technology that answers the former in the negative and the latter in the affirmative is not worth considering.

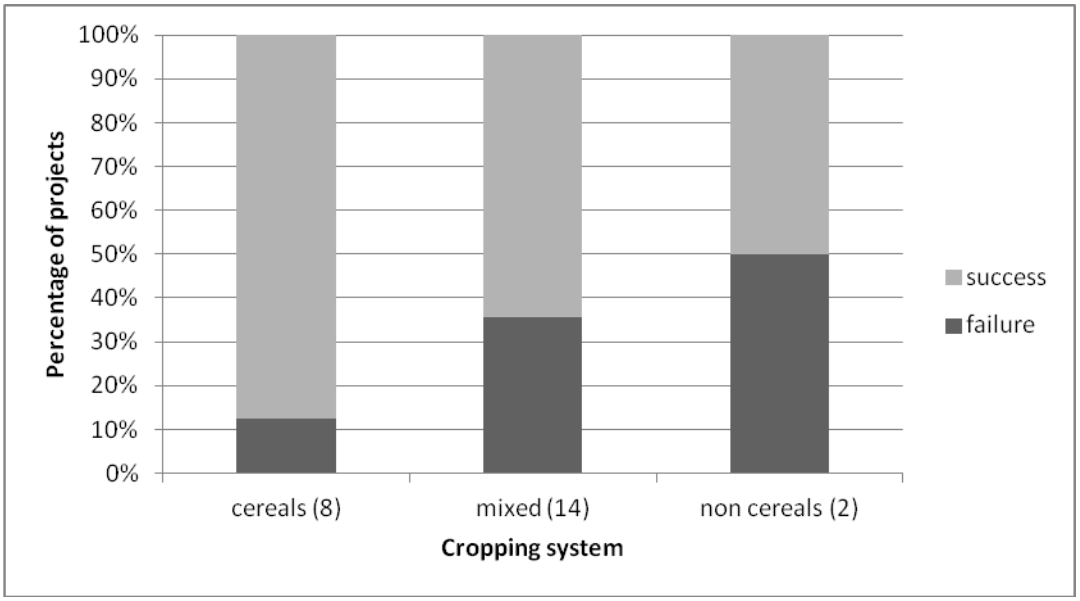

Figure 12: Success as a function of cropping system

Tang (1992) found that the type of crop grown in an irrigation system affects the way it is cooperatively managed by the community. The irrigation schemes in our database were classified into three types based on the major crops grown. These were: cropping systems dominated by cereals, mixed or diversified cropping systems and systems dominated by non-cereals. Our analysis indicates that projects which predominately cultivate cereal crops performed better than diversified and non-cereal cropping systems. Perhaps, a partial explanation for this trend is that in some projects, such as the *Dry-zone Livelihood Support and Partnerships Program* (Sri Lanka) cereal cultivation was bolstered by government subsidies and farmers had easy access to state regulated markets. It is also argued that, it is easier to forge cooperative strategy in mono-cropping systems commonly found in cereal systems like paddy. However, this line of reasoning is contested in the literature (Mukherji et al. 2009) and it may be equally well argued that non-cereal systems, which require greater water control than cereal systems, provide farmers better incentive to cooperate. This dichotomy underscores the difficulty in establishing causal links between type of crops grown and successful WUAs.

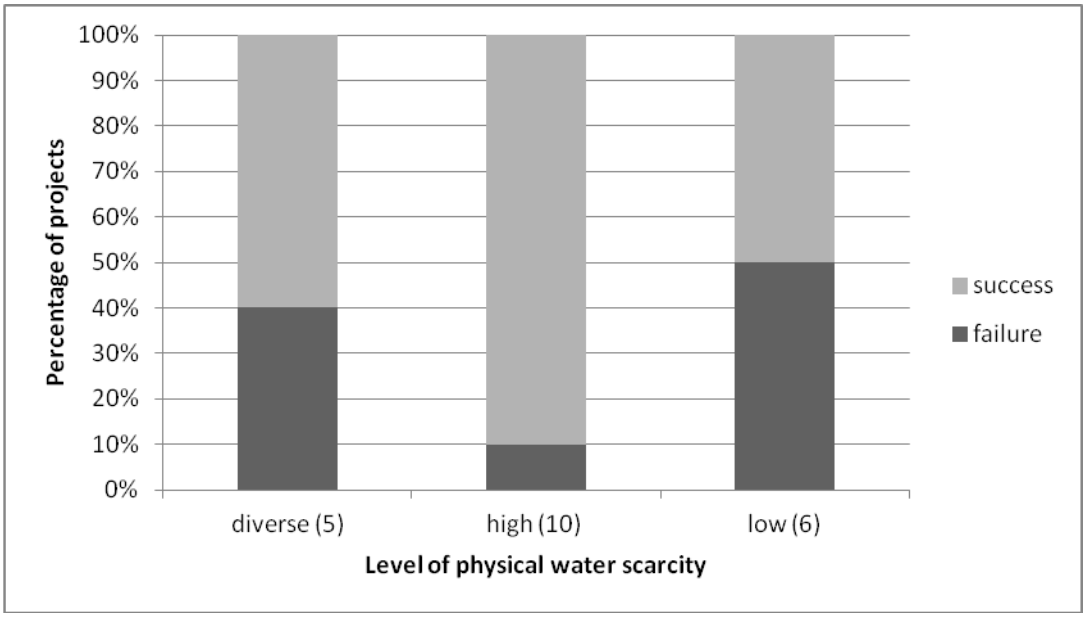

Figure 13: Success as a function of physical water scarcity

Whether or not a system is inherently water deficient obviously affects the performance of the system and the possibilities for water management. It is commonly hypothesized that the relationship between water availability in a system and chances of cooperative action is an inverted U shaped curve (Tang 1992). This suggests that chances of forging cooperative outcomes is less likely in systems that experience severe water scarcity or which are adequately endowed with water and is maximum in systems that are neither water scarce nor water abundant. The projects in our database fell into three categories, these were: high degree of water scarcity, geographically diverse experience and low degree of water scarcity (abundant). No projects fell in the middle of this continuum.

Contrary to the inverted U shape hypothesis, our results suggest that projects implemented in water abundant schemes are much more likely to experience poor performance than water scarce projects. A possible explanation for our divergent results stems from the fact that 50 per cent of water abundant projects, namely the *Community-Based Rural Development Programme* (Cambodia), *Oudomxai Community Initiative Support Programme* (Laos), and *Rural Income Diversification Programme* (Vietnam) involve pump irrigation technology, which are often less likely to result in successful cooperative outcomes (Shah 2008) and as argued above, are in many cases poorly matched with the local capacity for repairs and back-up systems. In contrast, 80 per cent of water scare schemes involve diversion and storage irrigation which are perhaps more amenable to collective management.

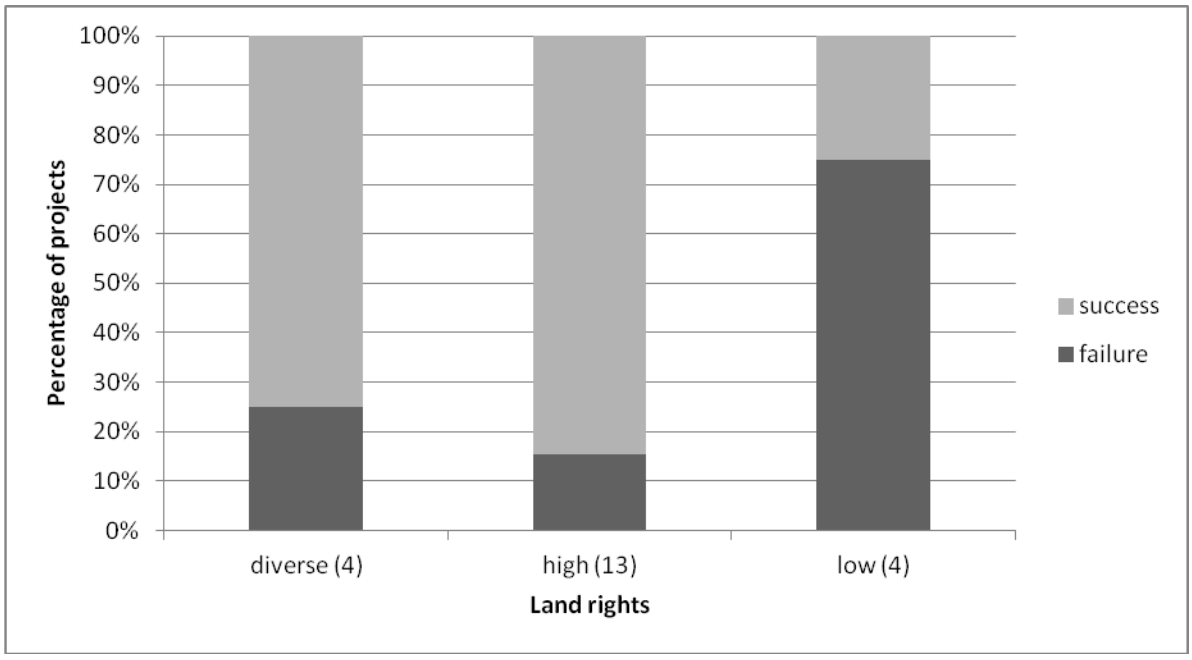

Figure 14: Success as a function of the security of land tenure

Our results indicate that when beneficiary farmers have secure land tenure rights the chances of successful interventions are higher. Property rights provide important security and incentives for farmers to invest in irrigation management. Insecure tenure, lack of crop choice, rigid rental markets and the inability to offer land as collateral for obtaining credit, limits the time, materials and cash farmers are willing to commit to long term development investments on their land, let alone in irrigations schemes as wholes (Shah et al. 2002).

In *Ha Giang Subproject: Decentralized Programme for Rural Poverty* (Vietnam) for example, almost all agricultural land has been allocated to individual households (for 20 years), who are now entirely responsible for their own decisions on the cultivation and disposal of crops, providing important opportunities for livelihood enhancement. Indeed, Project M&E data indicates that between 2006 and 2009 average rice yields increased from 2.41 to 4.55 tonnes per hectare and maize yields have increased from 1.84 to 2.07 tonnes per hectare for households, and that this is partly due to the adoption of recommended crop models (Aide Memoire, 2010:11). Put differently, tenure security appears to facilitate farmers' uptake and investment in more productive and efficient cropping systems/techniques.

The *West Guangxi Poverty Alleviation Project* and *Ningxia Environment Conservation and Poverty Reduction Programme* provide examples of tenure security in the context of communal land ownership. In principle, farmlands are owned by the village (collective), which contracts or otherwise allocates the use of land to households. Appraisal Reports for both projects argue that 'despite the benefits that farmers would *theoretically* receive if land were privatised, household surveys systematically indicate that farmers appear to prefer

collective land ownership with periodic land adjustment based on demographic dynamics' (emphasis added). In these projects, the security of land tenure is not compromised by the lack of private ownership. Rather, 'farmers feel very confident that the reward of their individual efforts will benefit their individual households'. (Appraisal Report, West Guangxi Poverty Alleviation Project). In short, the incentives at play in privatised land tenure systems also appear to be active in these cases.

For poor, smallholder farmers, secure access to water cannot be separated from secure access to land. Our results support the hypothesis that the security of land tenure creates incentives for farmers to invest in management practices, training, technologies and organizations.

Success as a function of legal-institutional environment

It is commonly hypothesized that the legal-institutional environment in which WUAs operate influences their success (FAO, 2007; Vermillion, 1997; Meinzen-Dick, 1997, Bolding et al, 2003; Olubode-Awosola et al, 2005; Tren and Schur, 2000). In our review, we are able to test this hypothesis, by evaluating the relationships between rates of success and access to crucial inputs (extension and credit), integration into existing legal-administrative systems and pre-existing institutional strength.

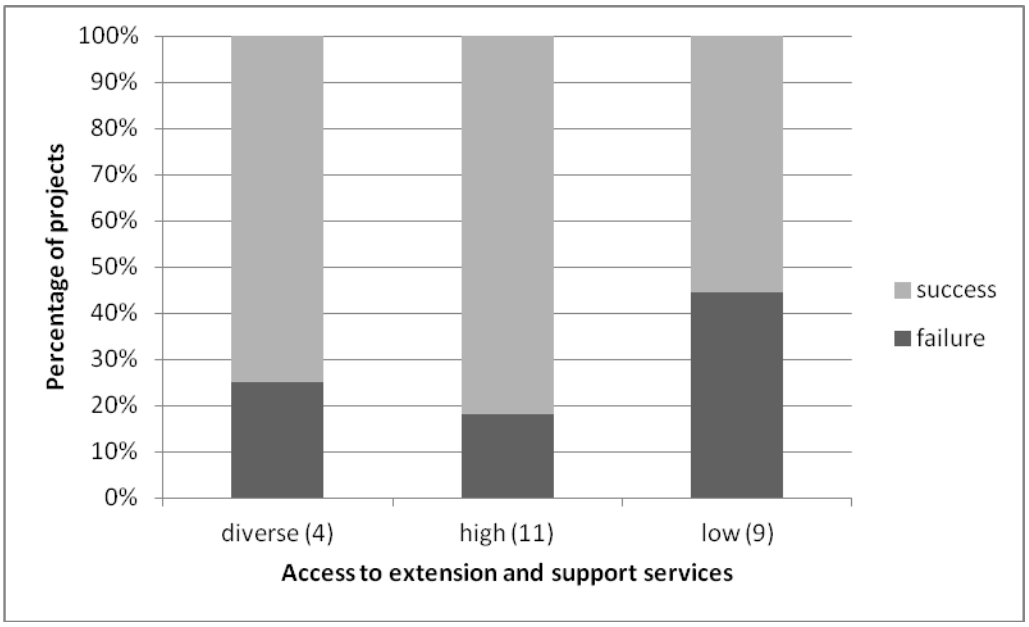

Figure 15: Success as a function of access to extension and support services

In most cases, IFAD's interventions targeted small or micro irrigation schemes, with a small number of beneficiary farmers per scheme. For this reason many of the management

challenges faced by large scale irrigation schemes, such as inefficient water allocation from the main system are averted. However, even small irrigation systems require the relevant extension and marketing activities to maximize their usefulness to the beneficiary community. Indeed, Ogunwale et al. (1994) found that farmers viewed the availability of other agricultural inputs and services (especially fertilizers, tractors and harvesters) as more important to them than irrigation water or irrigation systems' effectiveness. This is especially significant in systems where irrigation water supplements rain-fed irrigation systems and many of IFAD's PIM investments are made in such schemes. Similarly, the Appraisal Report of the *Azad Jammu Kashmir Community development Program* (Pakistan), claims the potential of irrigated agriculture to address poverty and increase livelihoods is curbed by domestic price policies; indifferent quality of seeds and planting material; lagged introduction of new higher yielding varieties; lagged input supply and power; failure to disseminate better technical practices to farmers; and the difficulties of expanding the cultivated area.

Our results indicate that high access to extension services is correlated with WUA success. However, of these projects some invest heavily in extension services only during the life of the project while others institutionalize these systems. In the *Decentralized Programme for Rural Poverty* (Vietnam), for instance the provision of inputs (fertilizer, seed and seedlings) and tools to increase agricultural production makes up over 80 per cent of the budget for the Farming System Development subcomponent of the project (Supervision Report, 2009). However, the decentralized models for agricultural extension, inputs supply and outputs processing and marketing implemented by DPPR are yet to be adopted by the public administration and provincial level agencies are still not integrated into the system (Supervision Report, 2009).

In contrast, in *Ningxia Environment Conservation and Poverty Reduction Programme* (China) fertilizers, agro-chemicals and farm tools are mainly supplied through the network of the Supply and Marketing Corporation with outlets at regional, county and township levels. Similarly, in Ha Tinh (Vietnam), the project improved the extension services in the Province through capacity building of the provincial and district staff of the Departments of Agriculture and Rural Development (DARD), providing them with access to new technologies and equipping them to train at the lower level. As project documents argue, 'by linking {WUAs} up with the existing social, political and developmental framework, the Project has contributed towards the institutionalization of the processes as well as building up social, organizational and institutional capital' (PCR, 2005: 15).

Overall, our results underline the importance of extension services *vis-à-vis* high performing agricultural systems. However, the sustainability of the systems in IFAD project site shows great variability in terms of their long term responsiveness to farmer's needs, access and technical expertise.

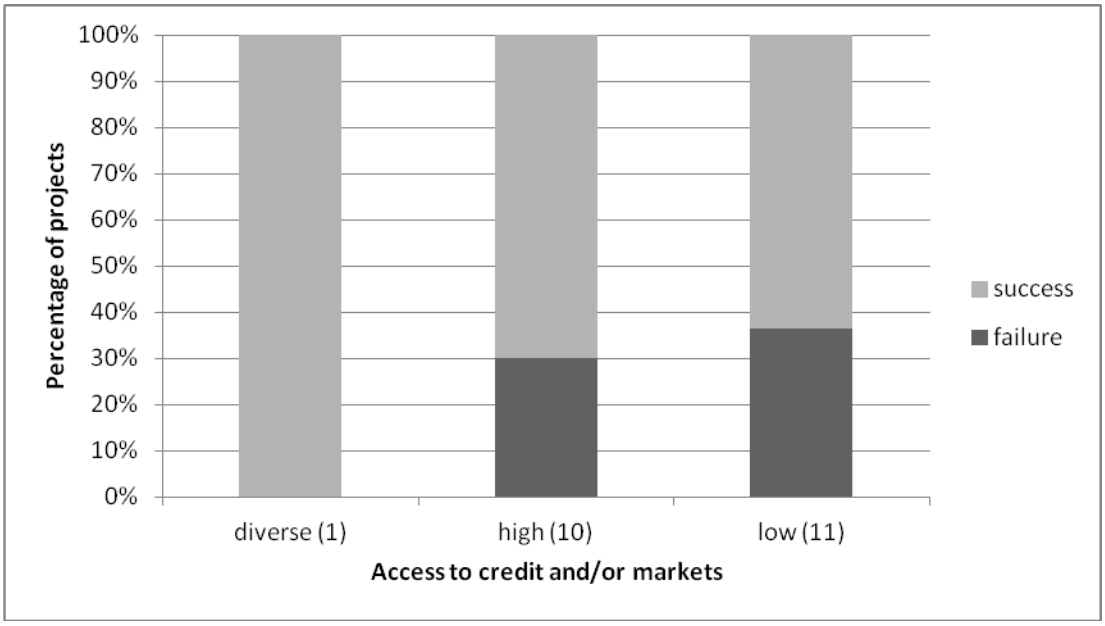

Figure 16: Success as a function of credit and market access

Overall our results suggest that access to credit and markets are not a critical factor underpinning success. It is important to consider these results in context. In many cases there was a significant overlap of different project components with little clarification about the percentage of farmers who benefited from both irrigation and micro-credit interventions, and indeed, if and to what extent, credit was used to develop or enhance irrigated cultivation.

Improving market access and farmers' marketing skills was also a common component (in its own right) of most projects. Shah et al. (2002) argue that stagnant, small-scale farming systems face an 'entire complex of constraints' such as poorly developed private markets, and low incomes and productivity which prevents effective farmer management. Similarly, Castillo and Namara argue, 'the income generating potential of agricultural water management is directly related to the degree to which smallholders are integrated with input and output markets. Impacts are greatest when small farmers can access a range of complementary goods and services for the production and marketing of crops' (2007: 183). However, our results suggest that the performance of projects with high market access differed little from those without. In our study, the impacts of increased market access on farmers incomes and productivity may be somewhat masked or attenuated by our CSS which also considers the technical and physical outcomes of projects.

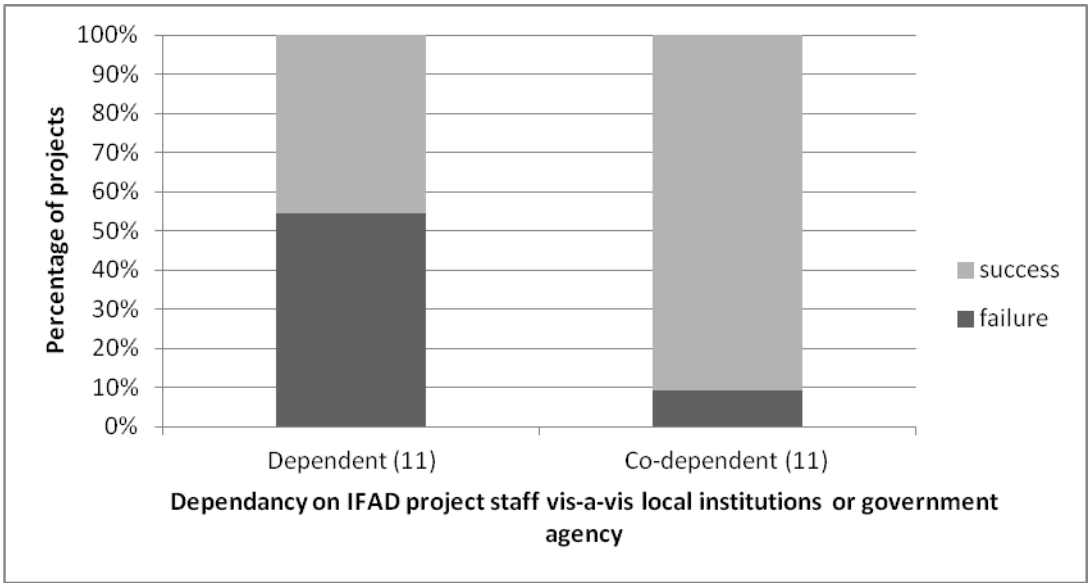

Figure 17: Success as a function of dependency on IFAD project staff or local institutions

None of IFAD's projects created completely self sustaining WUAs, indeed the expectation that WUAs can somehow function without crucial inputs or cover large scale O&M works and absorb the cost of management when it constitutes a large portion of their income is unrealistic. The extent to which IFAD's project staff, a government agency or other local institutions were involved in the O&M of scheme infrastructure varied from *dependent*, where WUAs rely heavily on *project* inputs and require further capacity building and investment before IFAD can phase out its support**,** to *co-dependent*, where WUAs are integrated into the country's water management or administrative framework.

Our results indicate that WUAs that are co-dependent perform better than those which are not. For example, in the *Environment Conservation and Poverty Reduction Programme*(China) technical assistance is provided free of charge by the resources bureau or township water resource stations. In addition, large scale maintenance works, such as the main canals or pipelines from dam to farmlands are usually funded by governmental support. This strong, institutionalized support system is a common factor across all Chinese projects, suggesting it is a crucial determinant of successful interventions.

However, it is also possible that integration into existing administrative and water management systems will do little to resolve questions of WUA sustainability. In the *Community-Based Rural Development Program* and *Rural Poverty Reduction Project* (Cambodia), for instance major O&M expenditures will be required after 10 years or in event of major damage caused by flooding etc. However, no clear commitment is available from the Provincial Department of Water Resources and Meteorology (PDWRAM) in project areas to meet these costs nor do the WUAs have the capacity to make such repairs.

Furthermore, integration can in some cases weaken WUAs, especially when combined with inappropriate water legislation or regulations and poor governance, (as a result of organizational inertia or vested interests of the agency) which compromise project plans to improve access to, and control of, water for irrigation by the poor.

Overall, however our analysis suggests continued external involvement in O&M (either by the project or government agency) is necessary, especially in contexts where there is a significant capacity shortfall (administrative or financial).

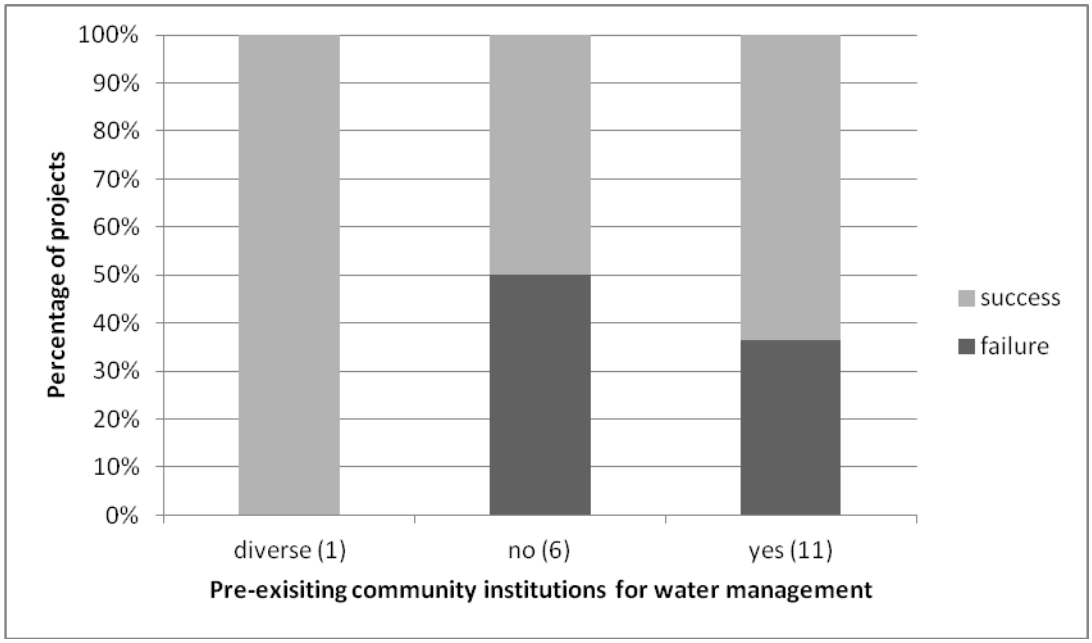

Figure 18: Success as a function of existing community institutions for water management

According to Agrawal (2001) past successful experiences and social capital are important determinants of collective management. This perspective also finds expression in IFAD's guiding principles, which place emphasis on local institutions and organizations governing irrigation management decision-making. On the whole our results also suggest that project sites which built on pre-existing community institutions for water management succeeded more often than those which did not. However, it is important to note that even when pre-existing organizations become the basis of WUAs, they sometimes reinforce pre-transfer power hierarchies and social inequality.

Success as a function of WUA organizational structure and functions

Most projects included interventions that either formed new WUAs or that sought to structurally change existing organizations (for example, by creating subcommittees for the

O&M of scheme infrastructure). Drawing on our rich database we were able examine the relationship between the structure and functions of IFAD sponsored organizations and rates of success.

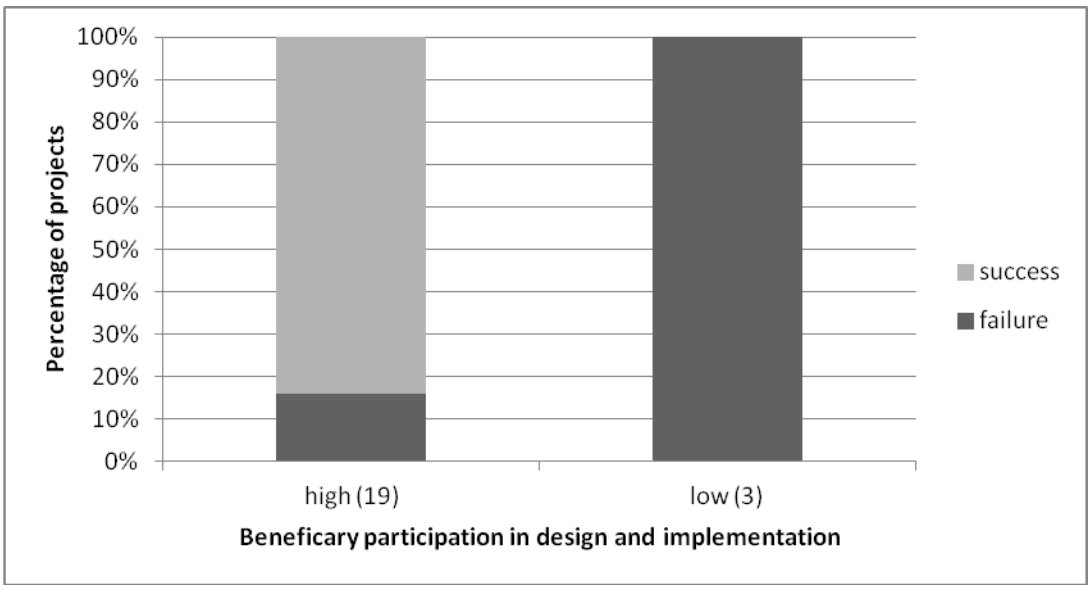

Figure 19: Success as a function of beneficiary participation in design and implementation

In 19 cases, beneficiaries actively participated in the technical design and implementation of project works. In these cases, the performance of the irrigation system and management authority was significantly higher than in those where beneficiaries were not engaged in design and implementation processes.

Many projects which failed in our system of classification were characterized by the low participation or dissatisfaction of beneficiaries. In the *Rural Poverty-Reduction Programme* (Mongolia), for example, local herders who live near project sponsored wells informed the 2009 Supervisory mission that they had never been consulted about the location of the wells. Similarly, herders in the proximity of the water harvesting dam in *Tuvshruulekh soum* expressed their dissatisfaction at not being involved in the decision making process (Aide Memoire, 2009).

Similarly, in the *Rural Livelihoods Improvement Programme* (Cambodia), interviews with farmers during the 2008 supervisory mission suggest that they have an 'invisible organization' at best. This means that beneficiaries were mobilized for works or contributions by the village headman only when emergency repairs are needed. The beneficiaries did not take any initiative towards the upkeep of scheme infrastructure.

Our results suggest the high levels of beneficiary participation translate into performance gains via an increased sense of ownership and increased capacity through training and experience. Furthermore, farmer engagement from the pre-construction phase increases the likelihood that investments are actually responsive to farmers needs and consistent with their managerial and financial capacities.

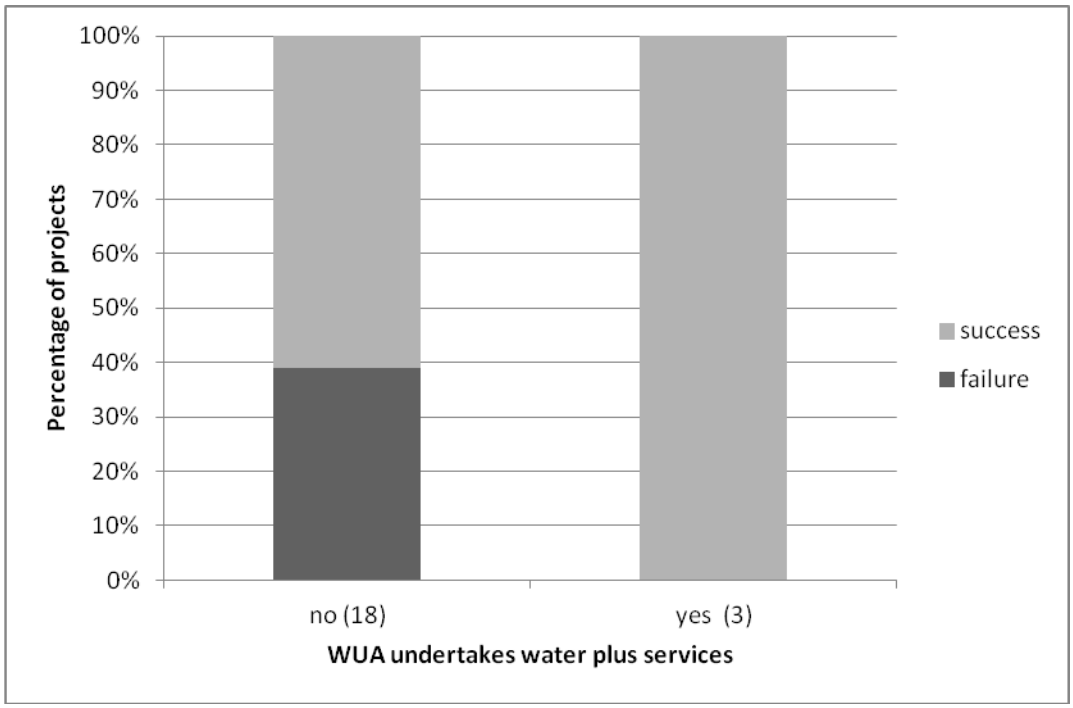

Figure 20: Success as a function of water plus services

The overwhelming tendency in evaluated projects was to *increase* specialization in O&M. The majority of projects involved the creation of sub-committees in broad-based village level management organizations. In most projects O&M of scheme infrastructure was the core function of WUAs. In only 3 cases did management organizations also administer micro-credit and extension services. In the cases where sub-committees were formed, many of these diversified functions were administered by the 'parent' or village-level management organization.

Our results indicate that the diversification of services by WUAs is highly correlated with success, suggesting that increasing the number of incentives for farmers to participate in WUAs can enhance performance. For instance, in the *Small-Scale Water Resources Development Sector Project* (Bangladesh), WMCAs not only undertake O&M activities but also administered microcredit programs. The capital base for each WMCA microcredit program is made up of the proceeds from the sale of shares and the accumulated savings of individual members with the WMCA. In general, the members of WMCAs must purchase at least one share in the cooperative. On top of this, each member is required to contribute

each month to a savings account, usually Tk10 but up to Tk100, depending on the WMCA by-law. These financial incentives to participate in WUAs seem to result in high collection rates and well-maintained physical infrastructure in these sub-projects (2007 Evaluation Mission).

However, it is important to emphasize that newly formed or weak WUAs may not be able to handle the expansion, or such diversification may distract from the core functions of the institution that is, to distribute water in an equitable and timely manner and maintain irrigation infrastructure. For instance in the *Decentralized Programme for Rural Poverty*(Vietnam) the VMGs and SMBs which assumed expanded implementation functions during the course of the project are those in relatively better-developed lowland and coastal areas. Furthermore, in some of the WUAs under the *Small-Scale Water Resources Development Sector Project* (Bangladesh) micro-credit has become the major business. The 2007 Evaluation Report even hinted at the possible diversion of O&M funds for micro-credit activities, claiming 'the two activities may not be compatible with each other. In fact, the WMCAs may be compelled to provide credit; otherwise they may not be able to get the community support in general. This is true particularly as people without much land may have little or no benefit due to the water resource development. There are instances of members leaving the WMCA for not getting enough credit' (18).

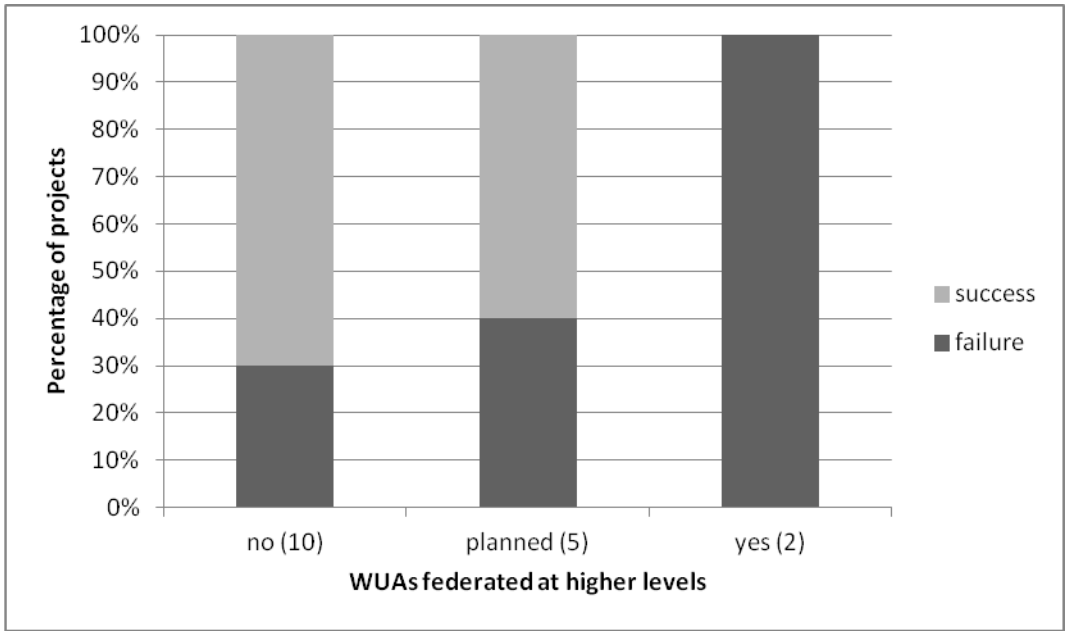

Figure 21: Success as a function of vertical integration

The federation of WUAs at different hydraulic and administrative levels is endorsed for two core reasons. First it enables the representation of farmers at the Provincial and National

level, which increases their influence over water policy formulation. Second, in cases where several WUAs rely on the same water source such as river basins or a large watershed, federated WUAs facilitate the management and co-ordination of water use.

The overwhelming majority of IFAD's irrigation interventions however are in small and micro irrigation systems. Most WUAs are single-tier organizations that form part of other village level CBOs. Only seven projects hold the possibility of meaningful federation in a hydraulic sense. Overall, projects which are (or are planned to be) vertically integrated WUAs were more likely to fail than those which are not. This may reflect problems of organizational maturity discussed above. In *Ha Tinh Rural Development project* (Vietnam), for instance community institutions created are still in their infancy and require further strengthening before federation can be attempted (PCR, 2005).

On the whole, our results suggest that further capacity building may be required *before* WUAs can be successfully federated at higher levels. In the two cases where federated institutions exist (at least on paper), *Community-Based Rural Development* and *Rural Poverty Reduction Project in Prey Veng and Svay Rieng* (Cambodia), WUA's at the tertiary level, have been described as 'invisible' organisations which play little to no role in the day to day operation or maintenance of schemes. In such contexts, it is perhaps premature to create federated organisations given that power over the management and co-ordination of water use at the tertiary level is vested outside WUAs.

Success vis-a-vis intra-project variation

Does intra-project variation in terms of crops grown; access to support services or land rights have any relationship to success or failure? Through the 'diverse' classification in our study codes and the disaggregated coding of 4 projects we tried to capture in-project variation across multiple descriptive and impact indicators. On the whole, intra-project variation in terms of descriptive attributes was neither strongly correlated with success or failure. In terms of project performance, the CSS values differed little between the provinces of Ningxia and Shanxi in the *Environment Conservation and Poverty Reduction Programme* (China). However, between Ha Giang and Quang Binh provinces in the *Decentralized Programme for Rural Poverty* the CSS differed by four points, suggesting variations in performance across geographic locations. In this particular case, villages in coastal and lowland areas of Quang Binh are relatively much better serviced than in Ha Giang in terms of infrastructure and extension (Aide Memoire, 2010). Furthermore, institutions for water management are on the whole more mature and developed than their upland counterparts which, when viewed in light of the findings above, help to explain the differences of empowerment and capacity observed between the two provinces.

Success vis-à-vis Hard-Soft investments

Is there a link between hard "infrastructure" and "soft" institutions and if so, how does it causally relate to the success or failure of WUAs? Through an analysis of IFAD's budgets we correlated levels of software investment with rates of performance. Our aim was to identify an optimum investment balance. The software analysis was carried out at two different levels:

- Irrigation-only related investments;
- Total investments.

The two level analysis was necessary due to the fact that some software investments for irrigation are budgeted as general institutional development. As a result, by considering exclusively irrigation investments, important 'software' elements may not be measured.

At the same time, a focus on irrigation-only investments is important because, maintaining the analysis too general could be misleading as the nature and components of projects may vary requiring different levels and types of software.

Each project budget was reported into a separate Excel spread-sheet. Single budget lines considered as 'hardware' (i.e. civil works, vehicles and equipment) and 'software' (i.e. WUAs formation/institutional strengthening/training) were separated, summed up and expressed as percentage of the total. Absolute and percentage values were reported to a main excel sheet to have a better overall picture, facilitating the analysis. Software investments for irrigation and the project as a whole were correlated with the CSS to investigate what, if any, relationship exists between software investments and performance and to verify if there is any optimal balance of H:S.

While it is fairly easy to identify *"hardware"*, a clear definition of *"software"* is more problematic. This is due to the fact that *"software"* is a blanket term covering a wide range of interventions, which are often complex and not easy to grasp. This challenge was dealt with by using the Integrated Capacity Development (ICD) framework for irrigation, which was defined by FAO (2005). Every element that fitted into the ICD framework below and addressed positively the question "does the element enhance the individual, organizational and network capacity for O&M of the infrastructure?" was considered as '*software*'.

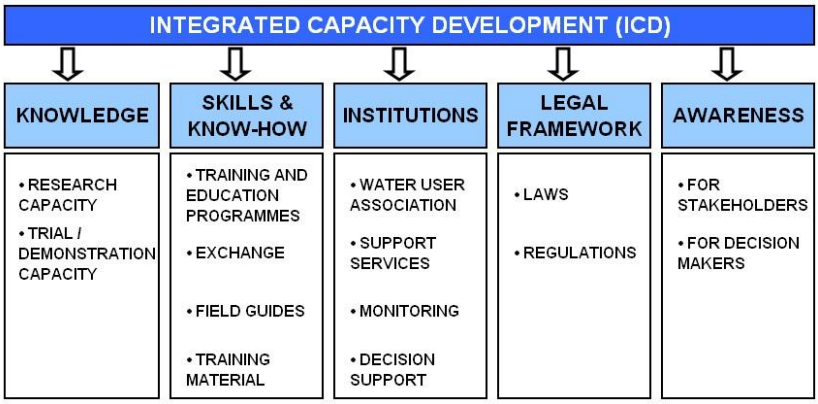

Figure 22: Integrated Capacity Development Framework (FAO, 2005)

The H:S analysis presents three major limitations:

1. For several projects, it was difficult to define precisely the software budget for irrigation only. Especially for small irrigation investments a separate budget for software was not available. We made an approximation of ID investments, weighting them accordingly to the percentage of irrigation investments vs total budget.

2. The software calculation were derived from appraisal/design reports as very detailed information was available in them. In contrast, detailed budget information was poorly documented in post-implementation reports. Therefore, the calculations do not represent actual expenditures, although we suppose that design and actual expenditures did not change substantially.

3. Software investments should be relative to the institutional context where project are implemented. However, no such differentiation was done in this analysis.

Software investments for irrigation ranged from 6% to 23% of overall irrigation investments, while most of the projects are in the range of 10-15%.

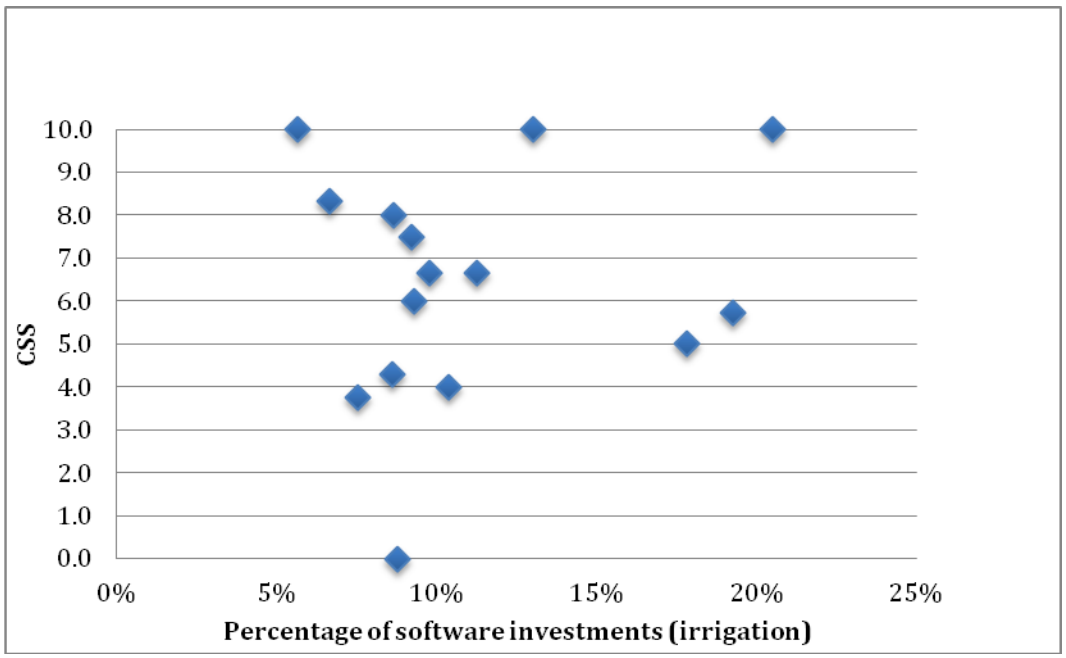

Figure 23: Success as a function of software investments (Irrigation only)

There is not a substantial correlation between software investments for irrigation and success (within 7-23% range). There maybe a correlation if projects are differentiated by considering the different institutional context (i.e. by using Strategic Institutional Positioning).

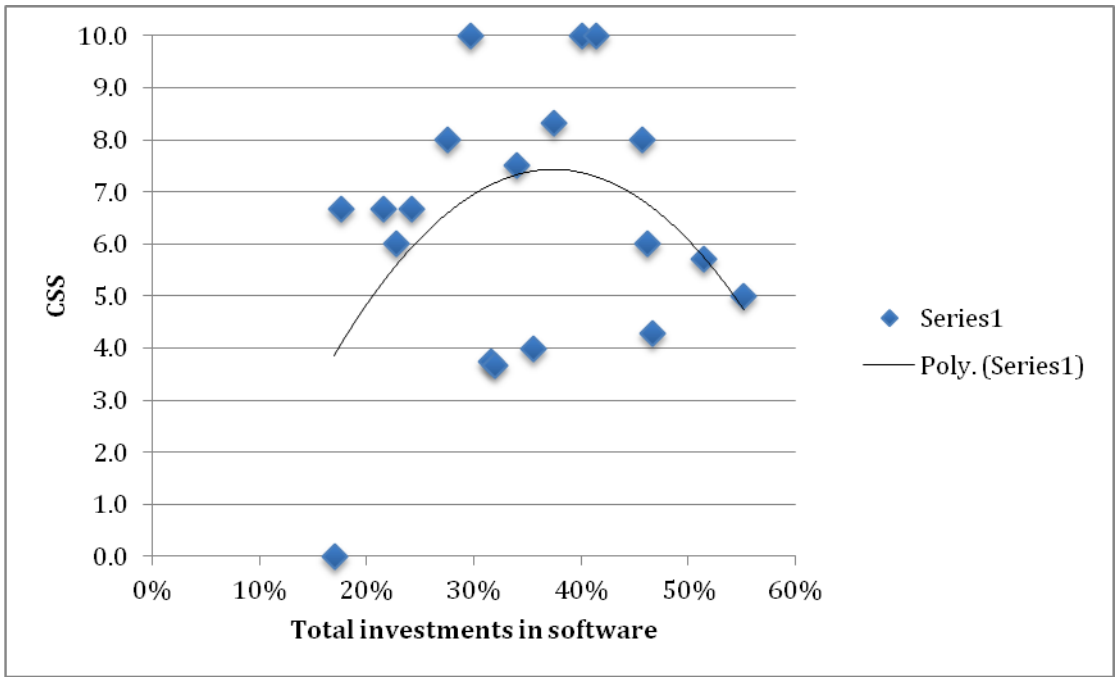

Figure 24: Success as a function of total software investments

An analysis of total software investments suggests that performance is best where software investments are about 35-40% of total project expenditure. This could be an optimum average (good balance) for IFAD's investments.

At this point, we treat the results of our desktop analysis as initial and tentative. On the whole, the relationships identified in our desk analysis must be more rigorously tested with better data and primary field research to permit *conclusions* about what PIM interventions work, where and why. Our preliminary analysis does however; hint at the answers to these questions. In particular, we found that irrigation technology which compliments local capacities for repairs were more successful and the experience of water scarcity increases the likelihood of effective collective management. Not surprisingly security of land tenure, pre-existing social capital and beneficiary participation also appear to have a positive effect.

What then are the lessons? How can we replicate success? The answer is that the entire process of institutional reform is embedded in a context with a history and a culture that shape the scope for future change. As Merry et al. argue, 'factors such as technology, water availability, cropping patterns, market development, social capital, and overall political factors shape institutions as well as how people manage water. Thus institutions that are effective in one environment cannot be simply transplanted to another environment and expected to have the same effect' (2007: 219). Indeed, although certain factors are active in our successful PIM interventions, no clear, consistent pattern emerges that offers a recipe for successful application elsewhere.

Moreover, although our study classifies the majority of interventions as successful it is important to point out here that our results may not be representative. This is because, the way impact indicators are calculated, makes it difficult, if not impossible to realistically attribute impacts to PIM implementation. It is now generally acknowledged that much of the success noted in short term is due to rehabilitation activities and not PIM per se. Ultimately, we find that the illusive search for magic formula of successful WUAs yields no results and conclude that successful WUAs cannot be socially engineered.

Qualitative insights:

Historical and institutional analysis of the most and least successful cases

So far this review has relied on, and inferred trends from data that fails to capture the impact of institutional contexts across time. Different phases of political, administrative and institutional development shape the maturity and functionality of WUAs, which in turn determines the modes and outcomes of PIM that are realistic at the present moment. In this

section, we critically unravel the impact of space and time on IFAD's PIM interventions. In doing so, we examined the historical and institutional development of the irrigation sector in cases of outstanding success and complete failure.[6] This allows us to identify the spatial and temporal factors that contribute to failure or success.

Qualitative and contextual insights into outstanding success: *The Environment Conservation and Poverty Reduction Programme and West Guangxi Poverty Alleviation Project (China)*

The history of irrigation development in China is a long one, stretching back well over 4000 years.[7] Government investment in surface irrigation peaked during the 1950s-70s, after which it began a steady decline. Since the late 1970s, investment priorities have shifted in two respects; first from construction to the rehabilitation and maintenance of existing surface water systems and second, to groundwater development in the north. Overall, these shifts have been accompanied by much more emphasis on local management, farmer participation, financing arrangements and water conservation.

Over the past 60 years, the Chinese agricultural sector has experienced major institutional upheaval as a result of rural collectivization during the 1950s which eventually gave way to decentralization and the effective abandonment of people's communes in the early 1960s. Subsequently, the Cultural Revolution precipitated the recentralization of farming practices and top-down controls until finally, under Deng Xiaoping, collectives were disbanded and household farming was re-introduced under the Household Responsibility System (Calow et al. 2009; Ash, 1993).

Policy context: Two important policy factors shape the modes and outcomes of IFAD's PIM investments in China. First, the passing of China's Water Law in 1988, and its revision in 2002, strengthened the water pricing system and decentralized irrigation management. According to Calow et al. 'the 2002 Water Law sets out a comprehensive framework for the planning and allocation of rights, with provisions on water resource ownership, the rights of collectives to use water, water abstraction rights (both surface and groundwater), water resource planning, water resource development and use, water conservation and allocation, dispute resolution and administrative responsibilities' (2009: 233). Second, the

[6] In our scheme of classification, outstanding success is defined as those projects that got a score of perfect 10 and complete failures are those that got a score of zero.

[7] According to Clyre (1984) and Calow et. Al (2009) successive dynasties and local rulers have organized troops and peasants to construct dykes, irrigation channels, water storage ponds and wells, For example, over 1000 separate irrigation projects were developed as state enterprises, and by the Song Dynasty (960–1297) over two million hectares of rice paddy could be irrigated under surface water schemes. Even today, irrigation and flood control works on the Min River in Sichuan Province are used much as they were originally designed.

11th Five-Year Plan (2006–10) also sets out a number of policy goals and priorities for water resource management aimed at supporting rural livelihoods and encouraging the reallocation of water between sectors (Meiner, 2009; Calow et al. 2009). Through these policies, the government attempts, on the one hand, to ensure the financing of irrigation agencies, and on the other hand, to persuade water users to adopt water savings practices (Meiner, 2009).

Nature of the Chinese State: incentive and responsibility systems: Water management reform in the Chinese system at once encourages local initiatives and incentives, and provides vertical checks on local officials through a competitive promotion and reward system within the party. This latter aspect is commonly termed the 'responsibility system' used by the Chinese Communist Party to 'address pervasive principal-agent problems in the world's largest bureaucracy' (Nickum, 2010: 538). According to Nickum (2010) and Minzner (2009) these systems are relatively new but have roots in the imperial system, which 'similarly applied strict, collective and vicarious liability to local magistrates in meeting numerical targets such as for tax revenue'(538).

At the same time, IFAD's PIM interventions operate in a context supportive of local initiatives and incentives. According to Huang et al., 'the use of incentives is not new in the context of China's overall economic reform effort. Reformers frequently have relied on incentives to induce agents to exert more effort, allocate resources more efficiently, and enter into new economic activities (2009: 219). In many of the new reform efforts, water managers are supposed to be provided with monetary rewards if they achieve water saving objectives. In a study conducted by Huang et al. (2009), canal managers are provided with earning incentives and are usually either paid a portion of the water fees collected or a portion of the residual profit from canal operation. (Huang et al, 2009). In many cases, farmers have found it more efficient to contract out the operation and maintenance responsibilities on lateral channels to private franchises, often individuals (Lohmar et al., 2003; Shah et al., 2004; Wang et al., 2008). This tendency was also observed in IFAD project sites by Supervisory Missions.

Role of Agency and support services for farmers: The Ministry for Water Resources (MWR), under the State Council, has the primary responsibility for water resources management, including ultimate responsibility for the preparation of water plans and the management of abstraction permits (Calow et al. 2009). The reach of the agency in IFAD project sites extends down to the grassroots level. Most of the extension agents at county and township levels receive regular training on updated technology and knowledge with the support of IFAD and other governmental projects. As a result, they are able to provide continuous and freely available technical services to program beneficiaries. Indeed, WUA rely on this technical support from the resources bureau and township water resource stations. Field visits by the 2010 Supervisory mission of the *Environment Conservation and Poverty*

Reduction Programme observed that the up-to-date technologies for irrigation were available due to the enforced intervention of the agency (2010, SM). Most of farmers visited in the field during these missions expressed the high value of training and support they received.

The system of rural credit also has an extensive network reaching down to the vast majority of townships throughout the country. According to the Appraisal Report of the *South Gansu Poverty-Reduction Programme,* the financial system of China has in recent years undergone considerable changes as part of the overall financial reform process. In 1995, 'rural policy lending was spun off from the Agricultural Bank of China (ABC). Rural Credit Cooperatives (RCCs) are now the main financial intermediary in rural China. In many areas the system also makes use of a dense network of credit agents working in the villages. Since 1996, the RCC-system no longer operates under the supervision of the ABC, but is directly supported and supervised by the Department of Cooperative Finance of the People's Bank of China (PBC), the central bank. In a few areas, RCCs have been given a large autonomy in management through the creation of a Provincial superstructure, which was lacking entirely in the original set-up. In addition, PBC has opened very substantial low-cost credit lines to the RCC system'*(Appraisal Report, South Gansu Poverty-Reduction Programme).*

Taken together, this analysis suggests that unique features of the Chinese context favourably impact PIM interventions. First, legislation and policies establish water rights, and pricing mechanisms to regulate water use and allocation. Second, strong extension and support networks penetrate the majority of the rural countryside, and finally PIM interventions operate amidst strong incentive systems for both irrigation officials and water users. Indeed, the *Environment Conservation and Poverty Reduction Programme* and *West Guangxi Poverty Alleviation Project* fall neatly into the Chinese model of PIM, which is not always very participatory (from the farmer's point of view), and yet water managers, especially contractors, are increasingly being given more incentives to save water and to manage their village's water more effectively (Huang et al, 2009). While it is tempting to conclude that supporting such incentive structures and pricing mechanisms elsewhere would yield similar results, chances are high that it will not be so. This is because of the political economy and the nature of the Chinese state. Trying to incentivize irrigation bureaucrats will be a difficult proposition in electoral democracies of South Asia, for instance, where politicians would be unwilling to offend political constituencies by taking unpopular decisions.

Qualitative and contextual insights into complete failure*: Southern Federally Administered Tribal Development Project (Pakistan)*

In stark contrast to IFAD projects in China, the *Southern FATA Development Project* was characterized by the absence of central government presence let alone any kind of

authority akin to the responsibility system or Water Resource Bureaus. Rather, the three Political Agencies; South Waziristan, North Waziristan and Kurram are self-governed by tribes and the state government has sparse representation or power over the administration or security of these regions. (Working Paper II, Appraisal Report). Indeed, these tribes do not recognize formal state boundaries, occupying and cultivating land on both sides of the Afghan-Pakistani border. The strength of IFAD sponsored Community Organizations (COs) is very weak relative to tribal authority and institutions in these areas and in some cases CO's were disbanded after the implementation of works (2008 Aide Memoire).

The most fundamental factor underpinning failure in this project is the fact that IFAD's investments coincided with the outbreak of sectarian violence in the area. As a result, the security for field staff deteriorated in the early months of 2008, and the project has been in a state of abeyance since that time. Thus, the complete failure of the project, according to our schema, is hardly surprising given the project's impact and outcomes have been derailed or masked by the effects of conflict.

In this case, it is perhaps more useful to view IFAD's PIM investments as laying the groundwork for WUA development, which in many cases plays out across generations. Our CSS seems to disadvantage such cases, grouping them together with more mature organizations and measuring performance at one particular point in time.

The systems of irrigation management in China and FATA, Pakistan, are at different levels of development with quite different historical as well as cultural trajectories. While it is not possible to include such insights for all projects in our sample, these two cases, or extremes, highlight the pivotal effect of space and time on the success or failure of PIM interventions. They also support our central argument that context shapes the scope for change and as a result institutions that are effective in some places (China) cannot be transplanted or socially engineered in another environment (Pakistan) with the same outcome.

Evidence from the field

The results from our desk-top analysis require extensive and robust field research to confirm our hypotheses about what PIM interventions work, under which conditions and why. However, due to restrictions of time and funds it was not possible to verify empirically and rigorously *all* of the findings of our desk-top study via field analysis. Rather, we undertook rapid field observations in only 5 project sites. These were: *Western Uplands Poverty Alleviation Programme* (Nepal); *Small-Scale Water Resources Development Sector Project* (Bangladesh); *Northern Mindanao Community Initiatives and Resource*

Management Project (Philippines); *Rural poverty reduction project* (Cambodia); and *Dry Zone Livelihood Support and Partnership Programme* (Sri Lanka).

Our findings are limited by some time and resource constraints which biased site selection to areas conveniently located and prevented random stratified sampling techniques. For this reason our observations may not be representative of the performance or perceptions of *all* irrigation systems and beneficiaries under a given project. Our work does, however identify several overarching patterns which are not adequately captured in our desktop analysis and offers some insight into what is happening in the field. In this way it provides a more complete picture than is available from desk-review alone.

In this section we first document some background and contextual differences of our field study sites and then move on to a comparative, thematic discussion of how IFAD's institutional interventions have played out on the ground, drawing particular attention to farmers' perceptions and adaptive capacity.

Study sites: information and background

Western Uplands Poverty Alleviation Programme (Nepal)

The *Western Uplands Poverty Alleviation Programme* (WUPAP) covers 11 upland Districts in the far and mid-western regions of Nepal. The project-area districts contain 392 village development committees (VDCs), approximately 226 000 households and a population of approximately 1.2 million.

Our fieldwork was conducted in only two villages- Rayal Village of Bajhang district and Photu Village, Mugu district. We studied a total of four schemes. Three systems were located under the jurisdiction of the Rayal Village Development Committee (VDC). The other, under Photu VDC. Within Rayal VDC, fieldwork was conducted in three settlements: Chaudala in ward no 1, and Pothada and Choudam in ward no 2. In Photu VDC, work was conducted only in Gilbili, in ward no 2. Some general features of the irrigation systems observed are summarised below.

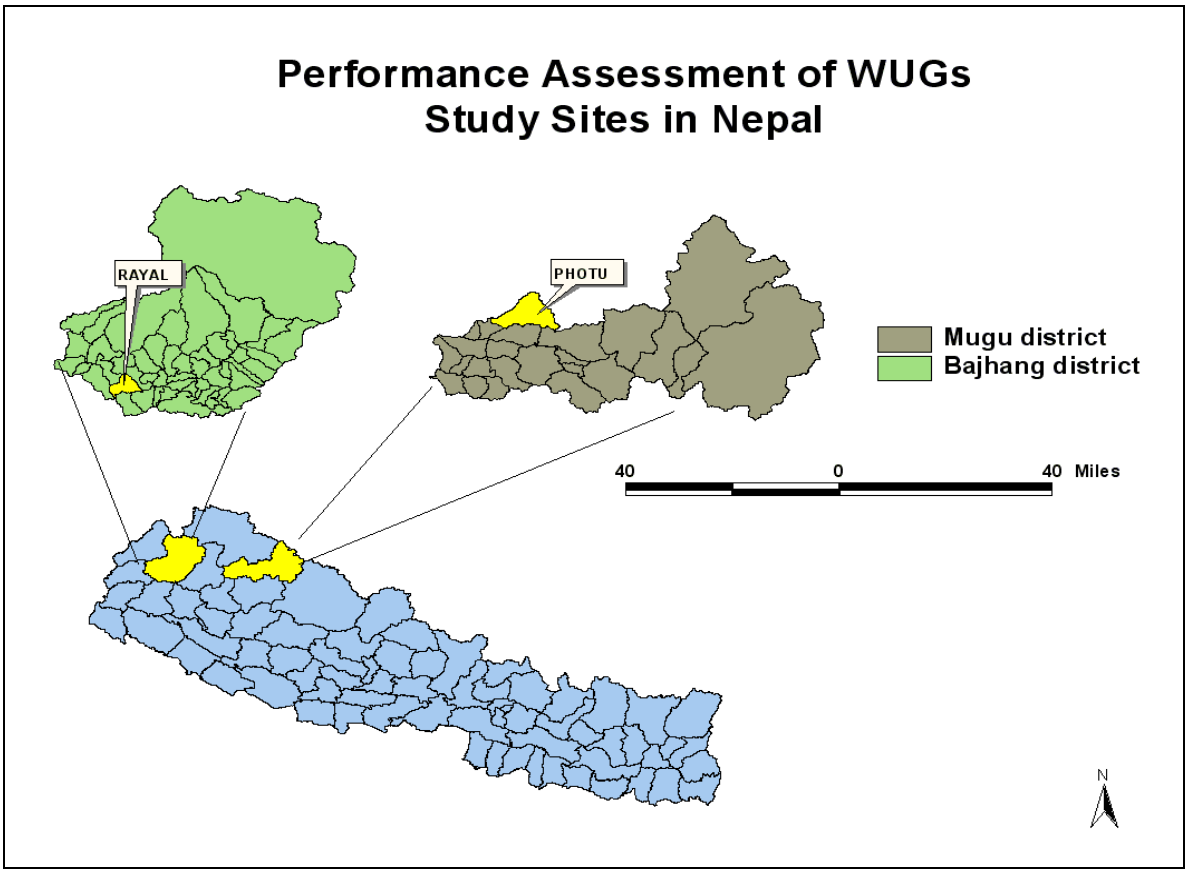

Figure 25: WUPAP study sites (Nepal)

Chaudala irrigation system: The irrigation system here has been in operation for a long time built by local people. It draws water from Kannada, a close-by perennial stream. The length of the canal from the diversion to the first field is 1.54 km. The canal passes through steep terrain. There used to be wooden sluices in five places prior to a major rehabilitation work about 20 years ago with the support of the District Development Committee. Four of those wooden sluices were replaced with a permanent structure during this rehabilitation work. Water from this irrigation system is used to irrigate paddy in Chaudala in rainy season and wheat in Chaudala, Bayalchak, and Rayal villages in winter season. The service from the canal is extended to Bayalchak and some sections of Rayal villages in winter months. WUPAP provided support of Rs. two hundred sixteen thousand to rehabilitate this canal in 2005. Originally beneficiaries planned to improve the water delivery capacity of the canal and extend it to the Rayal village. However, a dispute arose within the user group and in the villages on the allegations of misuse of funds. The problem was further aggravated because of the Maoist insurgency during the period. The lower section of the canal from Rayal to Bayalchak was improved and cement lining was done near the headwork. Amidst the dispute over the misuse of fund the work was abandoned.

Pothada irrigation system: This canal, called *Tuppa Kulo,* is one of the four almost parallel running canals delivering water to the fields of Pothada village in the ward no 2 of Rayal VDC. All the canals in the village are privately owned by groups of famers; descendants of the person who initially built the canal own the respective canal. All of these canals draw water the Norugadh stream. Although these canals also pass through steep terrain, access to the point of diversion is not as difficult as compared to the Chaudala canal. WUPAP provided financial support of Rs. three hundred forty four thousands to rehabilitate the canal at the top of the village.

Chaudam irrigation system: Out of the seven irrigation systems in Chaudam village, ward no 2 of Rayal VDC, the *Majh Kulo* runs at the top. All of these canals draw water from the Norugadh stream, and similar to Pothada village, all are owned by groups of descendants of individuals who constructed the canals. These canals are often identified with the persons constructing them. Water delivery from the Majh Kulo canal is limited by a huge landslide near the source. The water is passed through two 63 mm pipes in this section. The lower section of the canal has also limited capacity to deliver the water as it passes through steep terrain. Chaudam has 101 households out of which 34 are of Dalits. This canal is owned by six households although water from it is also used to irrigate the fields of other households. WUPAP supported to rehabilitate this canal in 2010 and the rehabilitation work was completed in the section above the landslide. However, since the bottleneck lies in the landslide, the improvement of the canal near the diversion did not increase the water flow in the canal. Although the landslide predates the initiation of the work, nothing was done in this section. The financial support of Rs. Two hundred thousand would not permit making any such improvement in this section. Farmers were also hoping to install a peltric set after the improvement of the canal. Rehabilitation of this canal was also mired by the allegation over the misuse of funds.

Gilbili irrigation system: Gilbili irrigation system in Photu VDC of Mugu district draws water from the Libru stream irrigating the fields of 14 households. The Libru stream feeds another seven canals irrigating the fields of households of ward no 1 and 2. Out of the 14 households in Gilbili village six are of Brahmin, 2 each of Thakuris and Chhetris, and 4 of Dalits. WUPAP provided a support of little over three hundred eighty thousands Rupees to rehabilitate the 2.1 km long canal in 2008. Prior to the support of WUPAP, District Development Committee and the Village Development Committees also provided financial support to rehabilitate this canal more than 15 years ago, albeit of smaller scale. The canal has again been damaged by smaller landslides in several places. This year, Small Irrigation Project is funding the rehabilitation work at the upper section of the canal and Women Development Office at the lower section of the canal. Although there is enough water in the source stream, the poor structure of the canal in several places does not allow delivery of enough water and hence there is a scarcity of water to irrigate paddy. But in the winter

season there is enough water to irrigate wheat crop as it requires less water. There was not any dispute in the village over the rehabilitation work of the canal.

Table 6: Summary of features of WUPAP irrigation systems (Nepal)

FEATURES	IRRIGATION SYSTEMS			
	Chaudala	Pothada	Chaudam	Gilbili
Location	Rayal 1, Bajhang	Rayal 2, Bajhang	Rayal 2, Bajhang	Photu 2, Mugu
Social				
Total Household numbers in the settlement	38	42	101	14
Dalit Households	11	0	34	4
Major ethnic groups	Malla, Dalit	Bhandari	Bhandari, Dalit	Brahmin, Dalit
Ownership of the canal	Community owned	Privately owned	Privately owned	Community owned
Causes of conflicts	Misuse of funds, access to water	Misuse of funds, ownership of the canal	Misuse of funds	None
Bio-physical				
Water source	Kannada	Nourugadh	Nourugadh	Libru
Number of canals in the village	1	4	7	7
Estimated command area (ha)	19	16	21	7
Major crops grown	Rice, wheat, corn	Rice, wheat, corn	Rice, wheat, corn	Rice, wheat, chino, foxtail millet
Water availability in lean season	Insufficient	Insufficient	Insufficient	Sufficient
WUPAP support				
Year	2005	2007	2010	2008
Amount in thousands	216	344	200	380
Functioning WUG	None	None	None	None
Challenges	Dispute over sharing of water with Rayal, insufficient water in lean season	Internal disputes,	Landslide near the water source, low delivery capacity of the canal	Damage of the canal by regular landslide

Small-Scale Water Resources Development Sector Project (Bangladesh)

The *Small-Scale Water Resources Development Sector Project* (SSWRDSP) was implemented in 30 districts of west Bangladesh (defined as the area west of the Jamuna, Padma, and Lower Meghna rivers). The programme was implemented between the year 1996 and

2002, and resulted in the construction of 280 sub-projects, including Water Control and Flood Control and Drainage structures, canal re-excavations and rehabilitations.

Our fieldwork occurred in 15 schemes, located in the five districts of Khulna, Nawabganj, Rajshahi, Naogaon, Natore. The districts visited are interesting from a poverty point of view, as in the majority of their Upazilas, the proportion of people living below the lower poverty line decreased from an average of 37-55% in 2000 to 23-32% during project implementation (WFP, 2010). Our observations from Bangladesh also take place nine years after the project's completion, which allows us to comment on the sustainability of IFAD's investments in these schemes.

IFAD's interventions in these sites were mainly a combination of flood control and drainage structures and water conservation systems. Only two out of the 15 sites visited were irrigation projects. However, our field observations indicate that the drainage and flood control works seem to target systems that are used for irrigation (at least partially, fisheries being the other main activity). So impact in terms of yields, cropping intensity was observed. Water Management Cooperative Association (WMCA), were also formed to assume responsibility for Operation and Maintenance (O&M) of project funded infrastructure. Sub-projects were handed over to WMCA after one year of co-management (coaching) with the executive agency (LGED). In fact, the LGED played a facilitating role in the selection of study sites and this should be considered as a distorting factor when success is analysed (the fact that we tend to report and show more positive results and successes rather than failures). Also, the two irrigation projects that we visited are among the most successful under the project as they evolved in a farmer's organization and are leading examples in the region.

Northern Mindanao Community Initiatives and Resource Management Project (Philippines)

The *Northern Mindanao Community Initiatives and Resource Management Program* (NMCIREMP) covers all four provinces of the CARAGA Region (Agusan del Norte, Agusan del Sur, Surigao del Norte, and Surigao del Sur) and the provinces of Misamis Oriental and Bukidnon in Region X.

Our field analysis is derived mainly from data gathered in Esperanza village irrigation scheme, Carmen Municipality, Surigao Del Sur Province and through comparison with other community irrigation schemes funded by JICA and the Philippines government (Department of Agriculture). The community irrigation scheme in Esperanza village has its water source from a small impounded reservoir. The reservoir has the capacity to irrigate 50 ha of rice fields. Under the NMCIREMP, IFAD provided technical and financial support for the construction of the small reservoir, construction of additional main canal, and the

installation of pipe system linking the reservoir with the main canals. In tadem with the infrastructure development, IFAD provided organizational support to strengthen WUA leadership and functioning. Trainings on system Operation and Maintenance (O&M), financial matters and book keeping had been provided to WUA staff. In addition, IFAD assigned an NGO to support the process of WUA formation and establishment in the early stage of the project.

In Esperanza village, a WUA was formed long before the IFAD project started in 2005. In 1993 the WUA was legally registered as a multi-purpose cooperative, but in actual fact the WUA was formed before 1993. Currently, WUA has 55 households as members covering 53 ha of irrigated paddy fields. According to the former chairman, average land holding in the area is 1.5 ha, but some households have smaller (less than 1 ha) or bigger land (more than 2 ha). WUA's organizational boundary is referred to the village administrative boundary, as all members come from Esperanza village. There are in total of 189 households in the village (barangay), divided in 5 village units (purok). This means that WUA members comprised only less than 30% of the total households in the village. This is mainly because the remaining households have no access to irrigation water.

Rural poverty reduction project (Cambodia)

The *Rural poverty reduction project* (RPRP) was implemented in the two provinces of Prey Veng and Svay Rieng of Southeast Cambodia. The programme area covers 19 Districts, which in turn contain 196 communes and 2,230 villages.

Our fieldwork was undertaken in four Communes: Chea Khlong, Chrey, Peampro and Romchek all in Prey Veng province. These communities had mainly used IFAD funding for the construction of irrigation canals. These irrigation canals are constructed on the site of old drainage canals, excavated during the Pol Pot regime. Prior to the construction, the old drainage had already functioned as a drain. However, farmers in the area could not reuse the drainage water as the canal was too shallow to store the water. After the excavation, the old drainage is used as water storage infrastructure, to store both drainage water from other irrigation systems and rain water, to be reused later as irrigation water. In line with the construction activities, IFAD suggested the formation of farmer groups or Water User Associations (WUAs). In all four Communes WUAs do not seem to function. Some general features of the irrigation systems observed are summarised below:

Commune Council in Romchek area: IFAD's work on irrigation started in 2005 and was completed in 2010. The total amount spent was 121 million riel which was used to build 2.8 km long irrigation canal and another 4.6 km long irrigation canal. Commune Council has put the construction of the irrigation canal as the first priority activity that needs to be

funded because farmers needed the water to irrigate their fields. The irrigation area is approximately 400 ha, covering 250 households. No WUA exists in this site.

Commune Council in Peampro area: IFAD's work started in 2006 and was completed in 2010. The total project fund is approximately 90 million riel, which Commune Council spent in five years. Most of the fund was used to fix roads. In 2007, CC spent 14 million riel to repair the road. In 2008, Commune Council spent 3 million riel for road repair and 11 million riel to repair the damaged dam and 12 million riel to rehabilitate the existing but damaged irrigation canals (2.6 km long, in which 800 m of it is newly constructed). This existing canal is built in 1987 by MoWRAM.

A WUA was formed in 1997 under a program led by MoWRAM. The WUA's main activities include removing water hyacinth from the canal, repair the canal and clean the canal. The canal is currently flooded. This flooding occurs every year. Once the flood recede, farmers will start with their first rice crop. Farmers work together to remove water hyacinth from the canal, repair the canal and clean the canal after the flood receded once a year. Other than this, WUA has no other activity and has not function for quite some time.

Commune Council in Chrey area: IFAD's project started in 2005 in this area, when Commune Council received 100 million riel under the project. All this money is spent on 3 irrigation canals. The first canal was built in 2005 (13 km long) and cost 65 million riel with 3 million riel contribution from the local government. The second canal was built in 2006 (10 km long) and cost 86 million riel with local contribution of 900,000 riel from the local government. The third canal was built in 2007 (5 km long) and cost 65 million riel with local contribution of 850,000 riel. These three canals are located parallel to each other and each canal receives water supply from two main canals in both heads/tail ends of the canals (depending on from where the water is flowing at that time). Like in other area, these irrigation canals were constructed on the existing drainage canal excavated during the Pol Pot time. IFAD project is implemented as part of the decentralization and democratization program in Cambodia. WUA only exists on paper.

Commune Council in Chea Khlong area: In 2007, the Commune Council prepared the Commune Investment Program (CIP). As part of this program the Commune Council proposed to build an irrigation canal. The CIP was discussed by Commune Planning Group and later proposed as part of Community Irrigation Development Fund (CIDF) project funded by IFAD. The idea to build irrigation canal came from the villagers who have problems with water scarcity even during the rainy seasons. IFAD agreed to fund 99% of the construction cost with 1% contribution from the local government (provincial and district). The canal was built in 2007 with IFAD fund. It is 2.9 km long and it goes through 2 villages. The basic rationale behind the canal construction is to give additional water

supply to farmers to increase water reliability for their first rice crop. In this context, the irrigation canal acts as supplement source of water for farmers if rain water is insufficient. The irrigation canal is used to cope with droughts problem during the rainy seasons. There is no WUA in the area. WUA was not formed mainly because the canal only benefits some of the farmers and not all of farmers from the 2 villages.

Dry Zone Livelihood Support and Partnership Programme (Sri Lanka).

As its name suggests, the *Dry Zone Livelihood Support and Partnership Programme* (DZLiSPP) targets four of the districts that make up Sri Lanka's dry-zone: Anuradhapura, Kurunegala, Badulla and Monaragala. These districts in turn house 44 DS divisions & 1077 GN divisions.

Our fieldwork was constrained to 15 micro-tank schemes in Kurunegala district. We were able to visit subprojects in DS Divisions across most of the project area (6 of 9 DS Divisions were visited, refer to Figure 26) to enable a more rounded picture of IFAD's impact in the district. Most tanks in the Programme area are classified as minor or micro, of which the majority have command areas of less than 10 ha. Some descriptive attributes of these sites are documented in Table **7** below. Although there is little potential for increasing the irrigated area, there is considerable scope to improve the availability of water and the effectiveness of the irrigation systems through small improvements to the tank bunds, sluice gates and on-farm water distribution systems.

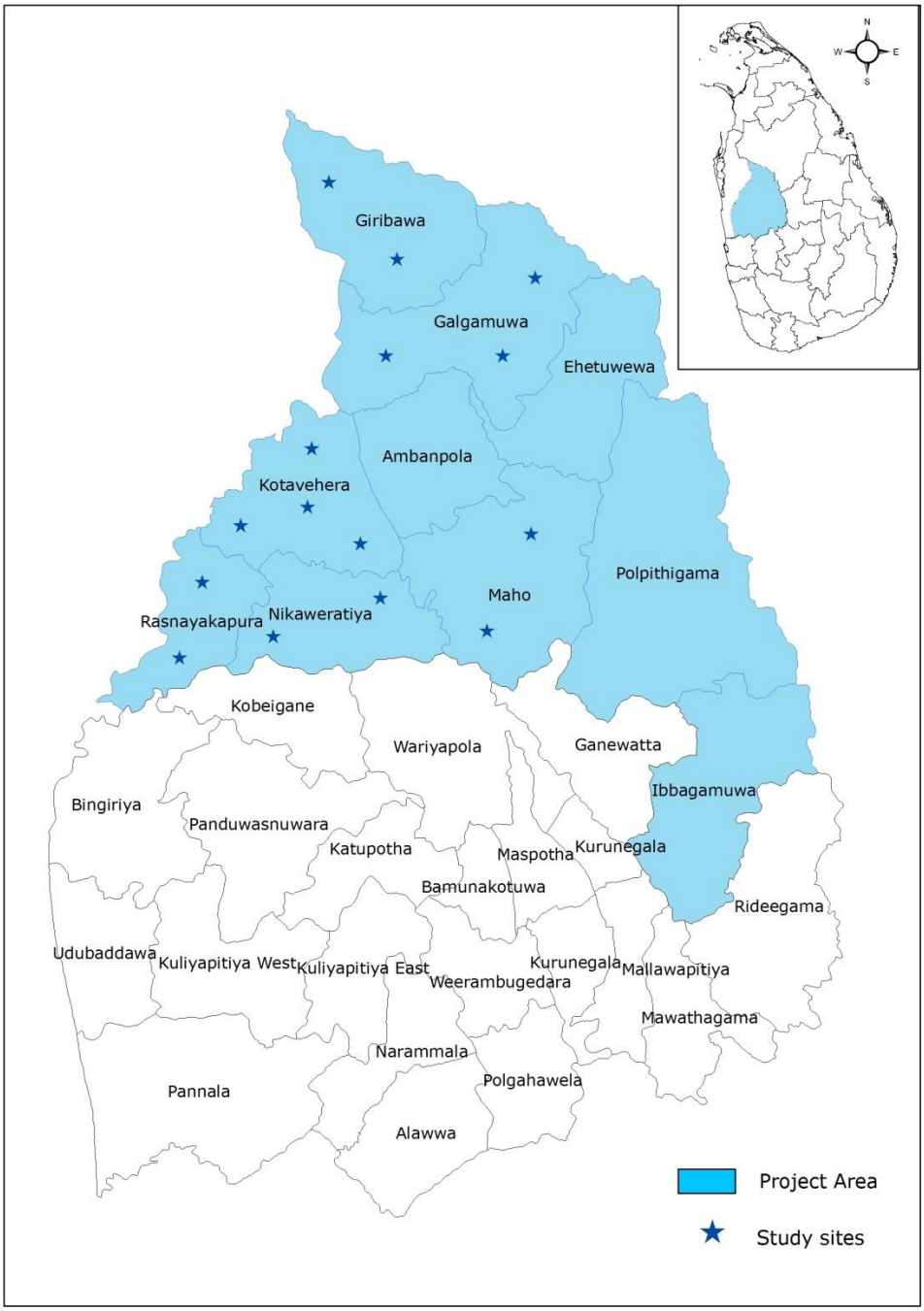

Figure 26: DZLiSPP study sites (Sri Lanka)

IFAD's interventions in these systems occurred at different points of time, ranging from 2007-2010. All visited schemes had undergone rehabilitation; this generally involved a combination of tank bunds reconstruction, tank excavation, installation or repair of sluice gates, and construction of bathing steps. IFAD also funded several institutional reforms, in particular creating sub-committees for each micro-tank (within an existing Farmers

Organisations). The rationale for individual tank O&M subcommittees stems from the fact that Farmers Organisations (FO) typically oversee the management of multiple tank schemes which vary in terms of size and complexity. Therefore, the interests of larger tanks and influential farmers may dominate the decision making processes and fund allocations of the FO (Working Paper III, 2005). However, subcommittees do not function in every rehabilitated scheme. Rather, in the majority of cases, tank management falls between two pre-existing actors in the management system; the FO and the water operator.

Table 7: Descriptive features of DZLiSSP micro-tank irrigation systems (Sri Lanka)

Name of Tank	% Full-time farmers	Strong Familial ties	Balance of O&M Fund (Rs)	No. of farmers	Total extent (Acs)	No of tanks under FO	No. of trainings received	Main Crops
Nipkunnewa wewa	100%	n/a	15,000	18	14	4	n/a	rice
Ihala wewa	more than 50 %	yes	15,600	17	16.5	4	n/a	rice
Dammulla wewa	less than 50%	no	15,000	16	24	2	2	rice
Usankuttiyawa wewa	67%	yes	15,000	35	9	3	2	rice
Arasan wewa	89%	yes	15,000	22	21	4	2	rice
Aluth wewa	more than 50 %	yes	15,000	30	20	3	5	maize and pumpkin
Weera wewa	more than 50 %	yes	16,000	22	14	3	n/a	rice
Darunu wewa	more than 50 %	yes	n/a	10	10	5	0	rice
Dhalupotha wewa	83%	yes	15,000	6	6	n/a	n/a	rice
Ehala wewa	less than 50%	n/a	15,000	24	23	2	n/a	rice
Randa wewa	n/a	yes	29,000	15	15	16	n/a	other field crops
Karagahayaya wewa	n/a	n/a	n/a	15	15	26	n/a	other field crops
Weli agara wewa	100%	n/a	15,000	30	20	10	n/a	rice
Mukalangama Wewa	n/a	yes	n/a	9	n/a	n/a	n/a	rice
Weerandiyagama wewa	n/a	yes	n/a	25	20	n/a	n/a	rice

Patterns and insights

WUA Organizational Functioning: Maintenance vis-a-vis Operation

Despite, rhetoric which endorses the 'equitable access to, use and control of water', on the ground IFAD sponsored WUAs and O&M programs are heavily projected towards system maintenance (via, separate maintenance accounts, trainings and maintenance cost recovery schemes) and much less so on water distribution systems, which in most cases remain consistent with the pre-intervention status quo. On the whole, this emphasis on Maintenance and Repair (M&R) has its roots in a wide consensus among national and international policy makers that poor systems performance is caused by the rapid deterioration of the physical irrigation infrastructure and therefore, regular systems up keep will translate into greater irrigation efficiency (Suhardiman, 2008). Through observations from field study sites we examine these causal arguments on several fronts:

1. Are the maintenance systems implemented by farmers consistent with those envisaged by international donors and do they preserve donor funded infrastructure/technological investments? Are farmers' perceptions of and motivation for maintenance in sync with donor envisaged O&M programmes?
2. Do farmers respond to problems of water scarcity or irrigation efficiency through regular M&R?
3. Are deferred maintenance and poor systems cost recovery causally linked and does ISF collection result in better upkeep and service provision?

Furthermore, we offer new insights into how farmers perceive WUA's roles vis-à-vis water distribution especially when irrigation water plays a supplementary role and farmers are autonomous in arranging the irrigation scheme, with particular reference to implications for equitable access.

Maintenance and systems performance

WUAs main function is derived from their roles in executing construction/rehabilitation and/or maintaining the physical system. In Philippine field sites, for example, WUA's organize farmers to clean weeds in the canal, prior to the start of each cropping season. Similarly, in Sri Lanka tank subcommittees are used to organize and implement maintenance schedules which include clearing the tank bund and earthen canals of overgrown vegetation**.** In Bangladesh, WUAs are expected to perform minor maintenance such as cleaning of weeds and repair of minor breaches in structure. In Nepal WUAs play no role in systems maintenance. Rather, they assumed the character and functions of 'construction committees'. Their sole function was to implement the construction/rehabilitation of canals. Once their assigned project was completed (or

sometimes even before that) they were dissolved. Finally, in Cambodia and Nepal farmers maintain their tertiary canals without WUAs.

However, the types of maintenance actually undertaken by farmers are different than those which are envisaged by international donors, the latter related mainly to the preservation of irrigation infrastructure and technology (lining the canal, repairing the sluice gates, etc.), rather than just removing weeds from earthen canals or bunds. In particular, farmers' perceive the condition of water storage and control structures as less important to their irrigation activities than conveyance infrastructure and this has implications for how farmers conduct systems maintenance.

In Cambodia, for instance, IFAD's intervention transformed the main/feeder irrigation canal's technical characteristics from a water conveyance into a water storage infrastructure. This has implications in terms of how farmers perceive systems maintenance. As farmers can pump the water from the main/feeder canal anytime they need it, they do not depend on the actual water flow in this canal, and thus have no interest to maintain the canal condition, as long as this does not hinder their pumping activity. This is in contrast with the way farmers maintain the condition of the tertiary canal. Viewing the canal as a water conveyance infrastructure, to channel irrigation water from the irrigation canal to their fields, farmers ensure that the tertiary canal is in good condition as to optimize water flow to their fields and reduce pumping costs.

Similarly farmers in Sri Lankan field sites, prioritises conveyance (earthen canals), with little maintenance done on storage capacities (tank) or water control structures (sluice gates). In *Arasanwewa*, *Darunuwewa*, and *Ihalawewa* for instance, IFAD- installed sluices require M&R work (mainly to address leakages and difficulties in opening and closing the gates) which farmers have no plans to undertake. This may reflect the fact that repairing water control and storage structures are more capital and time intensive and funds for such M&R works are not always readily available. Instead, farmers supplement the reduced water flows from the sluice by using sand bags in the spillway to divert natural drainage back into their fields or pipes to extract water directly from the tank. On the whole, we observed that when there is damage to, or sub-optimal performance of sluice gates, farmers do not resolve problems of water access through maintenance, rather they use pipes to siphon water over the tank bund or simply cut the bund to access water for irrigation.

In Bangladesh, most of the infrastructure is Flood Control and Drainage (FCD) and Water Conservation (WC). Here routine maintenance before the onset of monsoon rains is critical to prevent breach of embankments. This is a core task of WUAs, but they limit themselves to minor repairs and weed cleaning, while the Local Government Engineering Department (LGED) undertakes major repairs. Our field observations indicate that in sites where WUA

authority was weak, farmers preferred to adapt to a malfunctioning structure rather than carry out regular O&M of the system.

Put simply, regular maintenance is not always the most time or cost effective way of increasing the actual water flow in the system, despite the link between maintenance and irrigation efficiency (Mukherji et al. 2009). In practice, farmers solve their water scarcity problem by reconfiguring the irrigation system; as mentioned in Sri Lankan field study sites this involved cutting the tank bund or using pipes to siphon water, rather than maintenance or repair. Similarly, in *Chaudam irrigation system* (Nepal), where a huge landslide restricts the amount of irrigation water channelled to fields, farmers adjust water delivery by passing water through two 63 mm pipes in this section and diverting additional water from the source using boulders and twigs. In this context, regular M&R cannot improve irrigation efficiency as significant financial resources are required to remove the bottleneck. Rather farmers reconfigure the formal irrigation system to meet their requirements. Finally, it is worth noting that in the context of unequal water distribution, regular maintenance and upkeep will not resolve water scarcity for many tail-end or tenant farmers. For this reason, farmers respond to the problem by altering their cropping patterns, crop selection, or using tube well for groundwater pumping rather than engaging in systems maintenance.

Collective maintenance systems?

IFAD sponsored O&M programmes are also couched in development concepts such as democratisation, participation and collective, beneficiary-led management. However, this approach is at odds with traditional and pre-existing arrangements for O&M in some field sites. In Nepal, for instance, farmers seem to find it more efficient to contract out the operation and maintenance responsibilities for canals to individuals. In *Chaudala* and *Gilbili irrigation systems*, an individual is hired for irrigating all farmers fields and undertaking minor repair of the canal in the rice growing season. This O&M system is not always very participatory (from the farmer's point of view), and yet outcomes in terms of irrigation efficiency, water reliability, production and incomes differ little from schemes using informal, collective O&M mechanisms**.** Put differently, 'the basic fact [is] that farmers are interested in receiving adequate and reliable supplies of water in order to increase their production and are not interested in participation for the sake of it' (Mukherji et. Al, 2009: 50-1).

In Cambodian field sites, where individual pumping is the norm and the concept of irrigation communities are redundant there are actually incentives which *discourage* collective maintenance. Individual farmers who have the means to increase the water

storage capacity of the irrigation canal adjacent to their fields actively benefit from the inaction of their peers, as this increases the water storage capacity in their part of the canal relative to other farmers. Furthermore, although informally, farmers agree that they each must clean the part of tertiary (distributary) canal next to their fields, head-end farmers do not often bother about the condition of the tertiary canal *after* their fields are irrigated in spite of the fact that this reduces the efficiency of water delivery to tail-end farmers. This highlights the potential role that can be played by WUAs to ensure equal water distribution between farmers who pump water from the irrigation canal. However, as farmers do not always have to pump water from the canal, this potential role cannot always be justified from farmers' point of view. In cases where there is enough rainfall, farmers would not need any additional water supply from the irrigation canal.

Also, observations from Sri Lanka, suggest that even when strong collective systems for maintenance exist, improving systems' performance is not the sole or indeed the dominant force motivating farmers participation. Indeed, in the majority of Sri Lankan field study sites, the most widely cited incentive for the *continued* up keep and maintenance of the system was that it granted farmers access to a lucrative fertilizer subsidy scheme.[8] In the majority of surveyed schemes, WUAs had made recommendations for the fertilizer subsidy conditional on maintenance contributions. The fertilizer subsidy forms the crux of an incentive system designed to ensure the regular maintenance and upkeep of the scheme. The sheer size of the subsidy (on average farmers pay about 10% of the market price for a 50 kg bag of fertilizer)and in turn the financial incentive for farmers to actively partake in maintenance works meant that in those schemes which used the subsidy as an incentive, *no* farmers defaulted on their labour contributions. However, if this financial incentive was removed, as in *Aluthwewa, Darunuwewa, Nipkunnewawewa* where access to the subsidy is not conditional on maintenance contributions, the frequency and participation rate in M&R was *relatively* low. This suggests that farmers' perception of the importance of maintenance is often overstated and tied up with other, more compelling interests. Whether for good or bad, the Sri Lankan case also illustrates how WUAs reproduce and enforce a maintenance-centric approach to improving systems performance.

Cost recovery and deferred maintenance?

[8] In 2005, the government of Sri Lanka introduced a fertilizer subsidy for paddy cultivation. Under the subsidy scheme farmers receive 50 kilogram fertilizer bags for 350 rupees. On average this represents about 10% of the market price of a 50 kg bag of fertilizer (in some seasons the market price increased to Rs. 8,000 a bag). The government spends Rs. 34,850 million annually for the fertilizer subsidy and has pledged to administer it for at least 6 years and 13 harvesting seasons. The subsidy scheme has benefited farmers in two direct ways, first it has removed a significant financial burden involved in rice cultivation and second, it has encourage farmers to bring more land under paddy cultivation.

Finally, IFAD sponsored WUAs and O&M programmes, through their endorsements of maintenance cost recovery schemes and maintenance accounts, assume that deferred maintenance and poor systems cost recovery are causally related. This gives rise to the view that Irrigation Service Fee (ISF) collection rates are a useful indicator of infrastructure condition and in turn systems performance. On the whole however, regular fee collections for maintenance in Sri Lanka, Philippines and Cambodia were assigned low priority among farmers. This is the result of several factors. First, lack of ISF collection does not result in the poor condition of tertiary canals or tank bunds. On the contrary, our field observations in the Philippines, Cambodia and Sri Lanka show that this infrastructure is in good condition and very well maintained. Obviously, WUAs can maintain irrigation systems, without having to rely on ISF collection, as in these cases their role is to organize farmers to clean weeds from canals or earthen tank bunds, and not always related to infrastructure repairs. Furthermore, in the case of Cambodia it is difficult to convince farmers to collect funds for maintenance as they do everything by themselves and thus have no incentive to pay a ISF as no one manages systems maintenance or water distribution in the area to ensure that farmers' water needs are met. Farmers can arrange their own water individually through pumping, and this consequently reduces the potential role that can be played by WUAs in water distribution arrangements and overall canal maintenance.

A second important point to note is that cost recovery is only feasible when irrigated agriculture produces enough economic benefits to cover the economic and financial expense of farmer management. Put differently, in order for farmers to absorb maintenance expenses the costs of self-management must be a small proportion of their income (Vermillion, 1997; Shah et al 2002). However, in our sample sites, ISF collections, even if they were to occur regularly, could not cover more labour, time and capital intensive maintenance, such as clearing micro-tanks of overgrown vegetation and de-silting and deepening the storage capacities of tanks, reservoirs or canals. In *Nipkunnewa wewa* (Sri Lanka) for example, farmers estimate the cost for de-siltation is about 700 work-hours (approx. 30 days) with a bull-dozer (the hourly rate of hire for a medium-sized dozer is Rs, 8000, so in total Rs, 5600,000). The highest ISF rate in sampled sites was 1 bushel/acre- or Rs value 560; in light of the small number of farmers benefitting from the system and small plot sizes the maximum amounts levied by ISFs are not sufficient to cover the cost of large scale works. Rather in Sri Lanka, as in the Philippines and Cambodia when big repairs are needed, farmers and WUA have to depend on financial support from the government or donor funded grants.

Indeed, in the *Majh Kulo canal* (Nepal), even IFAD's Rs, 200,000 rehabilitation of the system was insufficient to cover necessary maintenance and repair work. In this scheme water delivery is limited by a huge landslide near the source. IFAD supported the rehabilitation of this canal in 2010 however; work was only completed in the section above the landslide.

Since the bottleneck lies in the landslide, the improvement of the canal near the point of diversion did not increase the water flow in the canal. In short, the expectation that farmers are capable of absorbing the costs of maintenance – when these costs exceed the budgets of donor funded grants and were a cause of budget deficits for many governments – is paradoxical unless it is accompanied by a significant improvement in farmers' livelihoods. This fact may also help to explain the neglect of capital intensive M&R (water storage and control structures) in observed maintenance systems.

In addition, farmers' reluctance to invest in large scale maintenance (in spite of the benefits they would theoretically receive in terms of increased storage capacity and water availability) may also have something to do with how farmers perceive canal and tank excavation as the local government or Commune Council's job and not theirs. In Cambodian field sites the Commune Council is the one that built the irrigation canal in the first place with CIDF funds from IFAD. Similarly, in Sri Lankan, *Pothada* and *Chaudam* irrigation systems (Nepal) the ownership over micro-tank schemes does not lie with the community, but rather with the Agrarian Services Department (ASD) and private individuals respectively.

Finally, the establishment of maintenance accounts, via IFAD's O&M programmes, does not guarantee that funds are actually spent on maintenance works. Put differently, in field sites deferred maintenance of water control and storage structures still occurs despite the availability of funds for M&R works. In Sri Lanka, for instance, the main rationale for creating separate M&R accounts for each tank subcommittee stems from the fact that Farmers' Organizations (FO) typically oversee the management of multiple tank schemes which vary in terms of size and complexity. As such, the interests of larger tanks and influential farmers may dominate the decision making processes and fund allocations of the FO at the expense of more marginal schemes. Prior to IFAD's PIM interventions, FOs housed membership fees, incomes earned from construction contracts and any O&M contributions from all tanks under their jurisdiction in the same account. Under IFAD's Programme, beneficiary farmers were required to deposit a minimum of Rs, 15,000 into a separate O&M sub-committee account to qualify for tank rehabilitation (Appraisal Report, 2005). As such the overwhelming majority of schemes in our field sample have O&M funds, all with a balance of Rs, 15,000 or more (refer to Table 7). In this way, the new accounts safeguard funds for individual tanks and mitigate the risk that farmer's contributions and interests may be swallowed up by larger more influential schemes.

However, procedures for accessing maintenance funds remain much the same. In the majority of cases, subcommittees still require two FO officials to sign off on the proposed work and in *all* cases the District Officer (DO) of the Agrarian Services Department must approve any withdrawals from O&M funds. While the APRA's and DO's heavy regulation of O&M accounts may deter the (mis)use of the money they also may forestall the timely

access of funds for maintenance, potentially exacerbating damage or wear down of infrastructure. In short, the intervention seems to have resolved problems of *distribution*, by creating subcommittees and maintenance funds at the tank level, but not problems of *access*. To date, no withdrawals have been made from O&M accounts, despite evidence of poorly functioning sluice gates in some systems and thus it remains to be seen how this innovation will shape the quality and scope of maintenance in the long term.

Thus, ISF collection rates are a problematic indicator of infrastructure condition and sustainability in schemes which are not capital intensive to run and can largely be maintain through labour contributions (in our field sites farmers contribute labour for M&R between one and four times a year). Furthermore, the principle of cost recovery, while suggestive in theory, assumes that farmers have the capacity to absorb the costs of necessary maintenance expenditure. In practice, all field sites rely (often in vain) on either government or external funding to cover the cost of large scale work. In this context, the problem of deferred maintenance cannot be resolved by regular ISF collections, but rather reflects greater problems with the system of funding in the irrigation sector. In particular we argue that deferred maintenance is a symptom of more chronic problems in the sector's development. In the first place, deferred maintenance is rooted in the problem of bureaucratic rent-seeking within the irrigation agency. Given the emphasis on construction and rehabilitation activities within the irrigation bureaucracy, the agency has little motivation to promote regular maintenance. The irrigation agency's role in preserving the vicious cycle in systems management is highlighted in Wade's studies on irrigation bureaucracy in India (Wade, 1982), Araral (2008) work on the perverse systems of incentives underpinning maintenance funding in the Indonesian irrigation sector and Levine's analysis of the economic rationality of deferred maintenance (Levine, 1999). Levine argues that apart from the agency's interest in preserving the vicious cycle in systems management, deferred maintenance is also used by the agency to mobilize political support for increased funding (Mukherji et al. 2009).

WUAs organisational functioning	SRI LANKA	BANGLADESH	CAMBODIA	PHILLIPINES	NEPAL
Main function of WUA	maintenance of tank bund and canals	infrastructure maintenance + microcredit and seed production	No WUA	annual canal maintenance	No WUA
Are farmers autonomous in arranging the irrigation scheme	Yes	Yes	Yes	Yes	Yes
Is the WUA a multi-purpose cooperative	No	Yes	No	Yes	No
Do informal mechanisms operate alongside or in place of the WUA	Yes	Yes	Yes	Yes	Yes
Does the WUA prepare and implement an operation and water distribution schedule	Mixed	Yes	No	No	No
Does the WUA prepare a plan for the maintenance of irrigation system in the area of its operation and carry out the maintenance works (at least annually)	Yes	Mixed	No	Yes	No
Does the WUA collect prescribed rate of operation and/or maintenance charges from the members of the scheme	Mixed	Yes	No	No	No
Does the WUA regulate the use and flow of the water	No	No	No	No	No
Do WUA's irrigation services result in more equal water distribution	No	No	No	No	No
Does the WUA resolve the disputes, if any, between members and water users in its area of operation	Mixed	Mixed	No	Mixed	No
Does the WUA raise resources (to cross subsidize irrigation costs)	Mixed	Mixed	No	Yes	No
Does the WUA maintain accounts	Yes	Yes	No	No	No

Table 8: Summary of WUAs Organisational Functioning

Does the WUA conduct elections to the Managing Committee	yes	yes	No	No	No
Are WUAs legal entities	Mixed	yes	No	Yes	No
Do WUAs have authority to apply sanctions and make rules	Mixed	n/a	No	No	No
Maximum sanction available to WUA	Deny recommendation for gov fertilizer subsidy	n/a	n/a	n/a	n/a
Do WUAs have authority to set water/maintenance charges	yes	No	No	No	No

WUAs, water distribution and equity

In most cases IFAD's technical interventions increased water supply and reliability. In Cambodia, for instance, by adjusting the role of the existing drainage system as water storage infrastructure, the IFAD project increases irrigation water supply and improves water reliability for farmers' cultivation. Farmers benefit from the construction of the irrigation canal in terms of increased yield production, increased cropping intensity through more reliable water supply, reduced labour intensity in their farming practices, and reduced pumping costs. Similarly, prior to the intervention in the Philippines, farmers in Esperanza village could only plant one rice crop per year, relying mainly on rain water for crop cultivation. Currently, farmers plant two rice crops per year drawing on additional irrigation water supply from the small impounded reservoir constructed under the project. Average yield production has risen from 1.5 ton/ha to 3-4 ton/ha/cropping season. In Sri Lanka, water availability was increased as a result of deepening the tank and increasing its storage capacity with positive flow on effects for agricultural productivity, household income and food security.

However, WUAs play almost no role in regulating the distribution of these benefits. In Philippine field sites, for instance water flows continuously in the schemes. The small dam (impoundment structure) is always open. Apart from the intake structure at the main line, there is no structure to regulate water flow for irrigation scheduling.
The continuous flow of water and the lack of gates or other infrastructure to regulate this water flow indicates that WUAs do not spend much time in trying to regulate irrigation water flow to farmers' fields. This in turn reflects how farmers perceive the importance of WUAs in relation to their irrigation and farming practices. Farmers perceive WUAs as a

body which can help organize canal maintenance, but not as a body which will regulate water distribution, especially when water is abundant.

The lack of structures to regulate water flow for irrigation scheduling was also observed in Sri Lankan and Nepalese sites. Here, intake to farmer's field is also made on the site (through earthen bunds) not using any type of gate or structure. In Sri Lanka, as all farmers in the system cultivate the same crop (mainly paddy) and follow the same cultivation timeline there is often little need to adjust the irrigation schedule for individuals. In these schemes, the responsibility for water operation is assumed by an 'irrigator' who predates IFADs interventions and is derived from the traditional management system.[9] The primary task of the irrigator is to initiate the flow of water into the system (either by opening the sluice or traditional water outlet or cutting the bund). Once the water is flowing in either earthen canals – which are then used to divert water into farmer's fields – or directly through the command area, individual farmers control intake into their plots through earthen bunds. Fields are irrigated contiguously, starting either from plots closest or furthest from the bund. Put simply, in Sri Lankan field sites the responsibility for maintenance and water operation fall to different actors. The former is assumed by the WUA and implemented with beneficiary labour. The latter, by the irrigator. Similarly, in Nepal farmers have traditional arrangements for the operation of the irrigation system. In *Chaudala* and *Gilbili* irrigation systems, for instance, an individual called *Kulalo* is hired for irrigating the fields of all the farmers during the rice growing season. The *Kulalo* irrigates fields on a rotational basis where each household receives water for a limited time, usually a maximum of two days in one turn. Fields transplanted earlier get preference over those transplanted later. So, water allocation is determined by plots, crop variety and growth stage. On the whole, however water is not scarce in most parts of the year, and fields are irrigated contiguously without strictly following distribution rules. In Sri Lanka and Nepal the added value of WUAs in terms of distributing irrigation water is annulled by pre-existing, traditional systems.

In Cambodia farmers arrange their irrigation water taking and farming activities individually. Farmers pump the water from the irrigation canal to the tertiary canal. These tertiary canals are directly connected to the main irrigation canal and lie parallel to each other (separated by a distance of hundred meters). Between the tertiary canals lie farmers' fields, which like these tertiary canals are higher than the irrigation canals. Hence, farmers have to use pumps to channel water from the main irrigation canal to their tertiary canals. Once water is flowing into the tertiary canal farmers can channel it to their fields through changing earth bunds. This illustration shows how farmers arrange everything individually and indirectly reflects the uselessness of having WUA. During focus group discussions,

[9] The role of the Water Operator is the latest manifestation of a traditional system of *velvidana* or irrigator headsman with dates back to the pre-colonial era.

farmers questioned the actual significance of having a WUA, in relation to its actual ability to ensure farmers' water supply, promote equal water distribution, and support farmers' farming practices. As said by one of the farmers: *"Farmers bought the pump by themselves, use it individually, and cover all costs in production, including pumping costs. What will be then the added value of WUA for farmers in this context?"*

The way farmers have changed the role of irrigation and adjusted the function of the irrigation infrastructure has indeed some impact on the potential of WUA and how it can represent farmers' needs in irrigation. With the construction of the irrigation canal, farmers had not only changed the function of the existing drain into an irrigation canal, but they also had adjusted the characteristic of the irrigation canal from a water conveyance to water storage infrastructure. The irrigation canal will continue to receive drainage water from other irrigation systems, thus preserving its function as a drainage canal, while at the same time also function as 'irrigation canal' to store water. This technical transformation has some implications on WUA potential to ensure farmers' water supply and conduct canal maintenance. Within the current context of water distribution activities (combining pumping with gravity irrigation) WUA could hardly ensure farmers' water supply, unless they can regulate farmers' pumping activities. Similarly, in the context of unequal water distribution, WUA could hardly change the relationship between head and tail-end farmers.

Current experience in community managed irrigation systems in Cambodia shows farmers' ability to adjust the role and transform the technical characteristics of the existing irrigation infrastructure as a means to improve water reliability and ensure their irrigation water supply. The way farmers neglected the formation of WUA as procedural, administrative formality vis-à-vis farmers' awareness to maintain the condition of the irrigation canals (especially at tertiary level) shows their ability to create an alternative path to address their development needs with or without WUA. Efforts to improve irrigation development practices should be focused on facilitating farmers' ability to define these alternative paths.

A common factor among the systems observed in Sri Lanka, Nepal, Philippines, Bangladesh and Cambodia is that irrigation supplements rain-fed cultivation and is not the mainstay of farming practices in these areas. In the majority of Sri Lankan field sites tanks plays a stabilization role by supplementing rain fed irrigation in *maha*(wet season) and enabling limited cultivation in *yala* (dry season). Increased water availability as a result of deepening the tank and increasing its storage capacity was also cited as a cause of improved agricultural performance, especially in *yala* season where micro tanks take on added importance to cover frequent and sometimes lengthy dry periods. Similarly in field sites in Cambodia, the irrigation canal was built to give farmers more reliable water supply, as a back-up strategy to cope with water scarcity during the rainy seasons when farmers

grow their first rice crop, rather than as continuous water supply for farmers' farming practices. Before the canal was constructed farmers would have to wait sometimes until the end of the rainy seasons (September/October) when water is abundant before they can start planting their first rice crop. Now they can start as early as in April, because they have enough water from the irrigation canal. In short, the schemes observed in Cambodia show how farmers shape the actual function/role of irrigation as back-up strategy to cope with water scarcity rather than as an integral part of their farming practices, through the adaptation of the irrigation canal characteristics, from water conveyance into water storage infrastructure. This has implications for the roles WUAs could theoretically assume in water distribution and also the willingness of farmers to commit time and resources to systems maintenance.

The way farmers perceive WUAs role in water distribution also has implications for the equitable access to, use and control of water and also for equitable distribution of the benefits of water use. In Esperanza village (Philippines), for instance, the community irrigation scheme is divided into 5 different sectors. From the small reservoir irrigation water is channelled through a pipe to the main canal, which again distributes water to different tertiary canals that convey water to individual farmer's field. Sector 1, 2, 4, and 5 receive water directly from the main canal. Sector 3 receives water from the secondary canal that channels water to sector 2. Each has a sector head, in charge in arranging water distribution within their respective sector. In most cases, sector 4 will experience water scarcity during the dry season, due to its location at the tail end of the scheme. To cope with this, WUA together with respective sector heads will define a rotation schedule which in theory consists of temporarily closing the intake gate to sector 1 and 2 so that irrigation water can flow directly to sector 4. In practice, however, head farmers will continue to take water, regardless of the rotation schedule. Water rotation is only applied when head farmers' water needs are met. Our field observation shows that many stones are placed just in front of intake to sector 2 and 3, to block the water flowing to these sectors, and thus allowing more water from the main canal to flow to sector 1 instead. As a consequence of this water scarcity and consequent unequal water distribution within the scheme, farmers in sector 4 planted maize instead of rice. They have only 1 rice crop/year, compared to head farmers (sector 1,2, 5) who can have 2-3 rice crops/year. Water scarcity occurs in 30% of the total irrigated area, most of these areas are in the tail end.

Theoretically, sector heads could play an important role in ensuring equal water distribution in the irrigation system. Yet, the sector heads' main priority is to ensure that every farmer gets irrigation water supply, rather than striving for equal and perhaps more effective water distribution within his/her sector. This becomes evident in the way rotation is applied in reaction to farmer's complaint of water scarcity, and not as a proactive measure to prevent the occurrence of water scarcity in the first place. Furthermore, sector

heads' ability to shape water distribution practices depends on the sector's hydraulic location as well as their relationship with other sector heads. WUA's autonomy to arrange the overall water distribution arrangements in irrigation scheme does not necessarily result in equal water distribution between head and tail-end farmers. On the contrary, tail-end farmers' strategy to plant maize instead of rice as a means to cope with water scarcity problem show how they perceive water distribution in the irrigation scheme, rooted in the scheme's hydraulic characteristic and thus the hydraulic position of farmers' fields, rather than in WUA's ability to ensure equal water distribution.

In summary, both farmers and WUA perceive that WUA functioning should be focused on its ability to deliver sufficient supply of irrigation water to each farmer's fields. At the same time, this ability is not linked to WUA's role to ensure equal water distribution in the irrigation scheme. Rotation can be arranged, if head farmers already received sufficient irrigation water, and after tail farmers experience water scarcity problems.

Similarly, in Cambodian field sites, the way farmers combine their irrigation water taking through pumping and gravity irrigation reflects WUA's limited role in the overall water distribution arrangements and its limited capability to promote equal water distribution. As farmers take water individually (through pumping), they do not really care about other farmers' water taking activities. This individualistic approach in water distribution can potentially intensify unequal water distribution between head and tail-end farmers. In *Chrey Commune*, for instance, head farmers will continue to take as much water as possible to meet their water needs, sometimes by shifting from rice to sugarcane which has higher irrigation water demand. Tail-end farmers will address the problem by shifting from rice to other crops (like maize and watermelon) which require less amount of water. WUA presence makes little difference to farmers in terms of unequal water distribution as head farmers continue to take more water at the expense of tail-end farmers. Put differently, tail-end farmers are left on their own to solve their water scarcity problems.

Interesting to note here is the way farmers dealt with this unequal water distribution individually, by adjusting their cropping intensity, crop selection, or using tube well for groundwater pumping, as they are aware that head farmers would always take the water when they need it, regardless of other farmers' water needs. Furthermore, the way farmers deal with unequal water distribution is influenced by the fact that they have to pump to irrigate their fields. Head farmers would think that it is worth the money and effort to pump the water from the irrigation canal to their fields (given the short distance between their fields and the canal). Tail-end farmers, on the other hand, would think that it is a waste of money and effort to pump the water from the irrigation canal if they are not even sure whether the water will be able to reach their fields in the first place (not to mention water stealing in the tertiary canal). Technically, it is not economical for farmers to spend

long pumping hours just to ensure long-distance water transport from the irrigation canal to their fields. This illustration shows how tail-end farmers strategically address or cope with the water scarcity issue, without putting any effort on trying to establish certain rules and agreements in water distribution, as they know that these rules and agreements would not ensure that their water scarcity problem will be addressed.

The way WUAs in both Cambodia and the Philippines coped with issues of water scarcity illustrates how IFAD's interventions result in unequal water distribution in beneficiary villages, not only from the point of view of irrigated and non-irrigated agriculture, but also with regard to the hydraulic position of farmers' fields within the irrigation scheme. In time of water scarcity, tail-end farmers will bear the consequence, as head farmers will continue to plant 2-3 crops. Here, the rationale behind water distribution is derived from the objective to increase/maintain farmers' crop production, and ensuring irrigation water supply, rather than striving for equal water distribution. From farmers' perspective, equal water distribution does not give all farmers direct benefits, but rather demarcates farmers according to their hydraulic position in the system. Here, irrigation water supply is perceived as a means to sustain/increase crop production and not a goal in itself (to be distributed equally or used effectively). In this context, the scheme operation primarily mimics the existing power structure both socially and hydraulically. WUA's role in scheme water management is limited to canal maintenance.

Existing governance/power structures

The potential role WUAs may play in scheme management, especially vis-à-vis the maintenance and operation of irrigation infrastructure is also defined by existing formal and informal governance systems. Put differently, the roles and functions which WUAs can assume depend on the gaps, malleability and vested interests of the current management context. Through an investigation of these systems we attempt to isolate the added organizational value of IFAD sponsored WUAs in terms of irrigation efficiency and farming practices, highlighting instances of duplication and futility.

Informal Administration

In terms of the day to day management of Sri Lankan, Philippine, Nepalese, Bangladeshi and Cambodian schemes informal interaction between farmers, both before and after IFAD's interventions, is very high. Put differently, in these small-scale, autonomous irrigation schemes farmers already take care of the system with or without WUA formation.

In Sri Lankan field sites farmers are bound by kinship ties and in many cases, farmers meet frequently via other community based organizations such as multipurpose co-operative societies; *Samurdhi* associations and death-benefits or funeral associations**.** Even before the intervention, farmers at the micro tank level were autonomous in terms of arranging the irrigation system. For instance, in *Arasanwewa, Dhalupothawewa*, and *Randawewa*, informal discussions among beneficiary farmers allowed for flexible responses to distribution and maintenance needs. In the overwhelming majority of sample sites, these informal mechanisms continue to dominate the decision making processes at the micro tank level. The key point here is that the main functions of the subcommittee were already being performed by beneficiary farmers via informal decision making processes. The intervention did not result in the devolution of greater powers or responsibilities to the micro-tank level, only a formalization of the status quo. Similarly, in Cambodian schemes, there is no WUA. They do not have any defined water distribution schedule as every farmer can pump the water whenever they like. However, farmers can informally discuss and negotiate their water taking activities. For instance, if some farmers do not want to use the water, they inform other farmers who might want to use it thereby allowing for flexible adjustments of irrigation water supply.

In Nepal, WUAs, as are generally understood, do not exist. Instead, WUAs function more or less as 'construction committees'. A case in point was observed in *Gilbili* canal where two rehabilitations of the system, supported by two different donors, have given rise to two different 'users groups' to undertake construction works. They stop functioning once the assigned project is completed and sometimes even before that. However, this does not mean that the tasks of water distribution and infrastructure maintenance are neglected in field sites. Rather, these communities manage their systems through traditional arrangements for operation and maintenance although no formal or informal WUAs exist. In *Choudam* and *Pothada* irrigation systems, for example, informal arrangements are made as to the contribution of labour for the maintenance of the canals. Regular maintenance of the canal is usually done twice a year, first before the transplantation of rice begins and then before the sowing of wheat in the winter. In *Chaudala* and *Gilbili* irrigation systems, they had more elaborate rules for the distribution of water and maintenance of the canal. As mentioned above, an individual is hired for irrigating the fields all the farmers and undertaking minor repair of the canal in rice growing season.

In the Philippines, WUA's role in distribution, maintenance and cultivation planning is shaped in close connection to farmers' decisions in defining the start of the cropping seasons (when they schedule the period for land preparation, rice transplanting), as to ensure that farmers receive sufficient amount of irrigation water during these periods. This role, however, exists long before the WUA was formed and established. The persons who arrange it are in most cases incorporated into the existing farming groups within (sub)

villages. Put differently, though essential, the shaping of water distribution task does not urge the formation of WUAs. The same can be said with regard to canal maintenance. In case of leakage in the canal, WUA will try to repair it. As for the labour, farmers will do the work together. In short, WUA functions relatively well in community irrigation systems, as farmers already take care of the system with or without WUA formation.

In contrast, the rigid rules governing WUA organizational development in the Philippines do not coincide with the reality in the field. These rules include the obligation to renew WUA staff each two years, separation of WUA staff from village government structure, and conducting WUA monthly meeting (mainly to report ISF collection). Farmers and WUA staff are not interested in following these rules. Their main concern is that farmers' water needs are met regardless of WUA formal and actual functioning. Nevertheless, the way these rules are imposed to WUA staff and farmers by WUA coordinator reflects how WUA formation and organizational development follows a social-engineering approach, and thus how WUA organizational development had been designed to perform certain tasks defined by either the respective country government and/or international donors. At the same time, the way WUA neglected this procedural formality shows farmers' ability to create an alternative path to address their development needs and at the same time maintain WUA formal existence. Under the community irrigation system in Esperanza village, WUA functions in close relation with farmers' water needs, and less as a formal administrative body. Here, WUA can respond to farmers' needs while still maintaining its organizational formality in line with project requirements.

Enduring actors and governance structures

In Cambodian and Sri Lankan field sites, WUA's first task, namely to oversees the operation of the scheme and distribute water among farmers, is already incorporated into the existing governance structure. The crux of IFAD's PIM reforms in Sri Lanka, for example, involved the creation of sub-committees for each individual tank (within a parent Farmers Organization). Field assessments suggest that on the whole, this reform has not had substantial impacts on existing local power structures and hierarchies – neither improving negative performance nor causing detriment where performance is positive. In the majority of cases, micro tank management continued to fall between traditional actors; the Farmer's Organization (FO) and the water operator. Each represents different historical perspectives of village level water resource development and management. Furthermore, the politico-institutional context in which IFAD's O&M subcommittees operate has not changed. Rather, FOs continue to be the only legal community based organization involved in tank management (Agrarian Services Act No. 4). In no cases are subcommittees' legal entities with autonomy in terms of administering construction contracts or accessing

essential extension services such as the fertilizer subsidy scheme. Furthermore, the reform has not been picked up and extended to non-IFAD sites by the Agrarian Services Department and government of Sri Lanka. Rather, the majority of the farming community continues to be represented by FOs. Thus the external legal recognition and political acceptance of the sub-organization is still lacking.

Similarly, in Cambodia WUA's potential role is already incorporated into the existing governance structure via Commune Councils and village governments. In Chrey area, Prey Veng province, for instance WUAs were formed in each village (4 in total) with the village head also assuming the position of WUA chairman. The appointment of village head as WUA chairman reflects how WUA organizational potential is incorporated as part of the existing village government structure and functioning. Furthermore, in some of the Communes WUA's potential role in conflict resolution is incorporated into the village government structure, minimizing the amount of administrative works with regard to WUA formation. In short, these incorporations reflect how farmers perceive WUA as having no added organizational value for their farming practices, next to the existing village government structure.

Indeed in Romchek area (Prey Veng province), the Commune Council chairman claimed that it is difficult for the Council to convince farmers to form WUAs, because farmers do everything individually and do not see any added value of WUA for them and their farming practices. The water in the irrigation canal acted mainly as a supplement and not as the main source of water supply for farmers. Moreover, as currently no one is responsible for water management and its distribution in the area, he does not see why farmers should be organized in the first place and for what purpose. This illustration again reflects how farmers perceive the uselessness of organizing themselves into WUA or any other form of organization which could not give any benefit for them in the first place. Moreover, farmers also indirectly questioned the potential use of having a WUA organized, in relation to its actual ability to ensure farmers' water supply, promote equal water distribution, and support farmers' farming practices in general. Here we can say that the way farmers have changed the role of irrigation and adjusted the function of the irrigation infrastructure has indeed some impact on the potential of WUA and how it can represent farmers' needs in irrigation. In the context of unequal water distribution, WUA would not change the relationship between head and tail-end farmers either. In terms of canal maintenance, farmers do not see any benefit to regularly maintain the main/feeder canal as they see it merely as a water storage infrastructure, and not as a water conveyance tool. Put differently, why should farmers organize themselves into WUAs to preform functions which they do not have any interest to do in the first place?

Another interesting case arises from Nepal, where in *Pothada* and *Chaudam* villages, irrigation canals are privately owned, and management decisions are made by the owners of the canals. In *Pothada* irrigation system, descendants of the original canal constructor irrigate their fields first only the do other beneficiaries get their turns. When families other than descendants acquire land in the command area of the canal, as in the case of *Tuppa Kulo* in *Pothada*, these 'new users' can also access the water but exercise less decision making power in the system. In this context, WUAs authority and organisational viability will always be undermined by the superior rights and particularistic interests of individual farmers. In the case of *Pothada* canal, for instance most of the community claimed that the owner of the canal had agreed to make it a public asset so that IFAD funding could be invested in the canal with benefits flowing to the whole village. However, when the canal rehabilitation was almost complete the owner of the canal rescinded his previous promise and the canal remained a private one. This example raises serious questions about the added organizational value of WUAs in sites where irrigation infrastructure is privately owned and operated. In Nepal, as in Cambodia, those farmers which own canals or pump at the head-end of the system have no incentive to establish institutions for the collective management of their schemes. Rather, their interests are maximised in the existing set up, where their irrigation needs are pre-eminent, often at the expense of new tenant or tail-end farmers.

The experience of WUAs under the SSWRDSP in Bangladesh has been quite different. Here O&M of scheme infrastructure is not the sole objective of the WUA. Rather most WUAs take on additional roles and are involved in administering agricultural extension and microcredit. In some cases this appears to divert attention away from O&M as WUAs focus on their more remunerative activities, where they get short-term/direct gains. However, most WUAs are able to effectively balance their O&M and micro credit activities. Indeed, four out the 14 WMCA visited excel in different businesses such as microcredit, tree plantations or seeds production without compromising the organisations core roles of O&M. More broadly, the 9 (out of 15) WUAs which engage in micro-credit activities all have infrastructure that is still functioning and fairly well maintained 9 years after project completion. Here, the establishment of a dedicated O&M sub-committee within the WUA and the high level of engagement with and continuous support from LGED may be enabling factors. In these cases, field observations suggest that WUAs with diversified functions may increase farmers' incentives to participate in O&M activities. Also interesting to note is the way WUAs bridge a real gap in the pre-existing farming system by improving the access of the rural poor to credit through the microcredit program.

Taken together our analysis suggests that formalising the existing governance structures of irrigation schemes is not sufficient to ensure efficient investment or significant performance gains. Rather, reforms must investigate and address the actual *causes* of poor

performance and resolve problems of equitable allocation, if they are to make a substantial or lasting impact.

Role of irrigation agencies in autonomous systems

In arranging the irrigation scheme, farmers in all field sites are self-reliant and autonomous and as such irrigation agencies play little role in actual water management. In this sense, IFAD sponsored WUAs avoid many of the inefficiencies associated with large surface irrigation systems which span several hydraulic levels. According to Aw and Diemer (2005), often poor performance and management at the distributary level can be traced to main system managers, who fail to deliver reliable water supplies in predictable schedules at the outlets. In such cases, power is vested outside WUAs, technically in the main system and institutionally with the Irrigation Agency (Narain, 2008).

As already illustrated, in field sites power to arrange the technical system lies very much in the hands of beneficiary farmers, however institutionally, power is vested outside WUAs, in individual farmers and existing governance systems. The influence and roles of the agency in these systems are diverse, ranging from a peripheral, input provider (Cambodia) to a highly engaged, planner, conflict mediator and service provider (Sri Lanka and Bangladesh). In the cases of Sri Lanka and Bangladesh, the irrigation agency asserts its influence in farming communities through regulating farmers' access to maintenance accounts, administering access to vital inputs and facilitating cultivation meetings where crop, maintenance and distribution schedules are determined. Its role is one of administering support and extension services for farmers with implications for the success and sustainability of these farming systems.

In Sri Lanka a very well-developed framework exists for the supervision of both agricultural extension and minor irrigation, in the form of the Agrarian Services Department (ASD) and its field officers: Agricultural Production and Research Assistants or *Govi Seva Niyamaka* (APRA). In all Sri Lankan field sites, distribution and cultivation schedules were determined at seasonal *kana* or cultivation meetings hosted by the Farmers' Organization and facilitated by the APRA. This is consistent with the main decision making patterns and procedures that existed prior to IFAD's interventions in the district. The ASD is also responsible for securing farmers' land tenure rights, and holding seminars and workshops to introduce farmers to modern techniques and cultivation methods (Agrarian Services Act). The department also registers all FO and provides various extension services to farmers via APRAs. In 11 cases (out of a maximum 15), APRAs also took on additional roles as conflict mediators or advisors and represented the interests of farmers to higher levels of the bureaucracy, namely to the District Officer and Agricultural committee (see figure 27). It is also worth emphasising that the current system of funding

tank maintenance entrenches the influence of APRAs and ASD in farming communities. As already noted, access to O&M funds is regulated by the APRA and DO.

The influence of the ASD in tank management has also grown with the introduction of lucrative fertilizer subsidies for paddy cultivation. Currently, the APRA's administer the subsidy scheme and the department has a monopoly over the input. Thus, while subcommittees are autonomous in the distribution of water, to access the fertilizer subsidy or funds for maintenance they must work through their parent FO, which makes recommendations to the APRA and ASD. This fact has in turn made the agency very influential in farming communities. Ultimately, the dependence of Sri Lankan farmers on the ASD for vital inputs (fertilizer) and financial viability means part of their success and sustainability is linked to the responsiveness of the agency and it's field staff to farmers' interests and concerns and thus constructive cooperation between the ASD and subcommittees or FOs is a condition for high performance.

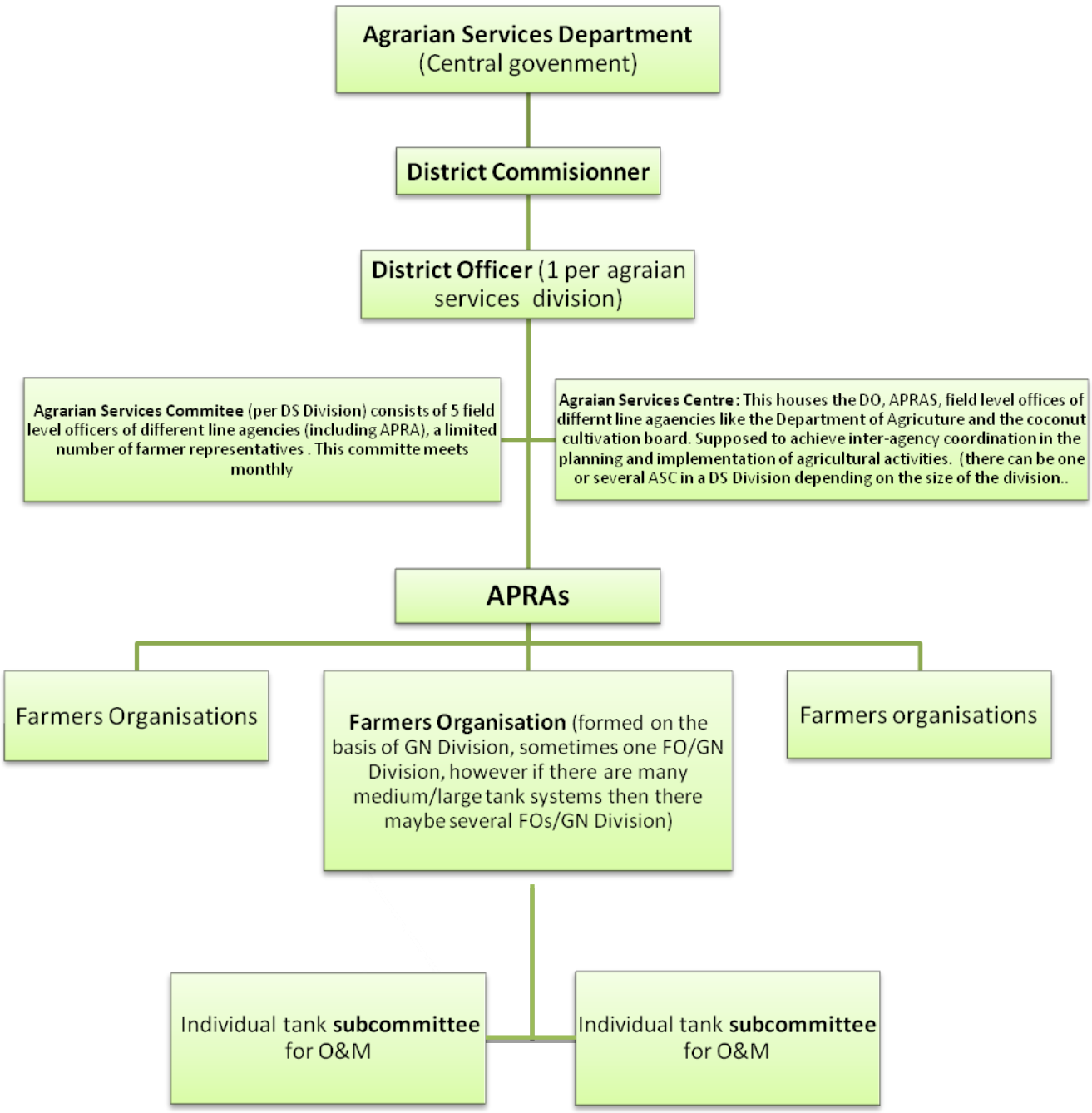

Figure 27: Institutional hierarchy in Sri Lankan micro-tank systems

Similarly, in Bangladesh, a pivotal role in building and sustaining WUA capacity was undertaken by the Local Government Engineering Department (LGED). LGED is an organ of the Government of Bangladesh and it's mandate consists in planning, implementing and supervising local, rural infrastructure development; urban infrastructure development; and small scale water resource development (<1000 ha). LGED staff include a good mix of technical (engineers) and institutional (sociologist) expertise (with a ratio of about 1 sociologist/community organiser every 3 engineers), especially at district and Upazila level.

In field sites, LGED is continuously in touch with WUA Management Committees with quarterly and monthly meetings at district and upazila level, respectively. Therefore, socio-economists and engineers are usually well aware of qualities and criticalities of each single sub-project and WUA of their district or sub-district. LGED still provides technical and institutional support (i.e. training) when needed, and facilitates contacts between WUAs and other Government's agencies such as the cooperative department. This aspect may significantly contribute to the sustainability and success of the WUA and infrastructure maintenance over time.

These examples show that while farmers are autonomous in arranging technical aspects of irrigation, agencies can still play a central role in these systems by administering agricultural inputs and services. Interesting to note in these two cases, is the fact that the agency involved is not the Irrigation Department (despite the fact that separate ID's exist in both countries) but rather a department with a broader mandate, which is also involved in agricultural extension and village-level planning. This is a point of contrast with our other field study sites where the influence and responsibility of Irrigation and Agriculture Departments remain highly sector focused and demarcated. This latter approach may be a key factor limiting the success of IFAD's reforms. As Merry et al., argue, 'negotiating and crafting new types of organisational arrangements for managing irrigation… are not possible without considering broader institutional arrangements of and policies in water, agriculture and rural sectors. For example, success of reforms in the Office du Niger in Mali lay in broader reforms to enhance the effectiveness of input and output markets' (2007: 210). This highlights the potential role that could be played by agencies in these kinds of systems, as a focal point of institutionalising and integrating different agricultural interventions (marketing, extension and credit, irrigation). IFAD can also make a big impact in farming communities by reorienting and working with these agencies in terms of strengthening market access and improving systems for providing extension and technical support to irrigators.

Conclusions and Recommendations

Based on systematic review of 24 IFAD funded PIM interventions we identified important gaps in IFAD's documentation process, in particular the need for higher quality and longer-term impact assessments of PIM interventions. We also develop and apply a methodology for classifying each of these PIM interventions based on their impact on the performance of irrigated agriculture. Performance was measured from several perspectives, drawing on nine financial, technical, social and agricultural outcome and impact indicators. Each intervention was assigned a unique score and was ranked in terms of success or failure. The majority of cases (71%) were deemed to be successful according to this system of classification. This system also proved robust in terms of agricultural and technical impact when compared with rapid field observations in five project sites.

The final objective of this review was to find patterns of success and failure. This involved simple correlations and qualitative comparative analysis via historical and field research. Our results indicate that several factors including access to extension, diversification of services by WUAs, pre-existing social capital and secure land tenure, affect user organisation and activity. However, on the whole our detailed assessment of these 24 case studies reveals the outcomes of PIM are mixed and no clear, consistent pattern emerges that offers a recipe for successful application elsewhere.

Our desk review and field analysis does indicate that in some cases formal WUAs may be an appropriate avenue for improving system performance and clarifying rights and responsibilities in irrigation schemes. In other cases, such as the *Community Based Rural Development Project* and *Rural Poverty Reduction Project* (Cambodia), it has resulted in what Meinzen-Dick calls 'paper tigers' or organisations that only exist on paper and do not result in any real institutional change (2007; 15203). On the whole we observed that the focus on formal irrigation or water management organisations o ignores many other institutions involved in managing water use in agriculture – traditional actors, informal O&M mechanisms and broader social institutions – often resulting in organisational duplication.

Our study also suggests that poor performance may be the results of non-infrastructure related constraints, which may help to explain why IFAD sponsored O&M programs attract little attention from farmers in some field study sites. For instance much of the water scarcity experienced by farmers in our field study sites is due to existing distribution systems and governance structures, favouring one group over another, or prioritising the needs of individuals rather than as the result of inadequate M&R of scheme infrastructure.

However much work remains to firmly establish the hypotheses put forward in this report. In particular future research must be underpinned by more extensive and robust fieldwork than was possible in this study. Moreover, we need a better understanding of how to promote the equitable distributions of water – especially in the context of pump schemes and supplemental irrigation – and what methods or incentives may work to bring about this result. Similarly, we require further examination of the processes by which government bureaucracies may be transformed into responsive service providers with the capacity to streamline and integrate different agricultural interventions such as marketing, extension, credit *and* irrigation. In many cases this will require greater understanding of the disconnect between agricultural policy reform and irrigation policy reform (which often fall under different ministries). Ultimately, unless, the actual causes of poor performance are understood and addressed in reform policies and donor interventions, the irrigation sector will continue to default on its promises of poverty reduction, development and improved food security, as has largely been the case thus far.

Recommendations for Monitoring and Evaluation

In light of the shortcomings discussed in this report, the following principles should guide future M&E of PIM impacts:

1. Wherever possible, collect baseline, mid-line and end-line data in a systematic and rigorous way from both project and comparable non-project areas or make use of staggered implementation to measure and isolate impact. Availability of comparable baseline, mid-line and end-line data from project and non-project areas will make it possible to deploy a number of quasi-experimental impact evaluation methods such as difference in difference method, propensity score matching and instrumental variables. These will take care of the attribution challenge to a large extent. In certain types of interventions, an experimental evaluation approach is also feasible. For example, in Sri Lankan micro tanks or the sub-projects in Bangladesh, it would have been possible to choose schemes to be rehabilitated in a random way such that non-rehabilitated tanks/subprojects could have acted as controls. RIMS Practical Guidance for Impact Surveys (2005) argues the use of control groups gives rise to ethical concerns.[10] However, we argue it is possible to mitigate these by choosing irrigation schemes or sub-projects to be rehabilitated in a random way or, because of the staggered implementation of IFAD's programmes to measure and contrast performance in both rehabilitated and earmarked schemes. In addition, the following will help with better impact evaluation.

[10] Ethical concerns arise because of the deliberate exclusion of control villages or households during the spread of the involvement in development activities or the engagement of other partners

2. To enable a thorough investigation of which socio-economic and technical mechanisms appear to be active in successful interventions, a range of descriptive indicators should be consistently documented.

3. To allow for generalizations of project performance sampling design should be random and systematic.

4. Wherever possible performance of irrigation investments (both hard and soft) should be evaluated using a balanced set of indicators. This will enable a more holistic assessment of impact and also allow us to examine trade-offs and interactions between key performance measures.

5. To better establish a causal link between intervention and impact, combine before and after and with or without analysis.

6. To isolate the impact of a particular intervention and also overcome problems of casual attribution, incorporate statistical tests.

7. To assess the sustainability of PIM interventions and performance over time, invest in more long-term post-completion evaluations of PIM.

8. Place the measurement of sustainability or effectiveness (by RIMS rating scale), in a broader, qualitative explanatory framework. This will enable greater insights into the factors and forces which shape interventions. At least in the case of yields and cropping intensity, our field observations indicate that comprehensive, disaggregated seasonal records exist and are maintained at the local level (Sri Lanka and Bangladesh). This data however is currently not integrated into IFAD documents or used to frame RIMS ratings.

9. Uniformly adopt RIMS indicators and methods in project M&E systems. Currently, in many cases baseline surveys are yet to be carried out (Indonesia) and data collection is neither systematic nor comprehensive. In the *Decentralized Program for Rural Poverty,* for example, a total of 101 RIMS and Project indicators are included in the M&E framework. However, of these 101 indicators (64 output level indicators and 38 outcome level indicators) only one third (34) of these have data recorded against them (Supervision Report Ha Giang: 110).

Recommendations for Future PIM Interventions

Our review also draws attention to some constraints and missed opportunities in IFAD's current approach to irrigation management reform. Accordingly, the following points should inform the design and implementation of IFAD's future PIM interventions:

1. Future intervention should increase local input and experimentation with new technologies. The unfavourable experiences with solar-powered pumps noted in this review underscores the need to pre-test new technologies and consult communities before new irrigation technologies are introduced.

2. On the whole, infrastructure designs should look beyond robustness to options for sustainability that are consistent with farmers' operation and maintenance systems. More specifically, IFAD's investments in irrigation technology should be guided by two key questions:

    a. After the life of the project, will farmers be able to manage the system reasonably well without outside support?
    b. Do physical investments alter or disrupt local arrangements for maintenance and distribution, with negative implications for equity? Any technology that answers the former in the negative and the latter in the affirmative is not worth considering.

3. Future intervention should continue to work towards the institutionalisation input supply, credit and marketing facilities as beneficiary farmers require support systems that extend far beyond irrigation if they are to significantly improve their livelihoods.

4. Our field observations suggest that WUAs could potentially contribute to the more equitable distribution of irrigation water in project sites – this role is also consistent with IFAD's guiding principles. In spite of this, there is little emphasis or detail given to how the equitable distribution of water resources could be achieved via organise user management in current project designs or implementation.

5. Future intervention should support farmers' adaptations in the context of unequal distribution and water scarcity. Our results indicate that in the context of unequal water distribution, regular maintenance and upkeep will not resolve water scarcity for many tail-end or tenant farmers. For this reason, farmers respond to the

problem by altering their cropping patterns, crop selection, or using tube wells for groundwater pumping rather than engaging in systems maintenance.

6. Efforts to improve irrigation development practices should focus on facilitating farmers' ability to define alternative paths. The way farmers neglected the formation of WUA as a procedural, administrative formality vis-à-vis farmers' awareness to maintain the condition of the irrigation canals (especially at tertiary level) shows their ability to create an alternative path to address their development needs with or without WUA.

7. Observations from the field also suggest that in some cases it may be neither necessary nor possible to create and sustain formal local organisations focused on irrigation management, such as WUAs. In societies characterised by diversified livelihoods and marginally profitable irrigated agriculture, it may not be worthwhile for farmers to invest heavily in management associations. In such contexts, the use of existing multipurpose local organisations, like village based administrative units (i.e. Commune Councils in Cambodia) or traditional water operators (Sri Lanka and Nepal) to manage irrigation may be the more sustainable option.

8. Future intervention can also make a big impact in farming communities by bridging the disconnect between irrigation and agricultural agencies in terms of strengthening market access and improving systems for providing extension and technical support to irrigators. On the whole IFAD sponsored programs need to reorient irrigation bureaucracies as much as farmers and enable them to respond to farmers demand. There is emerging evidence that it is possible to reform national authorities (for example the case of electricity boards in India) and we need to understand how it can best be done with the irrigation agencies. Our fieldwork also hints at the potential role that could be played by agencies in these kinds of systems, as a focal point of institutionalising and integrating different agricultural interventions such as marketing, extension, credit and irrigation.

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Appendix 2: Types of documents reviewed

SR	Country	Project	Inception or Appraisal Report	Mid-Term Review	Supervision Reports (Aide Memoires)	Progress Reports	Field Notes	Completion Report
1	Cambodia	Community based rural development project	yes	yes	yes	yes	yes	yes
2	Cambodia	Rural Poverty Reduction Project in Prey Veng and Svay Rieng	yes	yes	yes	yes	yes	no
3	Indonesia	Rural Empowerment and Agricultural Development Programme (READ)	yes	no	yes	yes	Yes	no
4	Mongolia	Rural Poverty-Reduction Programme	yes	no	yes	yes	no	no

SR	Country	Project	Inception or Appraisal Report	Mid-Term Review	Supervision Reports (Aide Memoires)	Progress Reports	Field Notes	Completion Report
5	Nepal	Western Uplands Poverty Alleviation Programme	yes	yes	yes	yes	yes	no
6	Pakistan	Southern Federally Administered Tribal Programme	yes	yes	yes	yes	no	no
7	Pakistan	Community Development Programme	yes	yes	yes	yes	no	no
8	Philippines	Northern Mindanao Community Initiatives and Resource Management Project	yes	yes	yes	yes	yes	yes
9	Philippines	Second Cordillera Highland Agriculture Project	yes	no	no	no	yes	no

SR	Country	Project	Inception or Appraisal Report	Mid-Term Review	Supervision Reports (Aide Memoires)	Progress Reports	Field Notes	Completion Report
10	Sri Lanka	Dry Zone Livelihood Support and Partnership Programme	yes	no	yes	yes	no	no
11	Viet Nam	Rural Income Diversification Project	yes	yes	yes	yes	no	yes
12A	Viet Nam	Ha Giang Subproject: Decentralized Programme for Rural Poverty	yes	yes	yes	yes	no	no
12B	Viet Nam	Quang Binh Subproject: Decentralized Programme for Rural Poverty	yes	yes	yes	yes	no	no
13	Viet Nam	Ha Tinh Rural Development Project	yes	yes	yes	yes	no	yes
14	China	West Guangxi Poverty Alleviation Project	yes	yes	yes	yes	no	Yes
15 A	China	Ningxia Environment Conservation and Poverty Reduction Programme	yes	yes	yes	yes	yes	No

SR	Country	Project	Inception or Appraisal Report	Mid-Term Review	Supervision Reports (Aide Memoires)	Progress Reports	Field Notes	Completion Report
15 B	China	Shanxi Environment Conservation and Poverty Reduction Programme	yes	yes	yes	yes	yes	No
16	China	South Gansu Poverty-Reduction Programme	yes	yes	yes	yes	yes	no
17 A	India	Chhattisgarh Tribal Development Programme	yes	yes	yes	yes	yes	no
17 B	India	Jharkhand Tribal Development Programme	yes	yes	yes	yes	no	no
18	Laos	Oudomxai Community Initiative Support Project	yes	yes	yes	yes	no	yes
19 A	Laos	Attapeau Rural Livelihoods Improvement Programme	yes	yes	yes	yes	no	no
19 B	Laos	Sayabouri Rural Livelihoods Improvement Programme	yes	yes	yes	yes	no	no
20	Bangladesh	Small-Scale Water Resources Development Sector Project	yes	no	no	no	yes	yes

Appendix 3 (a): Methods of Analysis

SR	Country	Project	Independent measurement of project outcomes and progresses	with or without measurements	Before and after measurements	Post-Intervention measurements only	time series analysis	statistical tests used	Descriptive statistics
1	Cambodia	Community based rural development project	yes	no	yes	yes	yes	yes	yes
2	Cambodia	Rural Poverty Reduction Project in Prey Veng and Svay Rieng	yes	no	no	Yes	no	no	yes
3	Indonesia	Rural Empowerment and Agricultural Development Programme (READ)	yes	no	no	yes	yes	yes	yes
4	Mongolia	Rural Poverty-Reduction Programme	yes	no	no	yes	yes	no	yes

SR	Country	Project	Independent measurement of project outcomes and progresses	with or without measurements	Before and after measurements	Post-Intervention measurements only	time series analysis	statistical tests used	Descriptive statistics
5	Nepal	Western Uplands Poverty Alleviation Programme	yes	no	no	yes	no	no	yes
6	Pakistan	Southern Federally Administered Tribal Programme	yes	no	no	yes	no	no	yes
7	Pakistan	Community Development Programme	yes	yes	no	yes	yes	no	yes
8	Philippines	Northern Mindanao Community Initiatives and Resource Management Project	yes	no	yes	yes	yes	yes	yes

SR	Country	Project	Independent measurement of project outcomes and progresses	with or without measurements	Before and after measurements	Post-Intervention measurements only	time series analysis	statistical tests used	Descriptive statistics
9	Philippines	Second Cordillera Highland Agriculture Project	yes	no	yes	yes	no	no	yes
10	Sri Lanka	Dry Zone Livelihood Support and Partnership Programme	yes	no	yes	yes	yes	no	yes
11	Viet Nam	Rural Income Diversification Project	yes	no	yes	yes	yes	no	yes
12A	Viet Nam	Ha Giang Subproject: Decentralized Programme for Rural Poverty	yes	no	yes	yes	yes	yes	yes
12B	Viet Nam	Quang Binh Subproject: Decentralized Programme for Rural Poverty	yes	no	yes	yes	yes	yes	yes

SR	Country	Project	Independent measurement of project outcomes and progresses	with or without measurements	Before and after measurements	Post-Intervention measurements only	time series analysis	statistical tests used	Descriptive statistics
13	Viet Nam	Ha Tinh Rural Development Project	yes	no	yes	yes	yes	no	yes
14	China	West Guangxi Poverty Alleviation Project	yes	yes	yes	yes	no	no	yes
15 A	China	Ningxia Environment Conservation and Poverty Reduction Programme	yes	no	yes	yes	yes	no	yes
15 B	China	Shanxi Environment Conservation and Poverty Reduction Programme	yes	no	yes	yes	yes	no	yes

SR	Country	Project	Independent measurement of project outcomes and progresses	with or without measurements	Before and after measurements	Post-Intervention measurements only	time series analysis	statistical tests used	Descriptive statistics
16	China	South Gansu Poverty-Reduction Programme	yes	no	yes	yes	yes	no	yes
17 A	India	Chhattisgarh Tribal Development Programme	yes	no	no	yes	yes	no	yes
17 B	India	Jharkhand Tribal Development Programme	yes	no	yes	yes	yes	yes	yes
18	Laos	Oudomxai Community Initiative Support Project	yes	no	yes	yes	yes	yes	yes
19 A	Laos	Attapeau Rural Livelihoods Improvement Programme	yes	no	no	yes	yes	no	yes
19 B	Laos	Sayabouri Rural Livelihoods Improvement Programme	yes	no	no	yes	yes	no	yes

SR	Country	Project	Independent measurement of project outcomes and progresses	with or without measurements	Before and after measurements	Post-Intervention measurements only	time series analysis	statistical tests used	Descriptive statistics
20	Bangladesh	Small-Scale Water Resources Development Sector Project	yes	no	yes	yes	yes	no	yes

Appendix 3 (b): Data Collection Methods

SR	Country	Project	Survey data	Systematic Sampling	Stakeholder perspectives	Direct measurement of operations	Direct inspection of structures	Project start date	Date of latest documentation	Period of evaluation
1	Cambodia	Community based rural development project	yes	n/a	yes	no	yes	2001	2008	medium-term
2	Cambodia	Rural Poverty Reduction Project in Prey Veng and Svay Rieng	yes	yes	yes	no	yes	2004	2009	medium-term
3	Indonesia	Rural Empowerment and Agricultural Development Programme (READ)	yes	n/a	yes	no	no	2008	2010	short-term
4	Mongolia	Rural Poverty-Reduction Programme	yes	yes	yes	yes	yes	2003	2009	medium-term

SR	Country	Project	Survey data	Systematic Sampling	Stakeholder perspectives	Direct measurement of operations	Direct inspection of structures	Project start date	Date of latest documentation	Period of evaluation
5	Nepal	Western Uplands Poverty Alleviation Programme	yes	yes	yes	no	yes	2003	2010	medium-term
6	Pakistan	Southern Federally Administered Tribal Programme	no	no	yes	no	yes	2002	2008	medium-term
7	Pakistan	Community Development Programme	yes	no	yes	no	yes	2004	2010	medium-term
8	Philippines	Northern Mindanao Community Initiatives and Resource Management Project	yes	n/a	yes	no	no	2002	2010	medium-term
9	Philippines	Secon Cordillera Highland Agriculture Project	yes	no	yes	no	no	2008	2009	short-term
10	Sri Lanka	Dry Zone Livelihood Support and	yes	no	no	no	yes	2005	2010	medium-term

SR	Country	Project	Survey data	Systematic Sampling	Stakeholder perspectives	Direct measurement of operations	Direct inspection of structures	Project start date	Date of latest documentation	Period of evaluation
		Partnership Programme								
11	Viet Nam	Rural Income Diversification Project	yes	n/a	yes	no	yes	2002	2010	medium-term
12A	Viet Nam	Ha Giang Subproject: Decentralized Programme for Rural Poverty	yes	n/a	yes	no	yes	2005	2010	medium-term
12B	Viet Nam	Quang Binh Subproject: Decentralized Programme for Rural Poverty	yes	n/a	yes	no	yes	2005	2010	medium-term
13	Viet Nam	Ha Tinh Rural Development Project	yes	n/a	yes	no	yes	1999	2005	medium-term
14	China	West Guangxi Poverty Alleviation Project	no	n/a	yes	no	no	2002	2009	medium-term
15 A	China	Ningxia Environment Conservation and Poverty Reduction Programme	yes	n/a	yes	no	yes	2005	2010	medium-term

SR	Country	Project	Survey data	Systematic Sampling	Stakeholder perspectives	Direct measurement of operations	Direct inspection of structures	Project start date	Date of latest documentation	Period of evaluation
15 B	China	Shanxi Environment Conservation and Poverty Reduction Programme	yes	n/a	yes	no	yes	2005	2010	medium-term
16	China	South Gansu Poverty-Reduction Programme	yes	n/a	yes	no	yes	2006	2010	medium-term
17 A	India	Chhattisgarh Tribal Development Programme	yes	n/a	yes	no	yes	2001	2010	medium-term
17 B	India	Jharkhand Tribal Development	yes	n/a	yes	no	no	2001	2010	medium-term
18	Laos	Oudomxai Community Initiative Support Project	yes	n/a	yes	no	yes	2002	2010	medium-term
19 A	Laos	Attapeau Rural Livelihoods Improvement Programme	yes	n/a	yes	no	yes	2006	2010	medium-term
19 B	Laos	Sayabouri Rural Livelihoods	yes	n/a	yes	no	yes	2006	2010	medium-term

SR	Country	Project	Survey data	Systematic Sampling	Stakeholder perspectives	Direct measurement of operations	Direct inspection of structures	Project start date	Date of latest documentation	Period of evaluation
		Improvement Programme								
20	Bangladesh	Small-Scale Water Resources Development Sector Project	yes	yes	yes	no	yes	1996	2007	long-term

Appendix 4: Technical specification of interventions

SR	Country	Project	Type of scheme	Total No. of schemes	Size of scheme (HA)	Scheme complexity
1	Cambodia	Community based rural development project	diversion, storage and pump	9	3960	
2	Cambodia	Rural Poverty Reduction Project in Prey Veng and Svay Rieng	diversion and storage	93	22390	
3	Indonesia	Rural Empowerment and Agricultural Development Programme (READ)	diversion	5	n/a	
4	Mongolia	Rural Poverty-Reduction Programme	diversion, storage and pump	549	2,389,000	

SR	Country	Project	Type of scheme	Total No. of schemes	Size of scheme (HA)	Scheme complexity
5	Nepal	Western Uplands Poverty Alleviation Programme	diversion and storage	104		simple
6	Pakistan	Southern Federally Administered Tribal Programme	diversion, storage and pump	310	25,000	mixed (both large and small systems are targeted)
7	Pakistan	Community Development Programme	diversion, storage and pump	79	2154	
8	Philippines	Northern Mindanao Community Initiatives and Resource Management Project	diversion and storage	n.a	460	
9	Philippines	Secon Cordillera Highland Agriculture Project	diversion and storage	n/a	4800	

SR	Country	Project	Type of scheme	Total No. of schemes	Size of scheme (HA)	Scheme complexity
10	Sri Lanka	Dry Zone Livelihood Support and Partnership Programme	diversion and storage	750	6600	simple
11	Viet Nam	Rural Income Diversification Project	diversion and pump	227	n/a	
12A	Viet Nam	Ha Giang Subproject: Decentralized Programme for Rural Poverty	diversion and storage	65	n/a	
12B	Viet Nam	Quang Binh Subproject: Decentralized Programme for Rural Poverty	diversion and pump	23	1356	
13	Viet Nam	Ha Tinh Rural Development Project	diversion and storage	28	5 039	
14	China	West Guangxi Poverty Alleviation Project	diversion and storage	20186 tanks and 553.74 km of canal	13687	
15 A	China	Ningxia Environment Conservation and Poverty Reduction Programme	diversion, storage and pump	3821 (+ 60km of canal lining)	10779	

SR	Country	Project	Type of scheme	Total No. of schemes	Size of scheme (HA)	Scheme complexity
15 B	China	Shanxi Environment Conservation and Poverty Reduction Programme	diversion and pump	68 (+197 km of built and rehabilitated canals)	6277	
16	China	South Gansu Poverty-Reduction Programme	diversion and storage	68	14867	
17 A	India	Chhattisgarh Tribal Development Programme	storage	1119 (+ 30 gully plugs)	2214	
17 B	India	Jharkhand Tribal Development Programme	diversion and storage	791 (+ 3514 Gully plugs)	225.8	
18	Laos	Oudomxai Community Initiative Support Project	diversion, storage and pump	102	1365.3	
19 A	Laos	Attapeau Rural Livelihoods Improvement Programme	diversion and pump	39	222	
19 B	Laos	Sayabouri Rural Livelihoods Improvement Programme	diversion	19	n/a	
20	Bangladesh	Small-Scale Water Resources Development Sector Project	diversion and storage	273	164,700	mixed

Appendix 5 (a) - Socio-economic and agricultural characteristics of the intervention

SR	Country	Project	Major crop(s)	Crop Value	Crop systems	Number of farmer	Agro-ecological zone	Physical water scarcity	GDP/capita (PPP US$)	Access to extension (high or low)	Access to Credit and/or Markets/(high or low)
1	Cambodia	Community based rural development project	Rice and soya, water melon, sesame		mixed	5306	diverse	low	1,802	high	high
2	Cambodia	Rural Poverty Reduction Project in Prey Veng and Svay Rieng	Rice		cereals	12,500	diverse	low	1,802	low	low
3	Indonesia	Rural Empowerment and Agricultural Development Programme (READ)	Rice , maize, Rubber		mixed	1607	diverse	high	3,712	low	high

SR	Country	Project	Major crop(s)	Crop Value	Crop systems	Number of farmer	Agro-ecological zone	Physical water scarcity	GDP/capita (PPP US$)	Access to extension (high or low)	Access to Credit and/or Markets/(high or low)
4	Mongolia	Rural Poverty-Reduction Programme	fodder crops (for livestock) and some vegetable cultivation		non cereals	10031	open rangelands		3,236	high	high
5	Nepal	Western Uplands Poverty Alleviation Programme	cereals (rice, maize and wheat)		cereals	3844	mountainous		1,049	low	low
6	Pakistan	Southern Federally Administered Tribal Programme	cereals and fodder crops as well as tomato, potato and onion. The main fruit crop		mixed	24,000	diverse	high	2,496	low	low

SR	Country	Project	Major crop(s)	Crop Value	Crop systems	Number of farmer	Agro-ecological zone	Physical water scarcity	GDP/capita (PPP US$)	Access to extension (high or low)	Access to Credit and/or Markets/(high or low)
			is apple								
7	Pakistan	Community Development Programme	Wheat, maize, off-season vegetables and flowers	transition to high crop	mixed	18,801	mountainous	high	2,496	high	high
8	Philippines	Northern Mindanao Community Initiatives and Resource Management Project	Rice, maize, coffee		mixed	55,907	mountainous	high	3,406	high	low

SR	Country	Project	Major crop(s)	Crop Value	Crop systems	Number of farmer	Agro-ecological zone	Physical water scarcity	GDP/capita (PPP US$)	Access to extension (high or low)	Access to Credit and/or Markets/(high or low)
9	Philippines	Secon Cordillera Highland Agriculture Project	paddy, coffee, legumes/ beans, carrots, root crops and other cash crops	diversified	mixed	7,200	diverse	low	3,406	high	high
10	Sri Lanka	Dry Zone Livelihood Support and Partnership Programme	paddy		cereals	10,200	arid	diverse	4,243	diverse	diverse
11	Viet Nam	Rural Income Diversification Project	maize and paddy		cereals	29466	mountainous	low	2,600	high	low
12A	Viet Nam	Ha Giang Subproject: Decentralized Programme for Rural Poverty	maize, paddy, soybean, cassava		mixed	8,956	diverse	diverse	2,600	low	low

SR	Country	Project	Major crop(s)	Crop Value	Crop systems	Number of farmer	Agro-ecological zone	Physical water scarcity	GDP/capita (PPP US$)	Access to extension (high or low)	Access to Credit and/or Markets/(high or low)
12B	Viet Nam	Quang Binh Subproject: Decentralized Programme for Rural Poverty	paddy and maize		cereals	11,511	diverse	diverse	2,600	low	low
13	Viet Nam	Ha Tinh Rural Development Project	rice and groundnuts		cereals	25,200	diverse		2,600	high	low
14	China	West Guangxi Poverty Alleviation Project	Paddy, maize, soya bean, sweet potato, vegetables	diversified	mixed	250,000	mountainous	high	5,383	high	high
15A	China	Ningxia Environment Conservation and Poverty Reduction Programme	Rice, Maize and Wheat		cereals	117,000	arid	high	5,383	high	

SR	Country	Project	Major crop(s)	Crop Value	Crop systems	Number of farmer	Agro-ecological zone	Physical water scarcity	GDP/capita (PPP US$)	Access to extension (high or low)	Access to Credit and/or Markets/(high or low)
15 B	China	Shanxi Environment Conservation and Poverty Reduction Programme	walnuts, fruits, vegetables, mushrooms	high	non cereals	85,000	arid	high	5,383	high	
16	China	South Gansu Poverty-Reduction Programme	fodder, cereals, potatoes (the project promotes cash crops: fruit)	diversified	mixed	14,570	mountainous	high	5,383	high	high
17 A	India	Chhattisgarh Tribal Development Programme	paddy, groundnut, wheat and vegetables		mixed	6992	diverse	high	2,753	diverse	high
17 B	India	Jharkhand Tribal Development Programme	Rice ,maize, pulse, tuber		cereals	34109	mountainous	high	2,753	diverse	high

SR	Country	Project	Major crop(s)	Crop Value	Crop systems	Number of farmer	Agro-ecological zone	Physical water scarcity	GDP/capita (PPP US$)	Access to extension (high or low)	Access to Credit and/or Markets/(high or low)
			crops								
18	Laos	Oudomxai Community Initiative Support Project	Rice, maize, coffee, tree farming		mixed	1,935	mountainous	low	2,165	diverse	high
19 A	Laos	Attapeau Rural Livelihoods Improvement Programme	maize, rice, also vegetable gardens , sugar cane, legumes	diversified	mixed		diverse	diverse	2,165	low	low
19 B	Laos	Sayabouri Rural Livelihoods Improvement Programme	maize, sesame, ginger and peanuts, rice	diversified	mixed	272	diverse	diverse	2,165	low	low
20	Bangladesh	Small-Scale Water Resources Development Sector Project	cereals (paddy) and non cereals	diversified	mixed	142,300	diverse	low	1,241	low	low

Appendix 5 (b): Socio-economic and agricultural characteristics of the intervention

SR	Country	Project	Importance of irrigated agriculture	Social cohesion	Water rights	Land rights	Average size of landholding (ha)	At what level of the irrigation system does the WUA function?	Amount of O&M authority transferred	Rehabilitation	Training
1	Cambodia	Community based rural development project		low	no		1.3	Secondary and tertiary	total	yes	yes
2	Cambodia	Rural Poverty Reduction Project in Prey Veng and Svay Rieng		low	no	high	0.56	Secondary and tertiary	total	yes	yes
3	Indonesia	Rural Empowerment and Agricultural Development Programme (READ)		low		diverse		distributary		yes	yes
4	Mongolia	Rural Poverty-Reduction	high	diverse		low		distributary	partial	yes	yes

SR	Country	Project	Importance of irrigated agriculture	Social cohesion	Water rights	Land rights	Average size of landholding (ha)	At what level of the irrigation system does the WUA function?	Amount of O&M authority transferred	Rehabilitation	Training
		Programme									
5	Nepal	Western Uplands Poverty Alleviation Programme		low		high	less than 0.5 ha	distributary	total	no	yes
6	Pakistan	Southern Federally Administered Tribal Programme		diverse	no	low		distributary	total	yes	yes
7	Pakistan	Community Development Programme	low	diverse		high	1.2	distributary	total	yes	yes
8	Philippines	Northern Mindanao Community Initiatives and Resource Management Project		diverse		high		distributary	total	yes	yes

SR	Country	Project	Importance of irrigated agriculture	Social cohesion	Water rights	Land rights	Average size of landholding (ha)	At what level of the irrigation system does the WUA function?	Amount of O&M authority transferred	Rehabilitation	Training
9	Philippines	Second Cordillera Highland Agriculture Project	high	low		high		distributary		yes	no
10	Sri Lanka	Dry Zone Livelihood Support and Partnership Programme	diverse	high	no	high		distributary	partial	yes	yes
11	Viet Nam	Rural Income Diversification Project		diverse				distributary	total	yes	yes
12A	Viet Nam	Ha Giang Subproject: Decentralized Programme for Rural Poverty		diverse		high		distributary	total	yes	yes
12B	Viet Nam	Quang Binh Subproject: Decentralized Programme for Rural Poverty	diverse	diverse		high		distributary	total	yes	yes

SR	Country	Project	Importance of irrigated agriculture	Social cohesion	Water rights	Land rights	Average size of landholding (ha)	At what level of the irrigation system does the WUA function?	Amount of O&M authority transferred	Rehabilitation	Training
13	Viet Nam	Ha Tinh Rural Development Project				high	less than 0.25	distributary	total	yes	yes
14	China	West Guangxi Poverty Alleviation Project		diverse	yes	high	0.06	distributary	total	yes	yes
15 A	China	Ningxia Environment Conservation and Poverty Reduction Programme		diverse		high		distributary	diverse	yes	yes,
15 B	China	Shanxi Environment Conservation and Poverty Reduction Programme		diverse				distributary	diverse	yes	yes
16	China	South Gansu Poverty-Reduction	low	diverse		high	0.267		partial	no	yes

SR	Country	Project	Importance of irrigated agriculture	Social cohesion	Water rights	Land rights	Average size of landholding (ha)	At what level of the irrigation system does the WUA function?	Amount of O&M authority transferred	Rehabilitation	Training
		Programme									
17 A	India	Chhattisgarh Tribal Development Programme		diverse		diverse		distributary		yes	yes
17 B	India	Jharkhand Tribal Development Programme		diverse		diverse	<1	distributary		yes	yes
18	Laos	Oudomxai Community Initiative Support Project		diverse		low	1.5	distributary	total	yes	yes
19 A	Laos	Attapeau Rural Livelihoods Improvement Programme		diverse	no	high	1	distributary	total	yes	yes
19 B	Laos	Sayabouri Rural Livelihoods Improvement Programme			no	diverse	1	distributary	total	yes	yes

SR	Country	Project	Importance of irrigated agriculture	Social cohesion	Water rights	Land rights	Average size of landholding (ha)	At what level of the irrigation system does the WUA function?	Amount of O&M authority transferred	Rehabilitation	Training
20	Bangladesh	Small-Scale Water Resources Development Sector Project	diverse			low		distributary	total	yes	yes

Appendix 6: PIM and IMT related indicators

SR	Country	Project	Beneficiaries participation	Pre-existing institutions for O&M	Strong political support	Degree of political stability	Legal status	Servicer contracts	WUA Chairman/ committee elected	WUA+	Vertical integration	Dependency on other local institutions and government
1	Cambodia	Community based rural development project	low	no			yes			no	yes	Dependent
2	Cambodia	Rural Poverty Reduction Project in Prey Veng and Svay Rieng	low	no			yes		yes	no	yes	Dependent
3	Indonesia	Rural Empowerment and Agricultural Development Programm	high						yes	yes		Co-dependent

SR	Country	Project	Beneficiaries participation	Pre-existing institutions for O&M	Strong political support	Degree of political stability	Legal status	Servicer contracts	WUA Chairman/ committee elected	WUA+	Vertical integration	Dependency on other local institutions and government
		e (READ)										
4	Mongolia	Rural Poverty-Reduction Programme	low	yes		non fragile	no	no		no	no	Dependent
5	Nepal	Western Uplands Poverty Alleviation Programme	high	no		fragile	no			no	no	Dependent
6	Pakistan	Southern Federally Administered Tribal Programme	high	yes	no	fragile	no			no	no	Dependent
7	Pakistan	Community Development Programme	high	no		fragile	no			no	possibly	Co-dependent

SR	Country	Project	Beneficiaries participation	Pre-existing institutions for O&M	Strong political support	Degree of political stability	Legal status	Servicer contracts	WUA Chairman/ committee elected	WUA+	Vertical integration	Dependency on other local institutions and government
8	Philippines	Northern Mindanao Community Initiatives and Resource Management Project	high		yes						no	Co-dependent
9	Philippines	Secon Cordillera Highland Agriculture Project		yes		non fragile						Co-dependent
10	Sri Lanka	Dry Zone Livelihood Support and Partnership Programme	high	yes	yes	non fragile	no	no	yes	no	no	Co-dependent
11	Viet Nam	Rural Income Diversification	high	no		non fragile			yes	no	no	Dependent

SR	Country	Project	Beneficiaries participation	Pre-existing institutions for O&M	Strong political support	Degree of political stability	Legal status	Servicer contracts	WUA Chairman/ committee elected	WUA+	Vertical integration	Dependency on other local institutions and government
		Project										
12 A	Viet Nam	Ha Giang Subproject : Decentralized Programme for Rural Poverty	high			non fragile	no	no	yes	no	no	Dependent
12 B	Viet Nam	Quang Binh Subproject : Decentralized Programme for Rural Poverty	high		no	non fragile	no	no	yes	no	no	Dependent
13	Viet Nam	Ha Tinh Rural Development Project	high	yes			yes			yes		Dependent

SR	Country	Project	Beneficiaries participation	Pre-existing institutions for O&M	Strong political support	Degree of political stability	Legal status	Servicer contracts	WUA Chairman/ committee elected	WUA+	Vertical integration	Dependency on other local institutions and government
14	China	West Guangxi Poverty Alleviation Project	high		yes	non fragile		yes	yes	no		Co-dependent
15A	China	Ningxia Environment Conservation and Poverty Reduction Programme	high	yes	yes	non fragile			yes	no		Co-dependent
15B	China	Shanxi Environment Conservation and Poverty Reduction Programme	high	yes	yes	non fragile			yes	no	possibly	Co-dependent
16	China	South Gansu Poverty-	high	yes	yes	non fragile				no		Co-dependent

SR	Country	Project	Beneficiaries participation	Pre-existing institutions for O&M	Strong political support	Degree of political stability	Legal status	Servicer contracts	WUA Chairman/ committee elected	WUA+	Vertical integration	Dependency on other local institutions and government
		Reduction Programme										
17A	India	Chhattisgarh Tribal Development Programme	high	yes			yes			no	possibly	
17B	India	Jharkhand Tribal Development Programme	high	diverse					yes		no	
18	Laos	Oudomxai Community Initiative Support Project	high	no	no	non fragile				no	no	Co-dependent
19A	Laos	Attapeau Rural Livelihoods Improvement	high	yes		non fragile	yes		no	no	possibly	Dependent

SR	Country	Project	Beneficiaries participation	Pre-existing institutions for O&M	Strong political support	Degree of political stability	Legal status	Servicer contracts	WUA Chairman/ committee elected	WUA+	Vertical integration	Dependency on other local institutions and government
		Programme										
19 B	Laos	Sayabouri Rural Livelihoods Improvement Programme		yes		non fragile	yes			no	possibly	Dependent
20	Bangladesh	Small-Scale Water Resources Development Sector Project	high				yes		yes	yes		Co-dependent

Appendix 7: IFAD Funding Details

SR	Country	Project	Project Cost million USD	IFAD contribution million USD	Type of water investment	Kind of Irrigation intervention	Government money for irrigation	Farmers contribution (USD)	Status	Success according to IWMI scores
1	Cambodia	Community based rural development project	22.9	9.6	IRR, WAT	new construction and rehab		10%(Planned)	Completed	failure
2	Cambodia	Rural Poverty Reduction Project in Prey Veng and Svay Rieng	19.6	15.5	IRRI-WAT	rehab		0.981 millions	Ongoing	failure
3	Indonesia	Rural Empowerment and Agricultural Development Programme (READ)	28.3	21.1	IRRI-WAT	new construction and rehab	10% of total budget	10% of total budget	Ongoing	success
4	Mongolia	Rural Poverty-Reduction Programme	19.1	14.8	WATSAN	new construction and rehab			Completed	failure

SR	Country	Project	Project Cost million USD	IFAD contribution million USD	Type of water investment	Kind of Irrigation intervention	Government money for irrigation	Farmers contribution (USD)	Status	Success according to IWMI scores
5	Nepal	Western Uplands Poverty Alleviation Programme	32.5		IRR	new construction	The GOP contribution includes duties and taxes. Other items financed by the GOP are operating costs (MTR)	2% of infrastructure cost	Ongoing	success
6	Pakistan	Southern Federally Administered Tribal Programme	20.8	17.1	IRR/WAT	new construction and rehab (Working Paper PKR 284, 420,000) 42 % of the total project budget (MTR)	10%	20% of total infrastructure cost (usually given in in the form of labor and materials/ equipment for civil works) According to 3006-7 Supervisory report, beneficiaries will contribute 7.38 percent of the total project cost	Ongoing	failure

SR	Country	Project	Project Cost million USD	IFAD contribution million USD	Type of water investment	Kind of Irrigation intervention	Government money for irrigation	Farmers contribution (USD)	Status	Success according to IWMI scores
7	Pakistan	Community Development Programme	30.7	21.7	WATSAN, IRR	new construction and rehab		According to the Appraisal Report Cos are to provide 20% of the costs (including labor)	ongoing	success
8	Philippines	Northern Mindanao Community Initiatives and Resource Management Project	21.6	14.8	(IRR)	new construction and rehab	15%	6% of the total fund	Completed	success
9	Philippines	Secon Cordillera Highland Agriculture Project	61.4	26.6 (loan) + 0.6 (grant)	IRR	new construction and rehab		Communities will contribute up to **30%** to the costs of the schemes through labor, cash and supply of local materials (Appraisal)	ongoing	success
10	Sri Lanka	Dry Zone Livelihood Support and	30.4	22.3	IRR	Rehab		10% (often as labor, works are usually	Ongoing	success

SR	Country	Project	Project Cost million USD	IFAD contribution million USD	Type of water investment	Kind of Irrigation intervention	Government money for irrigation	Farmers contribution (USD)	Status	Success according to IWMI scores
		Partnership Programme						organized and managed by the parent FO)		
11	Viet Nam	Rural Income Diversification Project	30.9	23.6	IRR/WATSAN	Rehab	251000 USD towards rural infrastructure	Total beneficiaries contribution is 1800000 USD	Completed	success
12A	Viet Nam	Ha Giang Subproject: Decentralized Programme for Rural Poverty	38.8	24.12 (loan)+ 0.63 (grant)	IRR/WAT	new construction and rehab	US$6.05 million (15.6%)	US$2.71 million (7.0%)	Ongoing	success
12B	Viet Nam	Quang Binh Subproject: Decentralized Programme for Rural Poverty	38.8	24.12 (loan)+ 0.63 (grant)	IRR/WAT	new construction and rehab	$14.03 million (both provinces)		Ongoing	success
13	Viet Nam	Ha Tinh Rural Development Project	19.1	15.4	IRR	new construction and rehab	USD 2.3 million (total project)	USD 574, 000 (for irrigation only; civil works and O&M). Beneficiaries are required to contribute a minimum of 10 % of total investment	Completed	success

SR	Country	Project	Project Cost million USD	IFAD contribution million USD	Type of water investment	Kind of Irrigation intervention	Government money for irrigation	Farmers contribution (USD)	Status	Success according to IWMI scores
								costs of the scheme, in unskilled labor and local materials.		
14	China	West Guangxi Poverty Alleviation Project	107.3	30.4	WAT/IRR	new construction and rehab			Completed	success
15 A	China	Ningxia Environment Conservation and Poverty Reduction Programme	45.5	14.6	WAT/IRR	new construction and rehab	51% of the project cost	7.6% of the total project cost	Ongoing	success
15 B	China	Shanxi Environment Conservation and Poverty Reduction Programme	45.0	14.4	WAT/IRR	new construction and rehab	51% of the project cost	7.6% of the total project cost	Ongoing	success
16	China	South Gansu Poverty-Reduction Programme	70.5	31.5	WAT/IRR	new construction	USD 34,316,000	USD 4,705,600	Ongoing	success

SR	Country	Project	Project Cost million USD	IFAD contribution million USD	Type of water investment	Kind of Irrigation intervention	Government money for irrigation	Farmers contribution (USD)	Status	Success according to IWMI scores
17 A	India	Chhattisgarh Tribal Development Programme	41.7	23.0	SOiLWAT (IRR)	new construction and rehab	9%	the beneficiaries would contribute unskilled labor valued at USD 3.4 million (8%)	Ongoing	success
17 B	India	Jharkhand Tribal Development Programme	41.7	23.0	SOiLWAT (IRR)	new construction and rehab	4.8 millions 12%	3.4 millions 8%	Ongoing	success
18	Laos	Oudomxai Community Initiative Support Project	25.6	16.1	WATSAN/IRR	new construction and rehab		539, 000 USD	Completed	failure
19 A	Laos	Attapeau Rural Livelihoods Improvement Programme	25.95	17.3 (loan) + 0.69 (grant)	IRR and WAT	new construction and rehab	USD $7.96 million (for both provinces)	in kind, labor for construction/rehabilitation	Ongoing	failure
19 B	Laos	Sayabouri Rural Livelihoods Improvement Programme	25.95	17.3 (loan) + 0.69 (grant)	IRR and WAT	new construction and rehab	USD $7.96 million (for both provinces)	in kind, labor for construction/rehabilitation	Ongoing	failure
20	Bangladesh	Small-Scale Water	25.7	18.6	IRR	new construction		Tk 33,332,033 (PCR)	Completed	success

SR	Country	Project	Project Cost million USD	IFAD contribution million USD	Type of water investment	Kind of Irrigation intervention	Government money for irrigation	Farmers contribution (USD)	Status	Success according to IWMI scores
		Resources Development Sector Project				and re-excavation				

Appendix 8: Outcome and impact indicators

SR	Project	Livelihood	Productivity	Financial viability	Sustainability of O&M systems	Equity	Reliability and Adequacy	Community Participation	Gender Participation	Empowerment and technical capacity	Maximum total	Actual total	CSS
1	Community based rural development project	1	1	0	0		0	0	1	1	8	4	**5.0**
2	Rural Poverty Reduction Project in Prey Veng and Svay Rieng	1	1	0	0	0	0	0		1	8	3	**3.8**
3	Rural Empowerment and Agricultural Development Programme (READ)		1		0			0	1	1	5	3	**6.0**

SR	Project	Livelihood	Productivity	Financial viability	Sustainability of O&M systems	Equity	Reliability and Adequacy	Community Participation	Gender Participation	Empowerment and technical capacity	Maximum total	Actual total	CSS
4	Rural Poverty-Reduction Programme	1	1	0	0		1	0		0	7	3	**4.3**
5	Western Uplands Poverty Alleviation Programme		1	0	1			1	1		5	4	**8.0**
6	Southern Federally Administered Tribal Programme	0	0	0	0			0			5	0	**0.0**
7	Community Development Programme	1	1	0	0		1	1		0	7	4	**5.7**
8	Northern Mindanao	1	1	1	0				1	0	6	4	**6.7**

SR	Project	Livelihood	Productivity	Financial viability	Sustainability of O&M systems	Equity	Reliability and Adequacy	Community Participation	Gender Participation	Empowerment and technical capacity	Maximum total	Actual total	CSS
	Community Initiatives and Resource Management Project												
9	Secon Cordillera Highland Agriculture Project	1	1							0	3	2	**6.7**
10	Dry Zone Livelihood Support and Partnership Programme	1	1	0	1					1	5	4	**8.0**
11	Rural Income Diversificatio n Project	1	1		1			0		1	5	4	**8.0**

SR	Project	Livelihood	Productivity	Financial viability	Sustainability of O&M systems	Equity	Reliability and Adequacy	Community Participation	Gender Participation	Empowerment and technical capacity	Maximum total	Actual total	CSS
12A	Ha Giang Subproject: Decentralized Programme for Rural Poverty	1	1	0	1					0	5	3	**6.0**
12B	Quang Binh Subproject: Decentralized Programme for Rural Poverty	1	1				1			1	4	4	**10.0**
13	Ha Tinh Rural Development Project	1	1	0	1				1	0	6	4	**6.7**
14	West Guangxi Poverty Alleviation Project	1	1	1			1	1		1	6	6	**10.0**

SR	Project	Livelihood	Productivity	Financial viability	Sustainability of O&M systems	Equity	Reliability and Adequacy	Community Participation	Gender Participation	Empowerment and technical capacity	Maximum total	Actual total	CSS
15 A	Ningxia Environment Conservation and Poverty Reduction Programme	1	1	1	1			1	0		6	5	**8.3**
15 B	Shanxi Environment Conservation and Poverty Reduction Programme	1	1	1	1			1	0	1	7	6	**8.6**
16	South Gansu Poverty-Reduction Programme	1	1						1	1	4	4	**10.0**
17 A	Chhattisgarh Tribal Development Programme	1	1		1				1	1	5	5	**10.0**

SR	Project	Livelihood	Productivity	Financial viability	Sustainability of O&M systems	Equity	Reliability and Adequacy	Community Participation	Gender Participation	Empowerment and technical capacity	Maximum total	Actual total	CSS
17 B	Jharkhand Tribal Development Programme	1	1						1	1	4	4	**10.0**
18	Oudomxai Community Initiative Support Project	1	1	0	0				0		5	2	**4.0**
19 A	Attapeau Rural Livelihoods Improvement Programme	1	1	0	0		0	0			6	2	**3.3**
19 B	Sayabouri Rural Livelihoods Improvement Programme	1	1	0				0	0		5	2	**4.0**

SR	Project	Livelihood	Productivity	Financial viability	Sustainability of O&M systems	Equity	Reliability and Adequacy	Community Participation	Gender Participation	Empowerment and technical capacity	Maximum total	Actual total	CSS
20	Small-Scale Water Resources Development Sector Project	1	1	1	1		1	1	1		7	7	**10.0**