Impact Assessment Series

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Managing water and land at the interface between fresh and saline environments

An impact evaluation

Bronwen McDonald

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Managing water and land at the interface between fresh and saline environments

An impact evaluation

Managing water and land resources for sustainable livelihoods in Viet Nam and Bangladesh – evaluation of the Viet Nam component

Bronwen McDonald

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Bronwen McDonald

Warragul
Victoria
Australia
bronwenmcdonald@hotmail.com

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Abbreviations and acronyms

BLPC	Bạc Liêu People's Committee
BFRI	Bangladesh Fisheries Research Institute
BRRI	Bangladesh Rice Research Institute
CA	Comprehensive Assessment of Water Management in Agriculture of CGIAR
CGIAR	Consultative Group on International Agricultural Research
CMOCs	Context-mechanism-outcome configurations
CPWF	Challenge Program on Water and Food
CTU	Can Tho University
DARD	(Bạc Liêu) Department of Agriculture and Rural Development
DFID	UK Department for International Development
GIS	Geographic Information System
IRMC	Integrated Resource Mapping Center
IRRI	International Rice Research Institute
IWMI	International Water Management Institute
LGED	Local Government Engineering Department (Bangladesh)
RIA2	Research Institute for Aquaculture No. 2
SIWRP	Southern Institute for Water Resources Planning
UAF	University of Agriculture and Forestry, Ho Chi Minh City
VRSAP	Vietnamese River Systems and Plains model
WorldFish	World Fish Center

Source: Wikipedia

Aerial view of land use in Viet Nam

Figure 1. Administrative map of Viet Nam showing the location of Bac Lieu Province

Executive summary

The Bac Lieu Province in the Mekong Delta is part of the Cà Mau Peninsula and is an important food-growing area in Viet Nam. It has a population of 830,000 with approximately 116,000 farming families living on small parcels of land producing a range of commodities for food security and the export market. These farmers and aquaculturalists[1] (together called producers in this report) are highly dependent on accessing the right quality water, fresh or saline or both, at the right time to grow their crops or raise their shrimp, crabs or fish. Water is delivered through an extensive network of canals and the intrusion of saline water into the area can be controlled on the southeastern side through the operation of sluice gates, a major investment in infrastructure undertaken by the Central Government of Viet Nam.

In the early 2000s, there were conflicts over water use as shrimp aquaculturalists in particular began to see their supply of saline water being compromised. Also, many producers were living in poverty and in some areas inappropriate land use was leading to unsustainable futures. This project completed in 2007 and built on the work of two preceding projects[2] is helping change that situation. What's more, this impact will continue to grow as the outputs are more widely applied.

With inputs including (i) approximately US$679,000 over 3 years, 86% from the Challenge Program on Water and Food (CPWF), (ii) support from CPWF in training in impact pathway analysis and for face-to-face meetings between the Bangladesh and Viet Nam components of this project to share experiences and lessons, (iii) an existing water management model ready for further development, (iv) the scientific knowledge of many local and international experts, (v) the experience of a wide range of partners in water management and production systems, (vi) the active participation of the provincial and local governments, (vii) the agreement of producers to provide their businesses as laboratories, (viii) the agreements of other producers to provide their farms as control farms with a likely opportunity cost, and (ix) the participation of producer groups who shared their experiences and insights, this project:

- produced an improved Vietnamese River Systems and Plains (VRSAP) model that now contributes to improved sluice gate operations to better meet producers' water needs;
- used the model and other data to contribute to the development of the Bac Lieu People's Committee's Land Use Policy, which recognizes the benefits of diversification and the role of saline water in farming; and
- developed and evaluated a successful participatory extension approach that assists producers select appropriate technologies (and reject others) based on on-farm demonstration and experimentation.

On average, the demonstration site farms involved in the project made approximately US$250/ha/year more than the controls (extrapolated from Ni et al. 2007). The producers interviewed believed the financial gain made a significant difference to their

1 The term 'aquaculturalist' is used to differentiate people who 'farm' fish from those who catch fish in the wild.

2 The two projects are Accelerating Poverty Elimination through Sustainable Resource Management funded by DFID and Increasing Water Productivity by Managing Land-water Interface: Effective Water Control for Solving Conflicts among Agriculture-Fisheries-Aquaculture in Coastal Zones funded by CGIAR.

lives but they were keen to improve further. The extension approach used in this project is now being applied by the Bac Lieu Department of Agriculture and Rural Development (DARD) and the number of sites has gone from eight during the project to 80 new sites per year for the last 2 years. A DARD survey suggests that of the 10,000 producers who have visited the sites and participate in the discussions 50-70% adopt improved technologies. This approach is based on group processes and the Vietnaamese saying "*to see once is better then to hear 100 times*."

As a consequence of these three main results:

- A contribution is being made to poverty reduction in the area, which has been demonstrated in two socioeconomic studies (Can et al. 2010; Khiem and Hossain 2007) and confirmed in interviews with producers.
- More sustainable farming systems are beginning to emerge as evidenced by the annual survey conducted by DARD.
- There has been a reduction in the number of conflicts over water resources as reported by government officials interviewed in this evaluation.
- The Southern Institute for Water Resources Planning (SIWRP) has used the improved VRSAP model developed in this project for the whole of the Cà Mau Peninsular.
- Neighboring provinces are beginning to use the on-farm technologies as evidenced from the queries that the project partners have received.
- New agribusinesses are beginning to emerge as either a direct result of the project or possibly as a flow-on effect.

To support the producers the Bac Lieu People's Committee is encouraging banks to provide credit to producers who lack collateral but who have adopted the practices promoted in this project, especially the application of appropriate technologies.

It is not known how much on-farm change has happened as a result of technology diffusion processes stemming from the project. While the DARD can track adoption of technologies it is the process of how the technologies were selected or rejected that is just as important. Also, the improvement in sluice gate operations would have impacted on all producers, not just those on the demonstration sites. Can *et al*. (2010) and Khiem and Hossain (2007) suggest incomes have increased as a result of sluice gate operations while the Bac Lieu People's Committee stated that incomes in Bac Lieu are increasing faster than in neighboring provinces. Incomes in Bac Lieu have reached the average for the whole Mekong Delta Region rather than lagging behind as before.

There is still work to be done including the need for more research at the saline-soil interface. A big extension effort is needed to reach more producers. The potential of the BayFish model, a tool that uses VRSAP model outputs in optimizing production under different sluice gate operations, still needs to be realized. High on the agenda for the Bac Lieu People's Committee is the need to strengthen its alliances with neighboring provinces regarding water use and it would also like to see a similar project being applied to its coastal non-project area outside the influence of the sluice gates.

The success of this project, however, can be attributed to its positive interaction with policy development, integrating good science with the tacit knowledge of producers, having the right players at the

table at the right time and having built-in evaluative processes so partners could monitor progress.

External factors will continue to influence the ultimate impact and these include commodity prices, the state of the Vietnamese economy in general, the policies of the Central Government, climate change and rising sea levels, and the actions of Bac Lieu's neighbors and the upstream users of the waters of the Mekong River.

Source: NASA

Figure 2. Mekong Delta from space

Background

The Bac Lieu Province in the Mekong Delta is part of the Cà Mau Peninsula and is an important food-growing area in Viet Nam. It has a population of 830,000 with approximately 116,000 farming families living on small parcels of land producing a range of commodities for food security and for supplying an export market. These farms are highly dependent on being able to access the right quality of water, either fresh or saline or both at the right time. The water is delivered through a complex network of canals connecting the Mekong River to the China Sea and the Gulf of Thailand. While rice and shrimp are the main commodities others include fish (both freshwater and saline species), crabs and upland crops such as vegetables, maize and fruit trees.

In 1994, the Vietnamese Central Government embarked on a project for building sluice gates to protect large parts of the Delta from intrusion of saline water and to convert it into land fit for rice intensification. An area of approximately 90,000 ha, in the Bac Lieu Province was to be converted to freshwater systems even though two-thirds of this land contained acid sulphate soils, a factor that impeded agricultural production. This infrastructure project was not completed and only the sluices in the southeast were built but these impacted significantly on the Bac Lieu Province. The area converted to freshwater production gradually increased until 2000 as did rice production, although the latter resulted in environmental degradation and livelihood deterioration for poorer people (IRRI 2004). Conflict emerged, especially for the shrimp aquaculturalists who saw their supply of saline water being compromised. This reached a flash point in 2001 when a group of shrimp aquaculturalists broke a dam in order to access their water requirements. At the time the price of rice was low while shrimp was highly profitable, although the latter was vulnerable to disease.

The Bac Lieu People's Committee and a project team who were working in Bac Lieu Province under a DFID-funded project (2000-2003)[3] met to determine how to address these issues under that project and to do so on a scientific basis. Specifically, project activities were adjusted to address (i) improved water management with the assumption that saline water should now be considered a resource, not a problem, (ii) creation of the policies to support diversification of agriculture and aquaculture through land use zoning, and (iii) development of an extension package. The DFID project concluded there were benefits to be gained from implementing a flexible approach to water resources use allowing diversification in agriculture and aquaculture. This created the basis for the CPWF project, the subject of this evaluation. Moreover, to ensure a smooth transition between the two projects and help maintain the support of partners, a one year project[4] was funded by the Comprehensive Assessment Program (CA) of Consultative Group in Agricultural Research (CGIAR) from mid-2003 to mid-2004.

[3] Accelerating Poverty Elimination through Sustainable Resource Management.

[4] Increasing Water Productivity by Managing Land-water Interface: Effective Water Control for Solving Conflicts among Agriculture-Fisheries-Aquaculture in Coastal Zones.

Under the revised land use zoning, there are three main water resources zones in Bac Lieu. The east is predominantly freshwater and supports rice and other freshwater commodities. The west is saline and supports shrimp and other saline commodities. The middle area is basically a freshwater zone in the wet season and saline in the dry.

Source: Bronwen McDonald

Figure 3. Gathering shrimp amongst the sea grass

Description of the project

The espoused high-level goal for this 3-year project was to increase land and water productivity for improved food security and livelihoods in a manner that was environmentally sustainable and socially acceptable to various resource users (IRRI 2004). It was designed around five key objectives that were described in the project proposal as follows:

1. To enhance understanding of livelihood changes resulting from regional resource management and farm-level technological interventions.
2. To assess the impacts of agricultural and aquacultural land and water uses on water quality, aquatic biodiversity, and inland fisheries.
3. To develop ecologically friendly and socially acceptable techniques for rice and rice-aquaculture production systems for domains with different soil and water quality characteristics.
4. To develop decision-making tools and an institutional framework for integrated multipurpose management of a dual fresh- and brackish-water regime to meet the needs of diverse water users, without an adverse impact on users and the environment outside.
5. To enhance human resources capacity and develop recommendations for resources management at the farm and regional level.

A project team was formed that included people, or at least their organizations, who were expected to be the primary users of the project outputs. This team then designed in-built strategies for ensuring the uptake of the outputs.

Inputs included:

(i) approximately US$679,000 over 3 years, 86% from the CPWF,

(ii) support from CPWF in training in impact pathway analysis and for face-to-face meetings between the Bangladesh and Viet Nam components of this project to share experiences and lessons,

(iii) an existing water management model ready for further development,

(iv) the scientific knowledge of many local and international experts,

(v) the experience of a wide range of partners in water management and production systems,

(vi) the active participation of the provincial and local government,

(vii) the agreements of producers to provide their farms as laboratories,

(viii) the agreement of other producers to provide their farms as control farms with a likely opportunity cost, and

(ix) the participation of producer groups who shared their experiences and insights.

This Viet Nam project was part of a larger project, namely the *Managing Water and Land Resources for Sustainable Livelihoods at the Interface Between Fresh and Saline Water Environments in Viet Nam and Bangladesh (CP WF#10)* (IRRI 2004) project that embraced the Gangetic Delta as well. This facilitated an exchange of knowledge and experiences in managing land and water between the two deltas.

In retrospect, there appear to be several implicit and explicit principles which the project followed that contributed significantly to its results in Viet Nam.

First, all the necessary stakeholders were at the table including provincial and local governments, universities and research institutes, extension officers and producers. They shared a vision of what had to be done. Second, there was a commitment to strong scientific evidence-based decision making with activities including evaluative approaches. Third, when working with producers, science and technology needed to be blended with producers' local knowledge and wisdom and to do so in a way that results could be seen – not just reported from afar. Last, principles of participatory processes were followed at all levels to promote ownership and eventual adoption.

The impact evaluation

Overall, this evaluation was intended to identify what contribution the project had made to reducing poverty and food insecurity in the Mekong Delta as a result of an investment by the CPWF. It was guided by the following evaluation questions, focusing on adoption and impact.

1. What are the changes?
2. What is the scope and extent of these changes on the ground?
3. What were the mechanisms that bought about these changes? What contribution did the project make to them? Specifically, what role did research play?
4. What is it about the context that is driving the changes? Where could the changes eventually spread?
5. What are the benefits and costs of the changes (quantify them as far as possible) both now, and potentially in the future? What did the project invest?
6. What was the contribution of CPWF in achieving the changes (to be assessed by projecting what would have happened without CPWF funding and comparing it with what did happen)?
7. What are the international public goods that the project has generated that are related to the changes?
8. What were the differences between the original and final impact pathway?

Further these questions were to be addressed with reference to the existing hypothesized impact pathway and the stories of the most significant change[5] that had been gathered for discussion at an international CPWF forum. These documents provided a base point from which to think about the achievements of the program and were used in revising the impact pathway. The stories, in particular, provided some sense-making of the global statements used in the impact pathway model.

In summary, the evaluation was required to focus on adoption and impact.

A typical definition of impact refers to the long-term consequences[6] of an intervention but in this instance it was too early for these consequences to have fully manifested themselves. There are also many other contributing factors outside of the control of this project that will impact on the final results, for example, commodity prices, the state of the Vietnamese economy in general, the policies of the Central Government, climate change and rising sea levels, and the actions of Bac Lieu's neighbors and upstream users of the Mekong River water.

For these reasons it was decided that identifying the actual impact pathway would become the basis of this evaluation. It draws on some of the principles described by Mayne (2008) in his work on contribution analysis for identifying likely impact where attribution is problematic.

5 The stories are included in Appendix 1.

6 According to the Development Assistance Committee of the Organisation for Economic Cooperation and Development, (Development Assistance Committee 2006), **Impact** refers to the positive and negative, primary and secondary long-term effects produced by a development intervention, directly or indirectly, intended or unintended. These effects can be economic, socio-cultural, institutional, environmental, technological or of other types. These are the effects that any impact evaluation endeavors to identify and analyze. This definition is being applied to this evaluation.

When discussing the terms of reference with the commissioner of the evaluation, it was decided that this evaluation, wherever possible, should take the form of a "realistic evaluation" as defined by Pawson and Tilley (1997). By agreeing to test how realistic evaluation could be applied in this evaluation, which differentiated it from the other CPWF-funded evaluations of other deltas, the type of data sought from respondents tended to hinge around the key realistic evaluation question of what worked where for whom, why and why not.

The overall approach to implementing this evaluation, therefore, was to:

1. Base it around the impact pathway drawing on the lessons from the contribution analysis.
2. Undertake a "realistic evaluation" interpretation of the data.
3. Report in ways that support the above two points, the main audiences being the commissioner of the evaluation, the project team and the key stakeholders.

The Terms of Reference for this evaluation are given in Appendix 1. The constraints of available time and resources imposed on this evaluation through necessity meant that the data collection had to rely on existing documents and the explicit and tacit knowledge of the project team and the project's stakeholders. As a result, the following steps were undertaken:

1. Review of key documents.
2. Workshop with the project team to assess what outcomes and impacts had occurred against what was originally planned. Given that the project had been finished for a year an Objective-Reflective-Interpretive-Decisional (ORID) model was used (Stanfield 1997) as a means of refocusing people on that work:
   a. *Objective Level* – Gaining an overview of the project that was presented by the Project Leader.
   b. *Reflective Level* - Obtaining an overall impression of impact using photolanguage (Catholic Education Office 1986) in a "before and after" scenario.
   c. *Interpretative Level* – Revisiting the Vision of Success statement to assess what actually happened compared to expected results.
   d. *Decisional Level* - Comparing progress against the original impact pathway model. The original is given in Appendix 2.
3. Interviews with project team members and key stakeholders.
4. Discussion with a group of producers at three demonstration sites:
   a. One farm with a freshwater system.
   b. One farm with a fresh and saline water system.
   c. One farm with a saline water system.
5. A second workshop with the project team to discuss any remaining issues and finalize an agreed impact pathway model based on what actually happened.
6. Report preparation, including a draft report that went to both the commissioner of the evaluation and the project leader for comment before finalization. The main audience for the report is the funders, the project team itself and other key stakeholders.

Note on comparisons: Although this project was implemented in two deltas (Gangetic and Mekong) this impact evaluation did not commission an evaluation of the Gangetic Delta and, therefore, no comparison between the two delta regions was possible.

Comments on the limitations of the evaluation are given in Appendix 4.

Findings

Post-project impact pathways Model PN10

It is too early for the full impact of this project to be realized – there is still a big extension job ahead. In order to assess progress towards that impact this evaluation elected to take an approach based on revisiting the hypothesized impact pathway formulated for this project,[7] a copy of which is given in Appendix 2. This pathway connects outputs and stakeholder actions with a series of intermediary outcomes that contribute to the final impact. For this evaluation, it was used as a framework for interpreting evidence and was, therefore, modified in the process.

The revised impact pathway, developed with the project team, confirmed three strands to impact or "three impact stories." These are interdependent but have emerged as a result of different people picking up different outputs. The three impact stories are about the following:

1. On-farm change (shown in green in Figure 1) where the main actors are the producers of Bac Lieu, the ultimate beneficiaries of this project and not just those directly associated with the project demonstration sites.
2. Improvement in water management (shown in blue in Figure 1) where the main actors are the SIWRP and DARD Water Operations providing a critical resource to producers.
3. Development of a supporting policy environment (shown in orange in Figure 1) where the main actors are the policymakers and leaders of the Bac Lieu People's Committee ensuring institutional frameworks support and encourage the change.

There are some major diagrammatic differences between the new version and the original. First, the post-project diagram describes who was a partner and who was an initial user of project outputs. In some instances their names appears twice. In the original all stakeholders were grouped together because of the integrated nature of the project, but when it came to assessing impact, it helped to disaggregate this bundle. Final beneficiaries were also identified.

While the picture makes a clear-cut delineation between who uses what output, discussions with the project team revealed that other people were using the outputs as well to inform and build their own knowledge base or support their work. For example, DARD has the main responsibility for future extension efforts in Bac Lieu and therefore it became the primary user of that output. Members of the Can Tho University (CTU) staff who participated in and drove the research on extension, however, now use the information gained as part of their teaching program.

A second feature is that the post-project diagram includes evidence of less-direct impacts shown as gray boxes in Figure 1. In these instances there was less-direct project intervention. For example, producers outside of Bac Lieu were beginning to be aware of the opportunities existing in Bac Lieu and taking appropriate action. The purpose of this differentiation is to illustrate where the main planned impacts are occurring and where impact was spreading further.

Finally, inputs were included in the revised version to complete the picture.

[7] The impact pathway was developed in February 2006 by two project implementers – Drs. Chu Thai Hoanh and Nguyen Duy Can – at a CPWF Mekong Impact Pathway and Most Significant Change workshop The pathway was then refined by the team of the CPWF BFP Impact Assessment Project

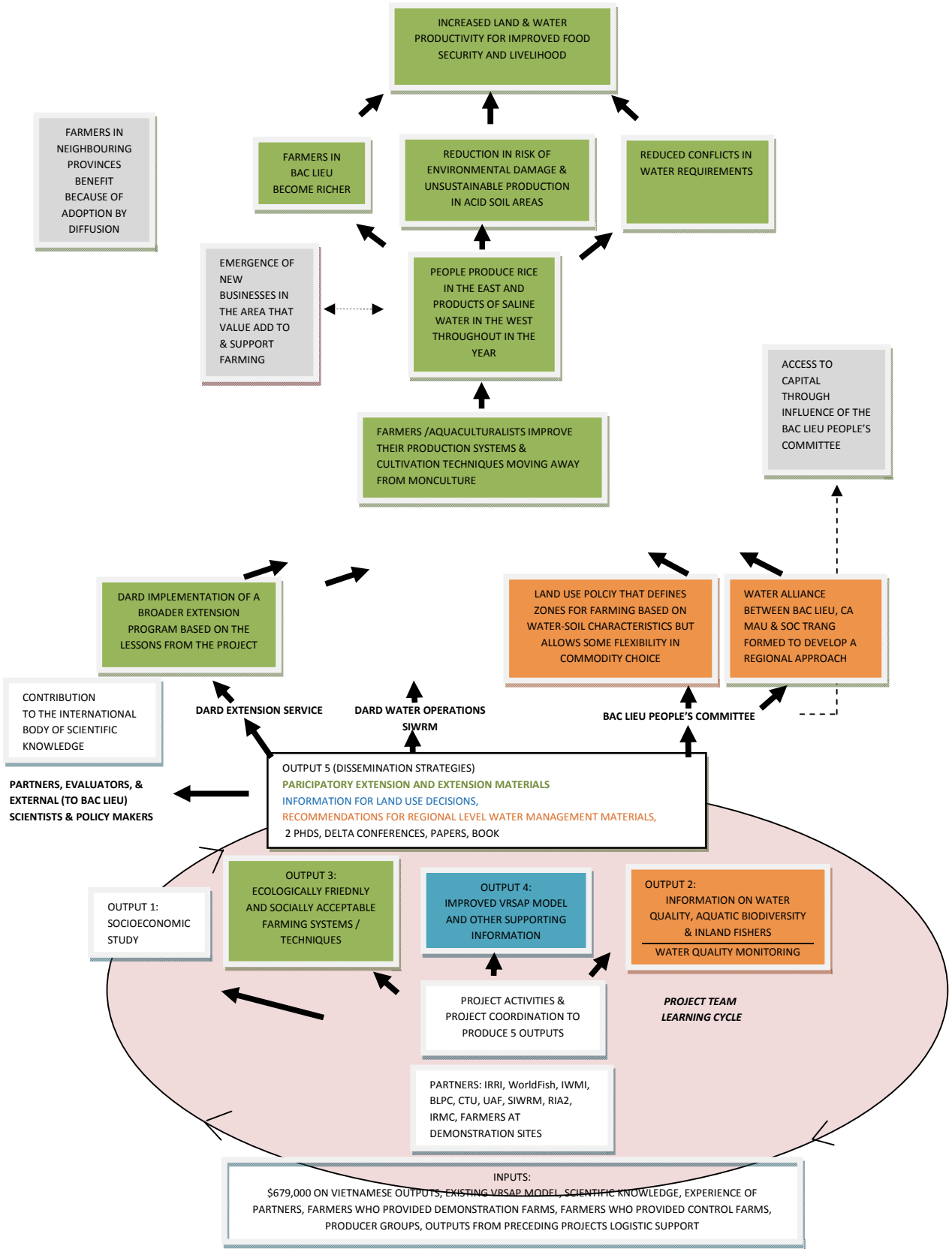

Figure 4. The post-project impact pathway, Model PN10

A number of lessons emerged from using the impact pathway as a framework:

1. Building an impact pathway model needs to be a team sport played during project design and revisited regularly. Not many people on the project team were familiar enough with it to use it during the life of the project. "*If only we had used this at critical stages of the project it could have helped us*" was one comment overheard.
2. People struggled with what was the original intent behind some of the statements both in the Vision of Success statement and the original impact model. Some of the meanings had been lost and statements had become vague or ambiguous. The advice given was that this sort of work requires that any summarized statements should be accompanied by a few sense-making paragraphs describing what is meant.
3. The power of the model is in focusing people on what needs to be done and seeing the bigger picture and how things fit together. This came through, and typical comments were:
   - "*Now I can see where this (a specific component) fits in!*"
   - "*I see there is still a big job to do in order to realize the potential of the project.*"

The post-project diagram follows where the names given to the outputs have been abbreviated for the convenience of drawing. Full descriptions of the outputs are given in the project proposal (IRRI 2004) and accessible via the web. In summary these are outlined in Table 1:

These outputs were designed so that outputs 1-4 feed into output 5.

Table 1. Project outputs

Number	Output
Output 1	Credible information and knowledge explaining the impact of regional- and farm-level resources management on the livelihood of producers in the study areas.
Output 2	GIS-based data that show spatiotemporal variation of canal water quality, aquatic biodiversity, and fisheries, and their dependence on soil type and agricultural and aquacultural resources use.
Output 3	Ecologically friendly and socially acceptable techniques for each of the three farming systems (rice-based, aquaculture and rice-aquaculture).
Output 4	Decision-support tools and an institutional framework developed for integrated multipurpose management of a dual freshwater and brackish-water regime to meet the needs of diverse water users and the environment.
Output 5	Training materials and recommendations for resource management at different levels (producers, all levels of government, researchers).

Progress to achieving the project goal

The project goal defined in the project proposal (IRRI 2004) was to increase land and water productivity for improved food security and livelihoods in a manner that was environmentally sustainable and socially acceptable to various resource users at two coastal sites, one in the Mekong River Delta (Viet Nam) and other in the Gangetic Delta (Bangladesh). In turn, it was hypothesized that this would contribute to the greater goal of the CPWF of reduced poverty and insecurity in tidal regions (Douthwaite and Alvarez 2006).

The Bac Lieu People's Committee reported a significant decline in poverty from 40 to 8-9% over recent years and now the average income in the Bac Lieu Province is the same as the average for the region and not lagging behind as before. The People's Committee was adamant that the project had contributed significantly to this. The members of the project team, though, were more modest in their claims indicating there was still a big extension and technology transfer job ahead.

A more detailed picture of change in the Bac Lieu Province over the last 10 years up to the end of the project was provided by Can *et al*. (2010) who undertook a socioeconomic study continuing on the work of a previous DFID project. Can *et al*. (2010) produced three sets of graphs, one set from each of three general production areas (rice, rice and aquaculture, aquaculture) showing household income in 2006 as a percentage of household income in 1996. In each set there was one graph for the "better-off and medium" group and another for the "poor" group.

The income increase pattern for both groups in the freshwater zone was approximately the same as it was for people in the predominantly aquaculture area. But this is not the case for the "recent intervention zone" where large areas have acid soils, and endeavors to convert it to a rice production area have resulted in poor yields. Here the poor suffered a decline in relative income but now it is beginning to increase again. A copy of these graphs is given in Appendix 3.

Khiem and Hossain (2007) also noted this gradual rise in income since 2000. Neither Can *et al*. (2010) nor Khiem and Hossain (2010) make any claim as to how much the project contributed in the last few years of their respective studies, but these studies do confirm the trend referred to by the Bac Lieu People's Committee.

When Can *et al*. (2010) where in the process of collecting income data farmers were asked to identify what contributed to their improved livelihood. In the freshwater area the factors mentioned were suitable technologies, increased irrigation capacity and easy access to loans. More specifically farmers mentioned the improvement of availability of freshwater and being able to include an extra rice crop per year. DARD and this project were mentioned as being influential.

Producers in the freshwater-saline zone and the saline-only zone specified having alternative land uses, suitable technologies in aquaculture and again ease of obtaining a loan as important factors in improving their income As with the first group, the role of water management and the DARD extension service along with this project were mentioned as important contributors to the outcome. Improved access to credit was also mentioned, which was being addressed by the Bac Lieu People's Committee outside of the context of this project but which was part of the supportive environment that worked symbiotically with the project.

In terms of environmental and economic sustainability much of the evidence is descriptive but well-founded in science.

- One of the important findings in this project is that the levels of acidic pollution have dropped over the life of the project (Tuong pers. comm.) and that, in turn, would be contributing to improved productivity.
- The project team and the extension service promoted a theme of "three reductions (volume of seed used, pesticides, fertilizers)" for three increases (yield, quality, income) for rice production. Producers were quick to say they believed this approach improved the

environment. The adoption of this approach is being monitored by DARD.

- The lesson of less-intensive shrimp breeding in order to promote sustainability was picked up from the Bangladesh component of the project where high-quality shrimp has been bred for decades with fewer instances of disease.
- Further reduction in the incidence of disease resulted from converting to only using one intake of water for a shrimp pond compared to the practices of using multiple water changes. The risk of using contaminated water was reduced.
- Growing sea grass in shrimp ponds has resulted in improvement in the environmental quality of ponds and their sustainability.
- Moving from monoculture to polyculture in both agriculture and aquaculture has improved economic sustainability.

As mentioned previously, in order to have a more robust assessment of environmental and economic sustainability, as Gowing *et al*, (2006) has suggested, a longer-term impact evaluation is required.

Three impact stories

The final impact pathway model showed three interdependent impact stories, as referred to previously. These were about the following:

1. On-farm change, the change that producers have or are still to make to improve their livelihoods.
2. Improved water supply to producers to provide water resources to support on-farm change.
3. A policy environment that supports the preceding two impact stories.

The first story is about voluntary behavioral change, the second is about changes in infrastructural management and the third is an enabler. The latter two are inputs into the first.

The following diagram is a simplified version of how these three fit together.

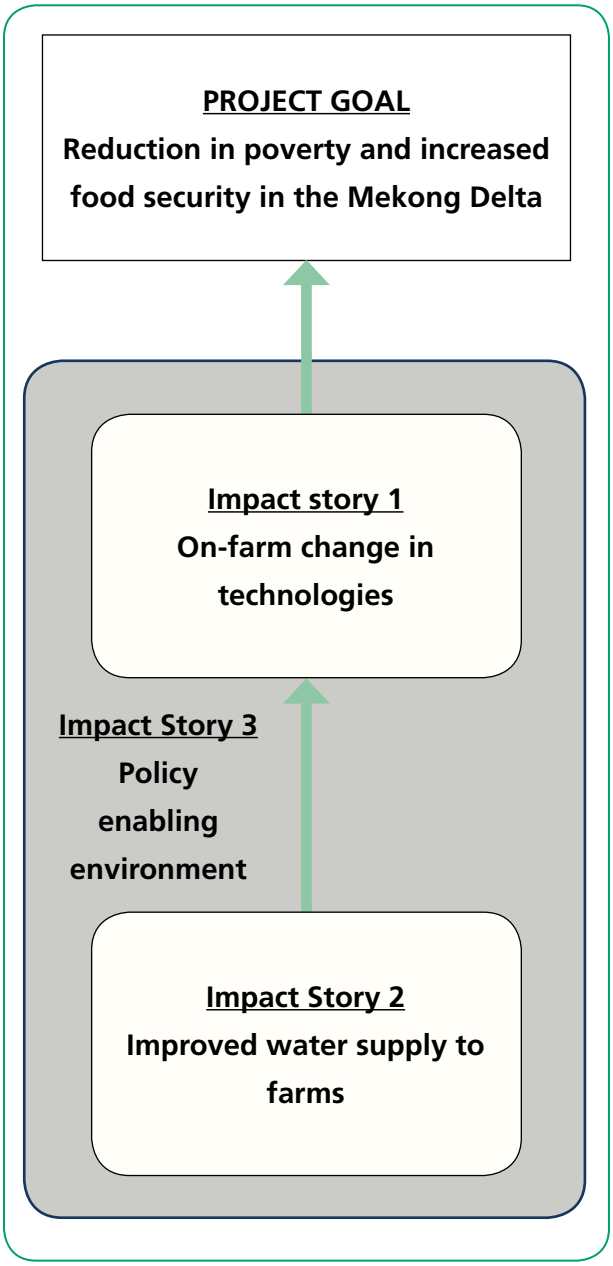

Figure 5. The relationship of the three impact stories to the project goal

What follows is a description and extent of these changes, and the contribution of each of these to project outcomes.

1. On-farm change

This impact story is about producers changing the way they go about their business to improve their livelihoods. In summary, this project selected a demonstration site extension method that was eventually tested at eight sites representing different ecological conditions. The features of this method included:

- The identification of a producer who was willing to let his or her farm be used as a demonstration farm to experiment with new or revised technologies.
- Five producers at each demonstration site who volunteered to lend their farms as controls so that comparisons could be made.
- Group decision making about which technologies to trial that intuitively took account of local knowledge.
- Group assessment of the results.

Essentially, each site was a self-contained experiment that blended science with local knowledge. Support and technical advice were provided by the scientists from CTU and the extension service of DARD. In order to facilitate broader adoption, these sites were visited by producers outside the hamlets in the study.

In order to make a judgment about the overall merit and worth of this extension approach a self-evaluation was undertaken by the project team that tracked the progress of the demonstration farms, what they did and how they compared to their control farms. This evaluation, currently being published (Ni *et al*. 2007), showed the following:

- Farms in the freshwater areas growing rice, possibly up to three crops per year, upland crops and freshwater fish increased their profit per hectare per year ranging from 30 to US$172 higher than in the control farms.
- Farms that had freshwater in the wet season and saline water in the dry season, and therefore had the capacity to grow both shrimp (and other saline aquaculture products) and rice had profit changes ranging from -274 to US$804 per hectare per year when compared to the control farms. At one site where negative returns were made compared to the controls the technological changes were discussed, and reasons why these had not worked were explained.
- Farms in the saline water system growing only saline aquaculture products experienced changes in returns ranging from -91 to US$821 when compared to the controls. Again the site that experienced a negative return worked out why.

The following Table 2 provides more details on the findings on income at the demonstration sites. Based on this work, Ni *et al*. (2010) concluded the following:

- Farms in the shrimp-raising area are better-off if they diversify and introduce other species into the system.
- Farms need to identify a "keystone" crop, one that gives some certainty of return rather than focusing on more profitable but riskier crops.
- Some further refinement of technologies for specific sites is still needed.
- Improved irrigation systems were needed in some areas.

Table 2. Comparison of total profits between demonstration farms and the controls (Ni *et al*. 2007)

Farms	Cropping system in (i) and (ii) shows the rotation of crops on farms	A=Total profit of the demonstration farms (US$/ha/year)	B=Total profit of the controls (US$/ha/year)	Difference of A-B (US$/ha/year)
1	(i) Rice and upland crops (ii) Rice only	829	799	30
2	(i) Rice (ii) Rice and fish	1,026	854	172
4	(i) Shrimp (ii) Rice and fish	2,136	1,332	804
6	(i) Shrimp (ii) Rice and fish	-7	267	-274
5	(i) Shrimp (ii) Rice and fish	1,314	887	427
8	(i) Shrimp and crab (ii) Fish	1,352	531	821
9	(i) Shrimp and crab (ii) Fish	1,075	1,166	-91
10	(i) Shrimp and crab (ii) Fish	416	326	90

- The selected techniques at each demonstration site can be up-scaled in the whole Land Use Zone unit with appropriate suggested technologies, provided other factors at a regional level such as transport, storage and processing facilities, and market price control are improved accordingly.

The producer stories related to the author during a field trip to Bac Lieu confirmed the above. There were several recurrent themes including one that, seeing the results of a technology change on-farm, is much more powerful than attending training. The Vietnamese saying "*to see once is better than to hear 100 times*" seemed to be the catch cry. Second, all the producer groups expressed some form of empowerment from this process - it made decisions easier, better and less stressful. Third, there seemed to be agreement that the group processes lead to greater cohesion in hamlets and offered the potential for collaborative action.

The extension methodology worked and had been substantiated. As a result, since the project ceased in 2007, the DARD has extended the number of demonstration sites in Bac Lieu (80 per year for 2007 and 2008). An annual survey undertaken by DARD suggests that 50-70% of the 10,000 producers per year who are involved in some capacity, either through visiting the pilot sites or participating in discussions, now adopt at least one improved practice.

One question raised by some of the interviewees was whether or not the producers in the original pilot were special in some way and that the future sites may not have the benefit of these "leaders." Second, a significant legacy of this work may be in the groups that are formed, and some wondered whether these were strong enough to stand the test of time. Should there be some resource dedicated to promoting and supporting group work beyond the life of a

demonstration site? DARD with its annual survey and monitoring adoption has the capacity to track progress and make decisions accordingly.

DARD acknowledged there is still much to do in order to realize the potential of the project given there are 116,000 farming families in Bac Lieu. The unknown factor is how far the lessons from the demonstration sites are spreading by technology diffusion processes, especially the lessons about how to select the most appropriate technologies or varieties for specific situations.

One of the requirements of this evaluation is to try to identify mechanisms that triggered change in accordance with the principles of realistic evaluation. In order to address this, the next few paragraphs endeavor to analyze what the underlying implicit theory of change is and then interpret this following the model proposed by Pawson and Tilley (1997) who developed the concept of context-mechanisms-outcome-configurations (CMOCs).

Many programs reliant on behavioral change in order to achieve a goal develop a specific theory of change. One model proposed by the Cancer Council in Victoria, Australia, hypothesized that if you are encouraging people to voluntarily change you need to provide an educational opportunity, a peer-support opportunity, one-to-one support and a community supportive of change (Boland pers. comm.). This type of model has been used in agricultural extension (Boomsma *et al*. 1996) to develop or explain project outputs and it seems to have some resonance here.

In this project educational opportunities were provided through extension, peer-support was provided through the group processes, while one-to-one advice would have been provided answering producers' questions during site visits. The "community of support" component was developed by the Bac Lieu People's Committee acting in a number of different ways – by developing a land use policy, by improving water management, by providing extension services including promotion through the mass media, by encouraging banks to provide credit, by encouraging the private sector to both provide inputs and buy farm products for processing and export outside the province, and so on.

This summary provides an explanation at one level but it almost assumes an average experience. The work of realist evaluators like Pawson and Tilley requires a deeper analysis of what works for whom, in what circumstance, why and why not.

Their approach to establishing causal packages provides explanation when random assignment or regression analysis is not feasible, as is the case here.

At the basis of their thinking is the concept that causality results from mechanisms triggered by an intervention that interacts with contextual factors to produce a variety of outcomes.

Figure 6 provides a brief outline of the causal package for on-farm change that reflects the analysis of data in a realistic evaluation framework.

To get a sense of what it feels like for a producer one must read a translation of Mrs. Hoa's story given in Figure 7. She is a shrimp/rice producer who participated at the interview with the farmer group led by Mr. Le Van Dang. It is printed with her permission and illustrates how context-mechanisms-outcome configurations are tightly intertwined.

Given that this is a translation, it has not been edited thoroughly so that it might retain its flavor of a story in the first person.

Contexts are evidenced by the descriptions of the existing situations articulated in many papers (IRRI 2004; Can *et al*. 2010; Khiem and Hossain 2010; Ni *et al*. 2010) and from the stories told by producers. These included the following:

- Poverty or low incomes and a desire to improve living standards.
- Conflict over water use.
- Policy environment that supported rice monoculture.
- Advisers from DARD and CTU who could "help" bring new ideas to the farms.

Activities at the farm-level as evidenced by project reports and interviews with the project team included:

- Development of a participatory extension process based around hamlets where new or renovated technologies were experimented and evaluated by the local producers.
- Provision of water resources more suited to local land use requirements.
- Training at the demonstration sites on assessing water quality and development of other skills.

Mechanisms as evidenced in the stories from producers interviewed in this evaluation. While there is considerable debate around what constitutes a mechanism this paper is taking the position that mechanism are the ways in which the activities and resources of the project influence reasoning that subsequently results in practice change. and included:

- "*To see one time is better than hear 100 times*" (Vietnamese saying), the "seeing is believing" mechanism.
- Sharing experiences makes it easier for me to make decisions, the "if we all agree then we must be onto something" mechanism.
- "I trust the advice of specialists, especially when I can participate in the evaluation," the "having input from scientists and experts gives me confidence" mechanism.

Outcomes as evidenced from the interviews and the socioeconomic data include:

- Improved livelihoods.
- More harmony.
- Community cohesion.
- Improvement in the environment.

Characteristics of the project that contributed to success

- Allowing producers to make decisions for themselves and not being didactic.
- Sound application of participatory processes that allowed for injection of new knowledge.
- Personal passion and vision of the team working with the demonstration groups. (Michael Patton (Pers. Comm.), an eminent American evaluator, often talks about the influence of individuals on project performance, which is difficult to quantify but is often critical to success. This evaluation wishes to acknowledge the dedication and passion of the project team.)
- DARD extension staff, who would have responsibility for delivery once the project is completed, participating in the on-farm research and development of the extension process.

Challenges for the future

- Part of the success of the demonstration sites was the people who stepped up to be leaders. Can these leaders be identified, mobilized and supported in a scaling-up scenario?
- What is the future of the groups at the demonstration sites? Can they survive without further intervention?
- How well will scaling up the extension methodology to a broader base work?
- What will be the impact of emerging contextual factors yet to be defined on these groups and subsequent practice change?

Figure 6. The causal package for producers

Mrs. Hoa's Story We are lucky to be a demonstration site. It brings us new technology, including shrimp and fish. Now local people can observe and talk about the technologies then adapt . Incomes have increased and compared to another area we are quite lucky. Technicians advise us to buy good shrimp varieties and can help solve problems through training. For example, pre-program some farmers tried to raise shrimp by buying post-larva then release them immediately. They didn't know the survival rate. The project introduced them to make a small area to raise shrimp in a nursery. When these are a little bit big they can be released to farm. It makes shrimp yield go up, and now all farmers follow that technique. Before project, farmerselect rice variety themselves. Didn't know one good for this area. Ask other areas but these don't work here. By project and demonstration see many rice varieties at the same time and therefore can select for this area. Now people succeed with new variety and (other) people come to see. Now we have a meeting, talk together and all 27 of us decide to adopt the same variety. Before a technician would come to train but we didn't see in the real. Sometime, technician say new variety good but when we try not good. Now with demonstration site can see one that does good.

Mr. Dang (lead producer at the demonstration site) plays a critical role in this community and can connect with technicians to get new varieties. I suggest every year the extension center send a set of new varieties to Mr. Dang to plant and try and in the end we can select the best for our area. If we do that it means farmers can save time and can save a lot of money. Need to be sure that the variety is good for the farm. And because in small communities there is a lot of interaction between families, they inform each other about the new variety, how to resist salinity, about insects, how to adapt soil fertility and fertilizer, so people come to see.

Before the demonstration, when husband want to use new variety, wife may not accept and there can be a strong argument. With model here people get to see, it is easy to decide and there is family harmony. Now if the crop fails the wife doesn't complain. There is shared responsibility.

Mr. Dang then added to Mrs. Hoa's story that after three years of improved water quality (access to freshwater) he can plant coconuts, plum, rubber, mango, and papaya. Some farmers plant vegetables. Where these won't grow we can plant eucalyptus and acacias to help the soil and provide wood.

Figure 7. Mrs. Hoa's story

2. Improved water management

The impact story here is about applied science providing the information to assist the delivery of appropriate water resources to producers. If their livelihoods are to improve then being sure of water supply is essential.

The main output produced by this project in regard to water management was an improved version of the VRSAP model. This model predicts the consequences of sluice gate operations and provides scenarios to inform the decisions on when to open or close the gates. This project was built on an already existing model (Hoanh *et al*. 2006) to include more complex situations to reflect reality such as two-way water flows. It also added a module for acidity and improved linkages to GIS facilities for ease of inputting and presentation of outputs.

In order to develop the model, an extensive data collection system was developed, expanding on the one already in place. All the important parameters, such as pH, EC, salinity and so on, were monitored. Experiments were also carried out to understand the movement of acidic water in acid-affected areas. This work had two benefits. The first was that it informed the model and the second was that it provided background information on which technologies might be recommended or discouraged.

The VRSAP model is now run by SIWRP who provides scenarios to the DARD (Water Operations) who, in turn, use this information along with consideration of other factors, such as rainfall and in-flows, to manage the flow of water. The model predicts what will happen under various conditions. Once the dates of sluice gate operations are determined, early in the rainy season when the sluices are open, producers are informed through a range of communication strategies and can then begin to plan their farming business for the following year.

There is some capacity for producers and local authorities to build temporary dams to further modify the flow of water in their specific area and, in this instance, some form of community agreement is important. Financial support to build these dams is provided by the Bac Lieu People's Committee but since the water operations at the provincial level have become more attuned to what is required, the need for temporary dams has diminished. An additional benefit of fewer temporary dams, aside from reducing cost and effort, is that more channels within the system remain open for boats – the main transportation mode in many areas. There has been some work done on developing mobile dams made of plastic, which are cheaper and easier to use and therefore provide more flexibility but there are still problems with leakage.

Consistent anecdotal evidence suggests that the level of conflicts have reduced. The interviews with a range of stakeholders indicated that the following:

- At the Bac Lieu level, despite some criticism that the process is not participatory, producers are able to plan better because of certainty of water resource.
- At the community level, there may be still some conflict between producers who do not share a common vision about what to produce and when.
- Bac Lieu Province is part of a much wider catchment system. What it decides affects its neighbors and vice versa and there has been some tension at this level. As a result, the Bac Lieu People's Committee has formed an alliance with two of its neighboring provinces, Cà Mau (downstream) and Soc Trang (upstream) to take a more regional approach.

The formation of this "regional water alliance" was strongly influenced by running the model for the whole Cà Mau Peninsula demonstrating impacts on water quality of various scenarios.

- The improved VRSAP is now used by SIWRP for water resources planning for the whole Cà Mau Peninsula and the entire Mekong Delta.

A second piece of work was also undertaken to understand the aquatic biodiversity and fisheries in the water systems (Baran, Chheng *et al*. 2010). This information, along with other items of information, contributed to the development of the BayFish-Bac Lieu model, again another predictive tool but one that is more broadly based than the VRSAP model. It considers optimal water regimes and trade-offs and is based on integrating local databases, the VRSAP model outputs and stakeholder consultations in a Bayesian probabilistic model. To quote Baran, Janatunen et al. (2010) this model *allows detailing of 1) annual production probabilities in the case of a baseline scenario, 2) outcomes for four different sluice gate operation modes, and 3) trade-offs between household income, food security and environmental outcomes for each scenario*. It could, for example, answer questions on the impact of improving shrimp farming against rice production.

Researchers at CTU have been trained in using the model and it has been introduced to the Bac Lieu People's Committee. According to the project's senior hydrologist, Dr. Hoanh, further development and application of this model will depend on how problems in water management in Bac Lieu are handled and on future collaboration between CTU and the Bac Lieu People's Committee in finding alternatives and analyzing trade-offs.

The interviews revealed there is still work to do in understanding parts of Bac Lieu ecosystems. For example, further research is required on the movement of acidic water in the acid sulphate soils areas. The analysis of data following the principles of realistic evaluation is given in Figure 8.

3. A supportive policy environment

The third impact story is about the Bac Lieu People's Committee providing the policy environment and leadership to promote change. Much of the information in this section was gathered during interviews with senior people, past and present, from the Committee. In summary the People's Committee felt that while the income of people is increasing and that the project contributed to this significantly, many people are still poor. They see their role as making and managing policy that focuses on the happiness of people through poverty reduction and sustainable livelihoods.

Specifically, the Bac Lieu People's Committee has used the information and outputs generated by the project to do the following:

- Develop a Land Use Plan to 2010, and it did so before the project ended using the information as soon as it was available. This land use map (see Figure 9) outlines the different land use zones and, therefore, the identification of types of suitable farming options. It reflects a change in attitude, considering treating saline water as a resource rather than a problem, and it recognizes that producers need the flexibility to respond to market commodity prices and other contextual factors. That is, it supports diversification.
- Predict what would happen for different land use zones under various scenarios of sluice gate operations. It is sharing these results with surrounding provinces and this is promoting

Contexts
- Conflict over water use creating no-win situations.
- A water model for salinity that did not include complex combinations of operating many sluice gates with different flow regimes and propagation of acidic water in the canal network.
- Scientists who understood the problem and had the capabilities to develop the model further.

Activities
- Applied science research including data collection and model redevelopment.

Mechanism
- Here is a technical problem, use technology to solve it.
- Urgent level of demand driven by the government – the "we really need this" mechanism.

Outcomes
- Improved information for the Bac Lieu DARD Water Operations where people used to inform their decisions for operating the sluices.
- Improved information on water management to the whole of the Cà Mau Peninsula.

Characteristics of the project
- Good science.
- Long-term and trusted relationships.

Challenges for the future
- Completion of the BayFish-Bac Lieu model.
- Further development of the VRSAP model depending on future water management strategies and the collaboration of CTU and the People's Committee.
- Further research on the movement of acid in the system.

Figure 8. The causal package for improved water management

the idea of a strategy for the broader Mekong River Delta.

- Consider how the principles and information generated by this project might be applied to the area of Bac Lieu nearer the coast and outside the influence of the sluices (and the project area). Poverty and uncertainty are issues here.
- Support the work of the project by helping local people understand when, where and what crops can be grown. Now people have more choices and can manage their resources better. Form a water alliance with Cà Mau and Soc Trang provinces to develop a regional approach to water management.
- Encourage the banks to provide credit to those without collateral provided they could demonstrate they were applying suitable technologies, especially those promoted by the project.

Although it is hard to quantify these changes at the policy level it represents a significant investment on the part of the Bac Lieu People's Committee, and the land use map provides visual evidence of one of the changes. This success has been attributed to i) the quality of the partnership the project has had with the Committee and ii) the role of the project in responding to urgent issues.

Another benefit that the Bac Lieu People's Committee acknowledged was the building of local capacities in

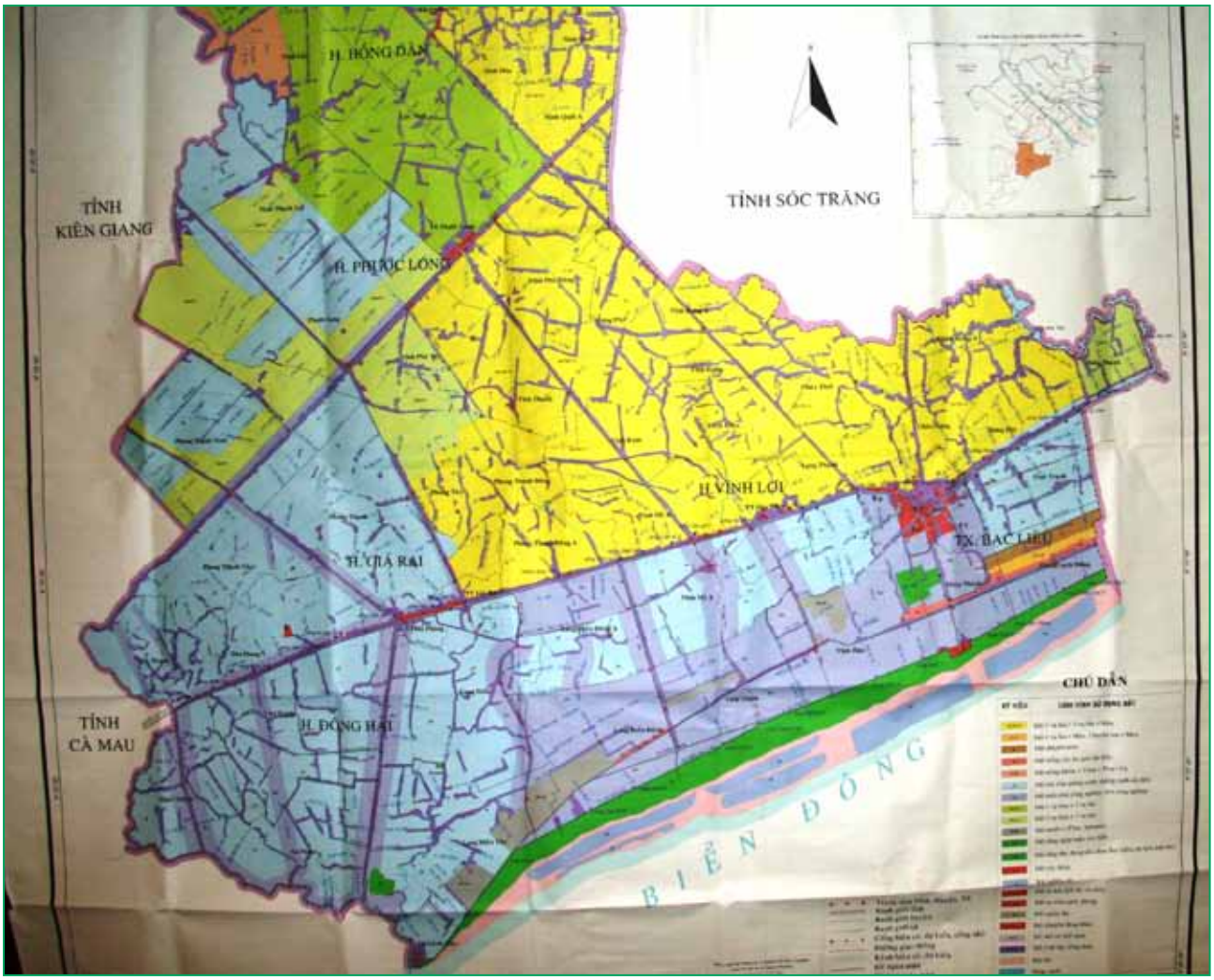

Figure 9. The Bac Lieu land use map: evidence of use of project data

research and scientific knowledge as a result of sharing expertise at events, such as the International Delta 05 Conference, which was held in Bac Lieu. The People's Committee believes this type of interchange has the potential to benefit many (who live in tropical deltaic areas) and (in the future) they would like to see more international efforts bringing world experts together so that the model can help them adapt to climate change and rising sea levels.

One of the major lessons for the Committee coming from the project has been the value of using the community to evaluate its work and that this is the best way to gain insight into how to provide benefit to the local people.

This project was launched at the right policy moment. It addressed a critical policy need to take action to reduce both conflict over water use and poverty. It did so in the face of an expressed Central Government Policy of converting the delta to increased rice production but it is hoped that should the Central Government continue its plan to complete the sluices that the science, which has backed the Bac Lieu People' Committee decisions, will influence central decision making. To that extent DARD has put considerable effort into strengthening its communication with the Central Government. The causal package is given below in Figure 10.

Context

- Conflict over water use, especially with shrimp aquaculturalists seeing their supply of saline water compromised.
- Poverty levels worse than in other parts of the region.
- International scientists, who understood the issues, already had a long-term relationship with the government.
- Rice production on acid soils (low yields) and emphasis on a monoculture.

Activities

- Supply of scientific information to provide policymakers with an evidence base to develop a policy of diversified land use and zoning.
- Development of a new land use policy that moved the province away from a trend of more rice production to one that recognized the value of saline aquaculture and took into account the relationship between soil types and forms of agriculture. It supported diversification.
- Provided supporting services.
- Improved water management.
- Encouraged banks to provide credit, especially to those who lacked collateral provided they were using the right on-farm technologies (although this was not part of the project).

Mechanism

- There is a problem whose solution needs scientific evidence.
- The "we need to support change through all appropriate policy and service delivery channels" mechanism.

Outcomes

- The Bac Lieu People's Committee used project results to modify their land use plan that was approved by the Central Government in the revised plan *Adjusted Land Use Plan for the Cà Mau Peninsula*.
- Diversification of production that is addressing rural poverty in Bac Lieu.
- Less conflicts over water.

Characteristics of the project

- Use of long-standing and respected relationships.
- Clear and urgent demand to address the issue of poverty.

Challenges for the future

- The Bac Lieu People's Committee would like to see a similar intervention for the coastal areas that are outside the project areas.
- Strengthening alliances with neighbors who are also reliant on the waters of the Mekong Delta.

Figure 10. The causal package for the policy environment

Less direct impacts

Three main areas of less direct impacts were identified in the impact pathway analysis. The categorization of these as less-direct was because the output users were not as well defined, nor were there specific activities undertaken by the project to influence them directly, although these may have been referred to generically.

i) Changes in access to credit

As mentioned in the previous section the Bac Lieu People People's Committee now encourages banks to provide credit to those producers without collateral but who are adopting the technologies appropriate for the land use zone. While the original impact pathways model showed changes in capital (and market) support as important to achieving the ultimate project goal, no specific outputs of activities were undertaken to address this component. The project team had difficulty describing what had been intended here. Despite this, some changes have occurred, possibly triggered by the planned impacts. Although obtaining credit from banks is still difficult for producers, some improvements have emerged.

ii) Emergence of new or more agribusinesses

Increased farm productivity requires more agribusiness to support it. Some new businesses have emerged as a result of the activity of the project (see the example of sea grass in Figure 9). Others have emerged without direct contact with the project but maybe through some flow-on effect. Examples to emerge have been rice seed testing as Bac Lieu has some natural advantages over its neighbors, outlets for fresh aquacultural products, and other food-processing enterprises.

iii) Changes in the surrounding provinces

One consequence of the project also beginning to be seen in areas outside Bac Lieu is that producers in the surrounding provinces, through processes of diffusion, have noticed the changes emerging in the Bac Lieu Province and are beginning to make enquiries about the technologies. For example, the Sub-Institute for Fisheries Research in a neighboring province is receiving requests to assist it with new species because of the Bac Lieu story. This evaluation has not been able to explore what change has occurred as a result of technological diffusion but this is obviously a positive consequence of the project.

A sea grass industry is emerging based on growing sea grass (*Scirpus littoralis*). When grown in shrimp ponds it provides a range of benefits. Ni (undated) identified these as:

- Maintenance of low temperature in the ponds.
- Filtering of pollutants.
- Provision of food to crabs and fish.
- Provision of income to the landowners (sell raw materials), especially providing income to the poor (landless) through handicraft processing (see samples).

This idea came about through group discussions between the scientists and the aquaculturalists with the latter reflecting that this used to happen years ago. The practice was stopped because it was thought it compromised shrimp productivity. In order to support this industry the project introduced the buyers to the farmer aquaculturalists who, in turn, provided training to the locals in handicraft production..

Figure 11. The story of sea grass

A summary of findings against the evaluation questions

The following is a summary of findings against the evaluation questions. Most of the answers have already been discussed in the previous section but some of the data are presented here for the first time.

Question	Finding
1. What is the change(s)	• Producers' incomes are increasing in Bac Lieu through the application of appropriate technologies (and rejection of others) but the increase in income is variable across the province. • A land use policy in Bac Lieu now maps out appropriate land uses given soil and water conditions that encourage diversity. It underpins other policies and service delivery and thereby provides the blueprint for producers to plan their business. • There is an improvement in water supply (fresh and/or saline) that matches the appropriate land use zone. This is resulting in less conflict, especially at the provincial level, and providing producers with a critical resource when they need it. Underpinning this is an increase in understanding of the ecosystems in the Mekong Delta.
2. What is the scope and extent of these changes on the ground?	• Average income in Bac Lieu is now the same as for the rest of the Delta and it is the view of all stakeholders that the project would have contributed to this. • Producers on the demonstration farms during the life of the project, on average, received an extra US$250 per/ha/year. • DARD has adopted the extension approach developed in this project. The number of demonstration sites has gone from eight during the life of the project to 80 new sites per year for the last 2 years involving 10,000 producers each year. The proportion of those who are now adopting a new or renovated technology is 50-70%. • There are approximately 116,000 farming families in Bac Lieu but the extent of adoption of *optimal* techniques across the Delta is not known. • The Bac Lieu People's Committee has used information generated in this project either directly or indirectly to influence its policies and service provision and has indicated that its interest in this use is not over. Climate change and rising sea levels are issues that will need future input from research. • New knowledge on ecosystems in the Mekong Delta, expressed in terms of new scientific knowledge, new decision support tools and new processes for working in this area, has been, and will continue to be, disseminated throughout the wider scientific community.
3a. What were the mechanisms that brought about these changes?	The main mechanism that triggered change for producers participating in the demonstration sites was "to see one time is better than hear 100 times" (Vietnamese saying). Other mechanisms included "sharing experiences makes it easier for me to make decisions" and "I trust the advice of specialists, especially when I can participate in the evaluation." For the Bac Lieu People's Committee the main mechanism was a belief in evidence-based policy development.

Question	Finding
3b. What contribution did the project make?	The project made four major contributions: 1. It produced an improved VRSAP model for water management that now generates information in the form of scenarios and maps for improved sluice gate operations to better meet the needs of producers. It provided the model and other sources of information to inform the development of the Bac Lieu People's Committee's Land Use Policy, which recognizes the benefits of diversification and the role of saline water in farming systems. 2. It developed and evaluated a successful participatory extension approach that assists producers select appropriate technologies (and reject others) for their situation, based on on-farm demonstration and experimentation. This approach is now being applied more extensively by DARD. 3. It make a contribution to the body of knowledge on natural resources management in tropical deltas.
3c. Specifically, what role did research play?	Research played three roles in this project: 1. Applied research was behind the many technical papers that resulted in the development and refinement of two models (VRSAP and the BayFish - Bac Lieu) and understanding of the ecosystems in the canal systems. It increased science capability through the development of new knowledge that is still being reviewed through the publication processes. It has already been disseminated through international conferences and as some of the project teams operate in the international arena this knowledge is likely to be passed on integrated into other projects. 2. Farming systems research was used by the producer groups, researchers and extension staff at the demonstration site to validate the merit or worth of new or renovated technologies in particular farming situations. 3. The provision of scientific information to policymakers to provide a robust evidence base for their policy decisions.
4a. What is it about the context that is driving the change?	The contextual factors for the project were: • The fact that it was demand-driven – there were problems in the Bac Lieu Province that needed urgent attention at the policy, scientific and farm levels. • The long-standing relationships between the players who acknowledged one another's potential contributions. • The scientific knowledge and experience of the partners. • The project team had a belief in participatory processes with the project management and when working with producers thereby facilitating the uptake of outputs. For producers, it was the desire to improve their livelihoods to meet their personal goals such as improving their living conditions or a better life for their children.
4b. Where could the changes eventually spread?	• Application of the model and the companion on-farm technologies are beginning to be adopted in the provinces neighboring Bac Lieu.

Question	Finding
4b. (continued)	• The Bac Lieu People's Committee is keen to apply the lessons learnt from this project to areas of Bac Lieu outside of the study area, that is, in the coastal areas. • Some of the experiences of the Vietnamese project were reported in the interviews to have influenced the Bangladesh project but this evaluation could not gather those data. • It is feasible that the information and lessons learnt will permeate to other tropical deltaic areas of the world through mechanisms such as the international conferences being organized by IRRI. • The new knowledge generated is already being applied in the CPWF project CP 25.
5a. What are the benefits and costs of the changes (quantify them as far as possible) both now, and potentially in the future?	**COSTS:** • US$679,000 on Vietnamese outputs, 86% from CPFW over 3 years. • Project management and overhead costs. • Existing VRSAP model. • Existing agricultural and aquacultural technologies and scientific information. • Eight producers who provided farms as demonstration farms. • 40 producers who volunteered to provide farms as control sites with opportunity cost of approximately US$250/farm = US$10,000 • Local knowledge of producers. • Tacit knowledge of partners . • Logistical support . • CPWF provision of opportunities for between-project discussions between the Bangladesh and Viet Nam projects. • CPWF providing training in impact pathway analysis. • In-kind support to Bac Lieu People's Committee. • Outputs from the previous project (funded by DFID and CGIAR).
	BENEFITS: • Increased farm incomes. • Increased diversification of farm activities, probably leading to more sustainable futures. • Fewer water conflicts. • Less need for temporary dams. • New knowledge from applied science and farming systems research.
	Future benefit costs will depend on the following: • Future action of the Vietnamese government. • Commodity prices and the future well-being of the Vietnamese economy. • Climate change and rising sea levels. • The future development of the whole catchment of the Mekong River across five countries.

Question	Finding
5a. (continued)	One enduring legacy of this project may well be the lessons producers have learnt about how to make the best resource decisions for their farms.
5b. What did the project invest?	(SEE THE "COSTS" IN QUESTION 5a)
6. What was the contribution of the CPWF in achieving the change (to be assessed by projecting what would happen without CPWF funding and comparing it with what did happen)?	When asked this question most people agreed that, without the project, progress could have been made but not as fast or necessarily in the same direction. The former Vice-Chair stated that more progress has been made in the last 5 years (from the end of the DFID-funded project to the CA and this CPWF project to now) than over several decades before. Without the science and processes provided by this project and its predecessors, trial-and-error would have been the order of the day.
7. What are the international public goods that the project has generated that are related to the change?	This project was a good example of how to resolve resource issues in a tropical deltaic environment to reduce poverty and improve food security.
8. What were the differences between the original and the final impact pathway?	The major differences were as follows: • When it came to an impact evaluation it became necessary to track who used what output, how and with what result. This meant unbundling the stakeholder mix that was presented in the original diagram. • There was uncertainty about the meaning of some of the terms in the original impact pathway, probably as a result of most of the project team members not participating in the original design, and even for those that did the meaning had become diffuse. The meanings, therefore, had to be reconstructed when developing the post-project model. • Capital and market support was included in the original but the influence of the project was serendipitous rather than planned. People questioned whether or not this should have been in the logic model at all and if it was then what did it mean, and what actions should be taken. • With the knowledge of hindsight less direct impacts were included in the final version.

Lessons for future work

This project has been successful and is likely to continue to make an impact. So what are the features that need to be specifically identified for future reference? The success of this project can be attributed to responding to demand at the policy level, integrating good science with the tacit knowledge of producers, having the right players at the table at the right time including the anticipated output users, and having built-in evaluative processes so partners could monitor progress.

Second, the integrity and passion of the project team in knitting all the threads together and conducting quality applied science and farming systems research have been a major contributing feature. A special note needs to be made of the commitment of the team and the DARD extension staff to an extension process that provided solutions, built on the local knowledge of producers and left them with decision-making capabilities.

The final word, however, is from the project team who believed in enduring and respectful partnerships. The account in the following story was submitted to a meeting on the CPWF by the project team as a "Most Significant Change" story. It is a shortened version of that presentation, only referring to the Viet Nam component of the larger project

The project team's story about partnership

The Vital Roles of Local Governments and Development Agencies in a Research Project on Coastal Resources Management

Date when the change occurred: 2002 till 2006

Place where the change occurred: Bac Lieu Province of Viet Nam

The Story:

Usually, research is carried out by research institutes and universities and is often divided by sectors, e.g. agriculture, aquaculture, etc. The uptake of research results is often considered a separate step, to be carried out by development agencies. Interventions by different development agencies are often also carried out independently.

Sustainable natural resources management in the coastal zones, where the freshwater and saline water interface must take into account diverse stakeholder interests (e.g., agriculture, aquaculture, capture fishery) and complex multi-scale interactions among different resources (e.g., water, soil, land use). Among PN10 partners are institutions in charge of various resources important to coastal management (water, land use, agriculture, aquaculture, and fishery).

What were the critical factors that led to the change?

Built on partnership developed from previous projects.

Clear understanding of roles and responsibilities of different organizations

A good ex-ante analysis of uptake and impact pathways of the project findings

They include research and development institutions, national, provincial and local governments and farmers. The project creates a forum for these institutions to discuss their diverse views on the possible impact of proposed resource use interventions. Of particular importance are the collaborations/dialogues between institutions in charge of research in agriculture (CTU), research in aquaculture (RIA2), land resources management (IMRC), and water management institutions (SIWRP).

The inclusion of local governments and extension services (at district and provincial levels) in Viet Nam is pivotal for the speedy dissemination of on-farm technologies of the project. They participated in on-farm research, and organized field visits and farmer training, using existing farmer networks.

The planning and development institutions (SIWRP, IRMC, DARD) are both research partners and clients of the project. They supplied the project with important secondary data; gave feedback on research findings, and incorporated the appropriate research findings in their development activities/ work plans.

Top management employees of these national development and research agencies were involved in the national advisory committee (NAC) of the project.

Why is the story significant?

- The involvement of local government ensures demand-driven research and the relevance of research outputs. They also facilitate rapid uptake of technologies.
- In Viet Nam, the research findings were incorporated in the provincial land use and water management schemes.
- National agencies are sharing secondary data for developing resource management domains (RMD), hydraulic and salinity modelling.

What were the constraints?

- Infrastructural development requires time and resources; there is a considerable time lag between planning and implementation.
- Adoption of new technologies by farmers takes a few years and, therefore, impacts of improved production systems may not be seen during the project period.

What are the future implications for actions (e.g., future research), if any?

- Improving coordination among the government organizations, and research and development agencies.
- Implementing an impact monitoring program and impact assessment when the project ends.

People interviewed

Project Management

- Dr. T.P Tuong, Project Leader, IRRI.
- Dr. C.T Hoanh, IWMI.

Bac Lieu People's Committee

- Mr. Nguyen Truong Giang, former Vice-Chair of the Bac Lieu People's Committee.
- Mr. Nguyen Thanh Be, Vice-Chair of the Bac Lieu's People's Committee.

DARD (In this section * indicates those who participated in one or both of the workshops.)

Agriculture

- Mr. Diep Chan Ben,* Deputy Director of DARD
- Mr. Duong Huyen Vu,* Extension Manager.

Aquaculture

- Mr. Ta Minh Phu, Deputy Director of DARD, Fishing and Aquaculture.
- Mr. Pham Hoang Giang, Fishery and Aquaculture, Extension Officer.

Water Management

- Mr. Luong Ngoc Lan, Director of DARD, in charge of the water management plan for the province.
- Mr. Lai Thanh An, Head of Water Resources Department.
- Mr. Nguyen Van Minh, Head of Hydraulic Works Management.

Phuoc Long District

- Mr. Tran Van An, Head of Agric-Aqua Office, Hong Dan District.
- Mr. Luong Phong Dong, Head of Agri-Aqua Office and Representative of the People's Committee.
- Mr. Vo Van Lang, Deputy Head of Agri-Aqua Office.

Project Management Unit

- Mr. Phan Hong Thai,* Secretary of the Project Management Unit, Synthesis of data and monitoring the project on behalf of DARD.

Can Tho University

- Dr. Duong Van Ni,* Agronomist/ Environmentalist.
- Project Coordinator for the Viet Nam Case Study
- Dr. Nguyen Duy Can,* Farming Systems Analyst.
- Mr. Le Canh Dung,* Economist.
- Mr. Tran Duy Phat.

SIWRP

- Mr. Nguyen Van Ngoc,* Hydraulic modeller.

RIA2

- Mr. Thieu Lu,* Head of the Sub-Institute of RIA2 in Ca Mau.
- Lead Producers and Producer Groups.
- Mr. Nguyen Van Phong, (Brackish water system) and 11 aquaculturalists.
- Mr. Le Van Dang, (Fresh-brackish water system) and 10 local farmers/ aquaculturalists.
- Mr. Tran Cong Lap (Freshwater system) and 15 farmers.

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Appendix 1. Terms of Reference

Terms of Reference for Bron McDonald in the CPWF Adoption and Cost-Benefit Analysis Project

The International Center for Tropical Agriculture (CIAT) requires the services of an impact evaluation consultant. Bron McDonald, Evaluator, has been identified to carry out the following evaluation that forms part of the outputs of the Adoption and Cost-Benefit Analysis Project.

Evaluation Design and Implementation

The evaluation will be of PN10: Coastal Resource Management for Improving Livelihoods (CRESMIL). Orientation for the evaluation is technical and significant partnership change stories will be written by the project (see Annex 1). The evaluation will follow the proposal in Annex 2.

The evaluation should address the following questions:

1. What are the changes?
2. What is the scope and extent of these changes on the ground?
3. How did the changes come about? What contribution did the project make to them?
4. What is driving the changes? Where could the changes eventually spread?
5. What are the benefits and costs of the changes (quantify them as far as possible) both now, and potentially in the future? What did the project invest in?
6. What was the contribution of the CPWF in achieving the changes (to be assessed by projecting what would have happened without CPWF funding and comparing it with what happened)?
7. What was the role of research in achieving the changes?
8. What are the international public goods that the project has generated that are related to the changes?
9. Did the project follow the expected impact pathways (as described in an earlier impact pathways workshop to define them)?

The method for carrying out the evaluation is up to the evaluator with the following provisos:

- The evaluation should focus on adoption and impact and not be an overall evaluation of the project.
- The Project Leader and Boru Douthwaite should agree to the evaluation design.
- As far as possible changes should be quantified and costed.
- A draft final report of about 30 pages (plus Annexes) is to be produced no later than 15 October, 2008 structured around the research questions (unless another structure makes more sense). The report should include:
    - A detailed impact pathway (i.e., logic model) for the changes evaluated, documented and compared and contrasted with those originally projected in 1) impact pathways workshops and 2) by the project leader before the beginning the evaluation.
    - Descriptions of strategies and tools for measuring change.
    - Descriptions of strategies and tools for determining attribution.

ANNEX 1. Significant Change Stories

Story 1. The main focus of the evaluation

The following story was selected as a favorite because the project has demonstrated its capacity to trigger various changes at a wide range of scales:

- **At farm level**: improved rice and livelihoods of shrimp farmers (especially increased income).
- **At local management level**: increased awareness of the value of brackish water for food production (in this case, shrimp) and thus the need to include brackish water in the management of water resources in coastal areas; strong partnership involving local institutions (especially NGOs): contribution to the production and dissemination of research outputs.
- **At national planning level**: understanding the need to shift from a rice-based production system to a diversified production system in order to enhance the productivity and the ecological and social sustainability of the coastal area; reciprocal benefits of project partnership especially integration of research findings in national planning.
- **At scientific level**: potential for producing International Public Goods on the management of the freshwater and saline water interface for the production of rice and shrimp in coastal areas.

INRM research supports livelihood at the interface of freshwater and saline water environments

Classification: Technical

Name of Person Reporting: TP Tuong on behalf of PN10 members in Viet Nam.

Project/Theme/Basin: PN10/Themes 1 and 3/Mekong and Indo-Gangetic basins.

Date when the change occurred: 2001

Place where the change occurred: Bac Lieu Province, Mekong Delta, Viet Nam.

The Story:

Prior to 2000, with the aim of boosting rice production for export, the Vietnamese government invested in water management infrastructure (embankments and sluices) to protect Bac Lieu Province from salinity intrusion. The intervention adversely affected the livelihood of people in the west of the protected area who needed brackish water to raise shrimp.

In 2001, demand of aqua products for export increased significantly, and conflicts between shrimp culture and rice culture became serious due to different water quality requirements: saline water for shrimp and freshwater for rice. A DfID-funded project analyzed the pros and cons of the salinity control measures and the land use policy that favored rice intensification. The project proposed a land zoning scheme and the associated sluice operation procedures that would accommodate both rice intensification in the eastern part and shrimp culture in the western part of the area and the shrimp (dry season) and rice (rainy season) systems in the transitional area. Changes in water quality due to sluice operation predicted by the hydraulic and salinity model were analyzed to identify the most suitable option. From 2002 to 2003, the local government adapted the land use zoning in the revised land use plan. Procedures for sluice operation were adopted and a water-quality monitoring network was established. Producers adjusted their production systems according to the zoning.

PN10 work, which started in 2004 involved refining the hydraulic and salinity models which they used to compare different water development scenarios (e.g., excavating new canals and dredging old ones) proposed by the local government and to find the impact of sluice operations of the surrounding province on Bac Lieu and vice versa. It also improved production systems in each of the "land use zones" by implementing agricultural and aquaculture experiments with producers, which have very much stabilized due to the preliminary land zoning.

Now, the local water management offices have the capacity to manage the water-quality network and to refine the sluice operations through data monitoring to ensure suitable water quality for different zones. Producers have adapted newly improved production systems and farming technologies to reduce production risks and increase income (e.g., maintaining Scirpus littoralis Schrab in the shrimp fields to regulate pond temperature, reducing shrimp diseases and getting extra income, adopting multiculture with shrimp and crab instead of shrimp monoculture, planting upland crops after two rice crops instead of three in freshwater zones, and using new rice varieties, etc,).

Why is the story significant?

- National planners accepted the diversification in production systems instead of monoculture with rice as the most dominant crop.
- The local government accepted the concept that brackish water is a resource instead of always labeling it a "constraint to production."
- The project helped boost farm income and improve farmers' livelihoods.
- The hydraulic model helped Bac Lieu and surrounding provinces to understand the interaction among water management systems in their own territory. Based on the suggestion from the project, MARD has established the "river basin organization" to coordinate water management in neighboring provinces.
- The impacts of research were multi-scale: from regional (land use and water management) to field level (farming technologies).
- The concept and methodology can be applicable in other coastal zones.

What were the critical factors that led to the change?

- Built on the success of previous projects.
- A multi-scale approach to resource management and quantification of upstream-downstream interactions among different zones.
- Participatory research with farmers and on-farm tests facilitated the dissemination of technologies.
- Good communication with local government and development institutions.

What were the constraints?

- A lot of data were required for hydraulic and salinity modeling; in many cases, governments do not invest systematically nor do they sustain data acquisition.
- Local governments have limited human resource capacity for technology transfer, e.g., hydraulic and salinity model, and GIS applications.
- Limited resources and time for testing the improved production systems with farmers given that research projects are often time-bound and do not include "extension and development" costs .

What are the future implications for actions (e.g., future research), if any?

- Continue the tests of improved production systems with farmers.
- Include other water-quality components (e.g., DO acidity) in the water model and use it as decision support tools for production planning.
- Expand the study on land use zoning and water management to the surrounding provinces that are sharing the same water control system with Bac Lieu.

Story 2

The next story was chosen as a favorite partnership story because it is an excellent example of the impact that can be achieved by identifying and truly involving the key stakeholders and end users – farmers, fishers, research and development (R&D) organizations including top management, district and provincial extension, NGO, local government, government resource managers, government planning and development institutions.

The vital roles of NGOs, local governments and development agencies in a research project on Coastal Resources Management

Classification: Partnership

Name of Person Reporting: Dr. TP Tuong on behalf of PN10 team members.

Project/Theme/Basin: PN10, Themes 1 and 3/Mekong and Indo-Gangetic basins.

Date when the change occurred: 2002

Place where the change occurred: Bac Lieu Province of Viet Nam and the southwest coastal sub districts (Batiaghata, Dumuria and Paikgacha) of Bangladesh.

The Story:

Usually research is carried out by research institutes and universities and is often divided by sectors, e.g., agriculture, aquaculture, etc. The uptake of research results is often considered a separate step, to be carried out by development agencies. Interventions by different development agencies are often also carried out independently.

Sustainable natural resources management in the coastal zones, where freshwater and saline water interface, must take into account diverse stakeholder interests (e.g., agriculture, aquaculture, capture fishery) and complex multi-scale interactions among different resources (e.g., water, soil, land use).

Among PN10 partners are institutions in charge of various resources important to coastal management (water, land use, agriculture, aquaculture, fishery). They include R&D institutions, national, provincial and local governments, NGOs and farmers. The project creates a forum for these institutions to discuss their diverse views on the possible impact of proposed resource use interventions. Of particular importance is the collaboration/dialogues between institutions in charge of research in agriculture (BRRI in Bangladesh, CTU in Viet Nam), research in aquaculture (BFRI in Bangladesh and RIA2 in Viet Nam), land resource management (LGED in Bangladesh, IMRC in Viet Nam), and water management institutions (BWDB in Bangladesh, SIWRP in Viet Nam). The inclusion of an NGO Health, Education and Economic Development (HEED) in Bangladesh and local governments and extension services (at district and provincial levels) in Viet Nam are pivotal in the speedy dissemination of on-farm technologies of the project. They participated in on-farm research, and organized field visits and farmer training, using existing farmer networks.

The planning and development institutions (BWDB, LGED in Bangladesh; SIWRP, IRMC, DARD) are both research partners and clients of the project. They supplied the project with important secondary data; gave feedback on research findings, and incorporated the appropriate research findings in their development activities/work plans. Top management employees of these national R&D agencies were involved in the national advisory committee (NAC) of the project.

Why is the story significant?

- The involvement of local government and NGOs ensures demand-driven research and the relevance of research outputs. They also facilitate rapid uptake of technologies.

- In Bangladesh, research results encouraged BWDB to implement a project on Integrated Planning for Sustainable Water Management (IPSWAM) involving farmer groups in polder 30 at Batiaghata, Khulna. LGED extended its support to determine elevation of water table in Tala upazila of the Satkhira District.
- Realizing the importance of, and farmers' interest in, HYV, the Department of Agricultural Extension (DAE) and BWDB have taken up development interventions to reduce the flood depth in polders 22, 29 and 30 (in Khulna District) so that HYV can be grown in the wet (commonly known as *aman*) season.
- In Viet Nam, the research findings were incorporated in the provincial land use and water management schemes.
- National agencies are sharing secondary data for developing resource management domains (RMD), and hydraulic and salinity modeling.

What were the critical factors that led to the change?

- Built on partnership developed from previous projects.
- A clear understanding of roles and responsibilities of different organizations in each country and how they work/interact.
- A good ex ante analysis of uptake and impact pathway of the project findings.

What were the constraints?

- Infrastructural development requires time and resources; there is a considerable time lag between planning and implementation.
- Adoption of new technologies by farmers takes a few years; therefore, impacts of improved production systems may not be seen during the project period.

What are the future implications for actions (e.g., future research), if any?

- Improving coordination among the government organizations, NGOs, and R&D agencies.
- Implementing an impact monitoring program and impact assessment when the project ends.

ANNEX 2. Evaluation Proposal - Process

This impact evaluation will employ participatory processes and, for evidence, will rely on a combination of existing data and group wisdom. Essentially, it is an approach designed to facilitate learning. The process will involve a comparison of the initial impact pathway designed in the ex ante phase of the project to what has actually happened. This comparison, if possible, will be done from three different perspectives. First, from the project team, second, from the key stakeholders and last, from the beneficiaries of the project.

The Process

A six step process is proposed for this evaluation that relies on the participation of the project team, its key stakeholders and where or if practical, some of the project's beneficiaries. The steps are as follows:

1. A desk study prior to a visit to the Mekong Delta of key existing documents including any evaluations or monitoring data to date.

2. Work with the project team in Viet Nam to:

   i. Reconstruct the logic model based on what actually happened.
   ii. Identify evidence that supports the "actual" model.
   iii. Compare the original logic model with the actual model and seek explanation of any differences between the two.
   iv. Work with key stakeholders, collaborators and partners in Viet Nam.

3. Repeat the above but with key stakeholders (funders, partners, collaborators).

4. If possible, interview a small group of beneficiaries in Viet Nam. This requires discussion with the project leader on how this might happen and if this is feasible.

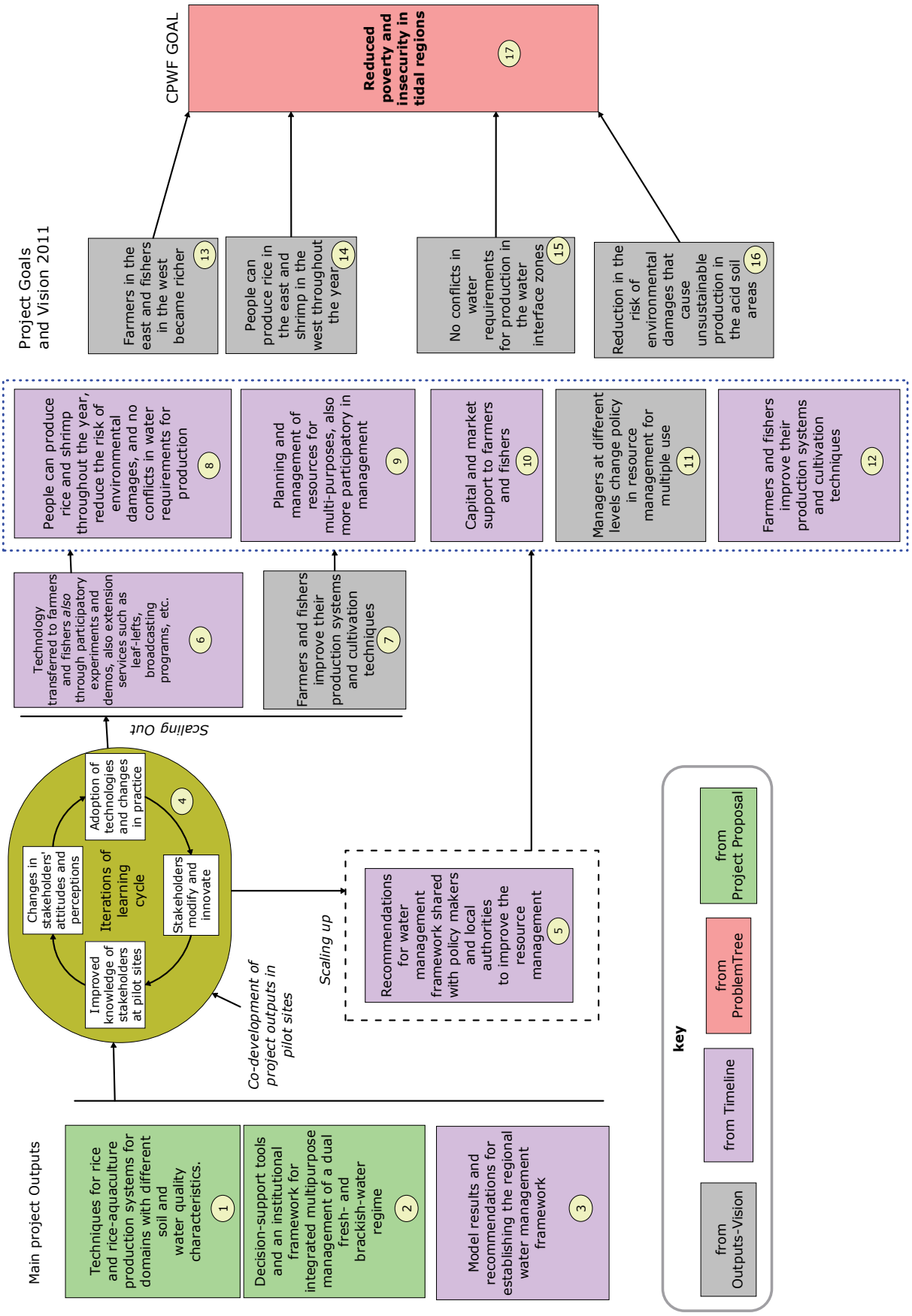
5. Preparation of a report (in Australia) that will provide information on the following:

   i. In summary form, a brief background to the project and its rationale.
   ii. A description of its evidence-based achievements using the headings of the logic model.
   iii. Comment on the differences between the original and the actual logic models.
   iv. Comment on the differing perceptions of the project from the three different viewpoints.
   v. Lessons learnt about the project.
   vi. Reflection on the impact evaluation process undertaken here and the lessons learnt, especially those relating to potential improvements while acknowledging tight timeline and limited resources.

6. Presentation of findings to the team in Viet Nam (if possible) and inclusion of their comments into the final report to ensure that the principles of participatory evaluation are adhered to.

An electronic version of the final report will be provided by the consultant.

Appendix 2.
Project 10: Original Impact Pathway Model



Appendix 3. Summary graphs on income change

The following graphs, which were presented in a socioeconomic assessment undertaken as part of this project, show that changes in incomes have been occurring over the last 10 years (Can *et al*. 2010) and that all three examples presented have experienced some income growth. As this study was completed at the end of the project, before its full impact has been realized, it is difficult to draw conclusions from the income data since that time. In the process of collecting these data, though, producers were asked what contributed to the increase in income and the technologies. Ideally, a follow-up study in 2 or 3 years' time matched with a measure of on-change farm would produce a stronger picture.

The following three graphs are from Can *et al*. 2010 showing specific income changes at three sites across Bac Lieu up to the end of the project.

Each of the visits to the demonstration sites conducted as part of this evaluation where producers recounted their personal experiences confirmed the picture that was recorded in the socioeconomic study. All felt they were better-off (although not rich yet!) and the benefits of the project were more than just money. These people valued their new-found ability to undertake evaluations of new species and on-farm technologies. For example, the group in the saline area expressed the advantages they had gained from being able to assess the quality of the water more accurately, and therefore make better decisions in regard to their farm operations. Others mentioned the increased capacity they gained from working as a group.

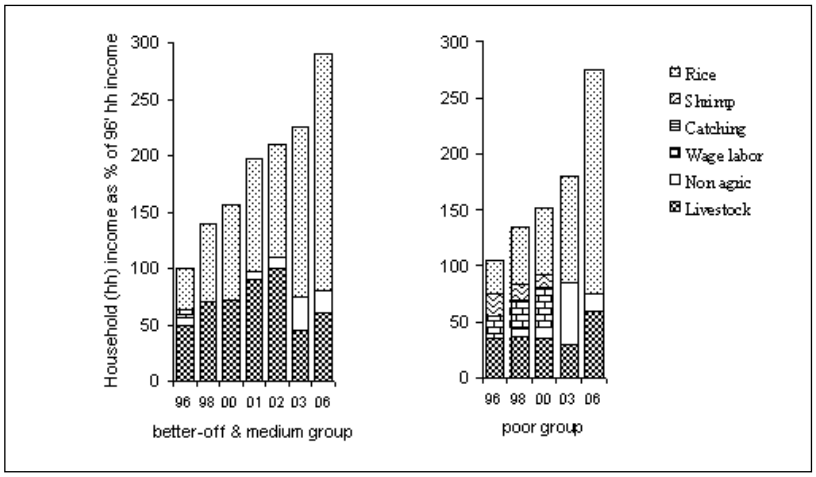


Figure A3.1. Illustration of household income and income sources over time as perceived by farmers in the Minh Dieu Village (Early Intervention Zone [changed from a saline ecology to a freshwater ecology prior to 1998 and is characterized by alluvial soils]). The 1996 household income was used as the base (100%) (n = 48)

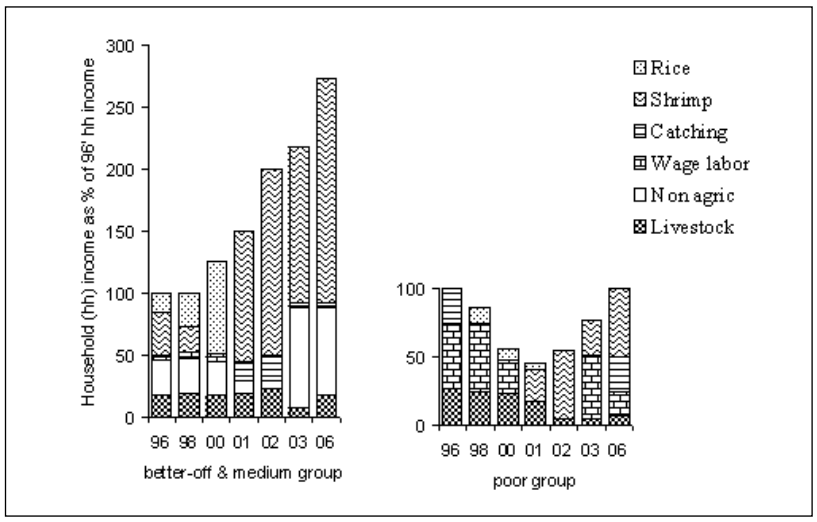


Figure A3.2. Illustration of household income and income sources overtime as perceived by farmers in the Phong Thanh Village (Recent Intervention Zone – Water and the environment changed to a freshwater ecology between 1998-2000, acid sulphate soils). The 1996 household income was used as the base (100%) (n = 39)

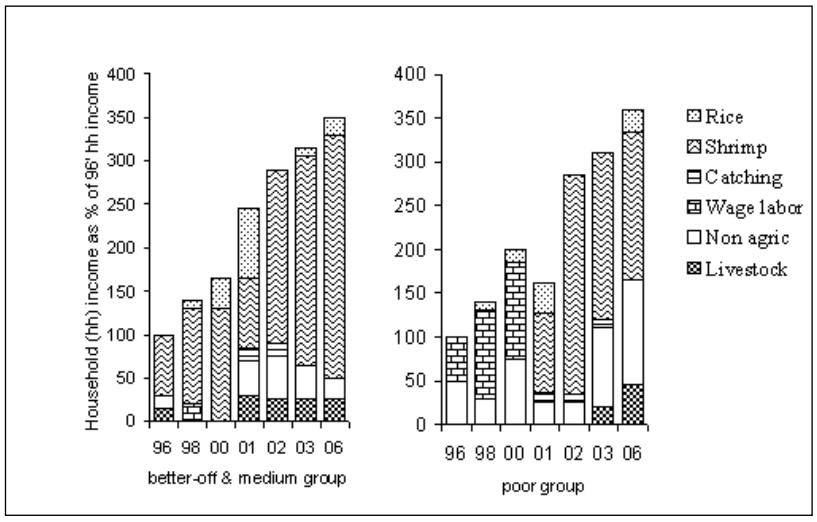


Figure A3.3. Illustration of household income and income sources over time as perceived by farmers in the Vinh Loc Village (Marginal Intervention Zone – not significantly affected by the closure of the sluices). The 1996 household income was used as the base (100%) (n = 43)

Appendix 4. Limitations of the evaluation

The methods used in the design of this evaluation were predominantly qualitative and included the following:

1. A review of existing papers including interim project reports, papers presented at conferences, expert reviewed published papers and those being prepared for publication.
2. Implementation of two facilitated workshops based on an ORID (Stanfield 1997) that takes people through a data-gathering phase, a reaction phase, an identification of the issues and a decisional phase. One was at the beginning of the visit to Viet Nam and the second at the end to review the findings of the interviews. As with any facilitation process the limitations are (i) the extent of espoused and tacit knowledge the participants have and (ii) the facilitator's skills. Was any critical piece of information missed? Was the emphasis correct?
3. Revision of the existing impact pathway. The limitations of models that hypothesize a theory of action, such as the hypothetical impact pathway, are that these often do not include unintended impacts, do not consider contextual issues sufficiently and often only deal with the average experience. The evaluator used the semi-structured interviews to address these weaknesses.
4. Semi-structured interviews.
5. Group interviews based on producers recounting their stories of the project. The three groups that were interviewed had had a positive experience of the project. Time and logistics prevented interviewing more.

Qualitative versus quantitative: The design may be considered less robust than if a randomised control treatment experiment had been untaken although control-treatment experiments were undertaken within each of the demonstration sites as an evaluative activity. An evaluation based on an extensive set of quantitative data was not feasible. Where possible this evaluation relied on what quantitative data there were in papers that were either published or in the process of being peer-/expert-reviewed. In order to overcome this limitation the principles of contribution analysis were applied.

Qualitative data and stories of change: On the plus side, it is from the qualitative data and stories that projects and their commissioners can distil lessons for the future, because, often this information provides more insights into why success or failure occurs. The stories of significant change provided were in the positive but in the future they maybe negative stories and could be considered as well to avoid the criticism of being too appreciative and provide a more balanced view. It is often from the lessons from negative results that the most learning occurs.

Who participates: One of the main limitations of combining the above methods is that the findings reflect the combined views of only those present. The project leader and the evaluator ensured that many people were included, either as participants in the two workshops and amongst those interviewed, but time was a limitation.

Realistic evaluation: The main limitation experienced in using realistic evaluation in this project was that the necessary data collection strategies were not set up at the beginning of the project. As a result there was little to work with. Despite this, it is up to the commissioner to determine if this approach might be useful in the future and therefore planning the approach from the beginning. The application of realistic evaluation principles was essentially a "taste test" in this instance.

Overall, the main strategy taken to reduce the limitations was triangulation, looking for common themes coming from multiple methods. Throughout the whole process the emergent findings from other methods were checked both in subsequent methods and in the final workshop where much of the evidence was reflected upon and validated.

Outside of the methods there were other limitations in this evaluation, which included the following:

1. Not being able to compare the findings from the Mekong Delta with those from the Bangladesh component.
2. The unknown slippages in information and interpretation that may have occurred through translation from Vietnamese and English and vice versa, although the author would like to acknowledge the care and effort demonstrated by the project team to minimize this limitation. Their skills in written and verbal English need to be acknowledged and were greatly appreciated.
3. The limitation of time and resources, and the endeavor to do the best with what was available.
4. The methodological skills of the evaluator.

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About CPWF

The Challenge Program on Water and Food was launched in 2002 as a reform initiative of the CGIAR, the Consultative Group on International Agricultural Research. CPWF aims to increase the resilience of social and ecological systems through better water management for food production (crops, fisheries and livestock). CPWF does this through an innovative research and development approach that brings together a broad range of scientists, development specialists, policy makers and communities to address the challenges of food security, poverty and water scarcity. CPWF is currently working in six river basins globally: Andes, Ganges, Limpopo, Mekong, Nile and Volta.

About this Impact Assessment

The Bac Lieu Province in the Mekong Delta is part of the Cà Mau Peninsula and is an important food-growing area in Viet Nam. It has a population of 830,000 with approximately 116,000 farming families living on small parcels of land producing a range of commodities for food security and the export market. These farmers and aquaculturalists (together called producers in this report) are highly dependent on accessing the right quality water, fresh or saline or both, at the right time to grow their crops or raise their shrimp, crabs or fish. This evaluation was intended to identify what contribution the project had made to reducing poverty and food insecurity in the Mekong Delta as a result of an investment by the CPWF. The success of this project, however, can be attributed to its positive interaction with policy development, integrating good science with the tacit knowledge of producers, having the right players at the right time and having built-in evaluative processes so partners could monitor progress.

Mailing address:

CGIAR Challenge Program on Water and Food

P.O. Box 2075

127 Sunil Mawatha,

Pelawatta, Battaramulla,

Sri Lanka

Tel +94 11 288 0143

Fax +94 11 278 4083

Email: cpwfsecretariat@cgiar.org

www.waterandfood.org

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