Building Bridges to an Uncertain Future Lived Now: Lessons from the Use of Participatory Action Research and Theory of Change Towards A Realistic Community-Based Participatory Monitoring and Evaluation System

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Abstract: Building on experience from the CGIAR Research Program on Aquatic Agricultural Systems implemented by WorldFish in the Visayas and Mindanao regions of the Philippines, known as the VisMin Hub, we describe the development and evolution of a monitoring and evaluation (M&E) system emerging from the facilitated action-reflection cycles of testing and adopting theories of change carried out with community partners through participatory action research (PAR). The former guides our community partners and us, as members of the potentially emergent PAR groups, towards the realization of the community's vision; the latter facilitates learning to understand what, how and why change is unfolding. Unlike the conventional M&E system where indicators are pre-set at the beginning of program implementation, these processes result in an organically-evolved, community-based participatory M&E system that is continuously revised according to contexts to guide communities towards realizing their visions. Its ultimate outcome is enhanced people's capacity to own the product and process, giving rise to an internally-driven change. Towards the end, the paper offers an iterative discussion of learnings from implementing such an approach.

1. Introduction

The CGIAR Research Program on Aquatic Agricultural Systems (CRP 1.3 AAS) is a long-term agricultural research program designed to pursue community-based approaches to agricultural research to improve the lives of the poorest and vulnerable aquatic agricultural systems (AAS)-dependent households (CRP AAS 2012a; b; Dugan *et al.,* 2013). Led by WorldFish, it has been operating worldwide since 2011. Realizing that conventional research and development (R&D) approaches are no longer adequate to meet the challenges of the complex world of the 21st century (Campbell and Sayer, 2003; Chambers, 1988; Douthwaite *et al.,* 2003a; Pretty, 1995; Ostrom, 2009; Ward, 2007; Waters-Bayer *et al.*, 2015), CGIAR and WorldFish (Sayer and Campbell, 2003) responded with this program (CRP AAS 2012a, b) to achieve gender equitable and inclusive development outcomes.

The main approach being tested and implemented by the AAS is Research in Development or "RinD" (Dugan *et al.,* 2013), which embeds research in development processes to spur innovation (Waters-Bayer *et al.,* 2015). It is transdisciplinary, systems-based, transformation-oriented and guided by five key elements: engagement through participatory action research or PAR (Apgar and Douthwaite, 2013), use of theory of change (ToC), use of gender-transformative approach (Kantor, 2013; Kantor and Apgar, 2013), working with partners (CRP AAS, 2012c) towards collective impact and in the process, developing the capacity for quality research and implementation.

To understand how we implemented PAR and ToC as elements of RinD in complex adaptive systems such as AAS, a methodology akin to community-based participatory monitoring and evaluation (PM&E) was devised. This is because the conventional monitoring and evaluation (M&E) system of viewing change, being linear, has limitations. The conventional M&E works on a logframe, which is usually developed in the pre-implementation project proposal (Bakewell and Garbutt, 2005) and subsequently used to monitor progress.

But being complex, AAS are dynamic and thus constantly changing. This is because of the diverse relationships operating between people, processes and the environment and confounded by feedbacks between, within and across these units that any intervention introduced into such systems produces unpredictable and unintended consequences (Burns, 2014). These dynamics are not captured by conventional M&E because by choice, it is blind to emerging outcomes (Perrin, 2002) and as such, eschews learning that challenges the story already told.

Since there are few examples of how good PM&E is in practice, this paper attempts to address such shortcoming. Much effort is exerted in documenting the findings of participatory evaluations, but only few published examples help practitioners in implementation. These are the very essence why CRP 1.3 AAS uses ToC and PAR as core elements of its RinD approach not only for the participants to understand the what, how and why of the change process in such complex systems, but also to advance understanding of PM&E.

The first part of this paper explains PM&E's importance to the body of knowledge it is contributing to; the second describes the community where PAR and ToC have been applied; the third discusses the evolution of an organically-developed PM&E, and the last considers the learnings from its implementation. While the parts are headed as such, parts three and four are iteratively discussed to show adherence to the PAR process.

2. Literature Review

PM&E is designed to overcome the externally driven, projectized M&E processes. It is about radically rethinking who initiates and undertakes the process, and who learns or benefits from the findings. It is not just a matter of using participatory techniques within a conventional M&E setting; it is part of a shift in thinking in M&E prompted by:

- the surge of interest in participatory appraisal and planning, which is a set of new approaches stressing the importance of taking local people's perspectives into account;
- pressure for greater accountability, especially at a time of scarce resources;
- a shift within organizations, particularly in the private sector, towards reflecting more on their own experiences and learning from them.
- the need to focus on the quality of participation that also supports double loop learning, which ToC and PAR may address.

PM&E is generally understood as a process by which programs and stakeholders track progress towards meeting project objectives together (e.g., main references). Proponents identify its main benefits as one of improving project performance while increasing as well the levels of satisfaction among stakeholders (Sangole *et al.,* 2014). It is also said to support downward accountability, thus becomes a decision-support tool for process-oriented management of projects (Estrella and Gaventa, 1998; Estrella *et al.,* 2000), and can lead to improvements in community organizing to engage better with service providers.

PM&E aims to enable stakeholders identify their needs, goals and indicators to monitor their own progress (Estrella and Gaventa, 1998). When using it, stakeholders who are directly or indirectly involved in a program take part in selecting the indicators to measure changes, in collecting information, and in evaluating findings. It allows tracking inputs, outputs, processes, and/or outcomes (impacts). It may include monitoring with intended and/or unintended consequences. It demonstrates what has been achieved, whether the needs of intended beneficiaries are being met over time, and whether the best strategies have been pursued. As such, it stimulates internal learning, enabling people to reflect on past experiences, examine present realities, revisit objectives, and define future strategies.

It is also claimed that PM&E empowers communities and enhances social capital (Estrella and Gaventa, 1998). Further, it promotes self-reliance in decision-making and problem-solving, therefore strengthening people's capacities to take action and foster change. At the community level, PM&E helps motivate people to sustain local initia-

tives and manage conflicts.

Although there are many variations of PM&E, four features are common to them and contribute to their good practice: 1) participation, 2) learning, 3) negotiation, and 4) flexibility (Estrella and Gaventa, 1998).

Because of the increasing need to focus on learning and understanding what constitutes change, the prevailing "audit culture" (Strathern, 2000) and emphasis on results-based management seem to have outgrown the traditional PM&E's usefulness. That is not surprising considering that development is about change and it is natural to ask what brings it about. The more we think about it, the more we ask what we are doing and why. "By focusing attention on the lasting changes we aim to bring, and reflecting on what really contributes to those kinds of changes," as James (2013) reminds us, "it helps us step out of 'project activity' mode, question our assumptions, and focus on what really matters." Reflection as we know it comes in handy then. It allows us to learn from others, builds bridges in our work, clarifies our strategies and partnerships, and puts our framework for learning, planning, monitoring, and evaluation in clear perspective.

2.1 PM&E in AAS: ToC and PAR Brought Together

According to Douthwaite *et al.* (2014), the development of community-based PM&E in AAS is anchored on theory and practice from two fields: theory-based evaluation and participatory action research (PAR).

Theory-based evaluation specifies ToCs, according to Rogers (as cited by Douthwaite *et al.,* 2014). ToCs are causal pathways that link program activities to outcomes, which are defined as changes in knowledge, attitudes, skills, and behaviors of key actors. Douthwaite *et al.* (2014) further stated that a ToC is built on a set of assumptions about how communities think change happens and how we think we influence it. A key premise is that testing assumptions during implementation will help us learn, improve, contribute to adaptive management, and increase our likelihood of achieving development outcomes. Hence, an important part of the M&E system is developing ToCs and testing them through cycles of reflection, planning, and action. PAR provides the methodology to do these.

Meanwhile, Reason & Bradbury (2008), Greenwood and Levin (1998), and Apgar and Douthwaite (2013) claim that the theoretical underpinnings of PAR and its applications in several disciplines and practitioner fields are diverse, leading to multiple and often contradictory understanding of the process and potential outcomes. They noted that the term "action research" was first used by Lewin (as cited by German and Stroud, 2007) who argued for the need to bring action and reflection together in the process of learning. Building on this tradition, Kolb (as cited by Apgar and Douthwaite, 2013) further developed the idea of learning as a process of engagement wherein people learn best through reflecting on their own actions.

The use of iterative action and reflection cycles underpins all approaches to PAR. Essentially, PAR is a participatory process of inquiry which looks for answers to real life concerns to improve the well-being of those engaged. "It seeks to bring together action

and reflection, theory and practice, in partic-ipation with others, in the pursuit of practi-cal solutions to issues of pressing concern to people, and more generally the flourishing of individual persons and their communities," say Reason and Bradbury (2008). Unlike most research endeavors that present *ex post* findings, this process is dynamic and contin-uous, enabling feedback in real time. This is the power of ToC applied as M&E in a PAR situation. The participatory and action-ori-ented focus builds ownership of the process by the participants, who learn through their own experiences and are able to change their lives and social world.

3. Barangay Pinamgo Described

Barangay Pinamgo, one of the eight AAS focal communities in the Philippines, is located in the Visayas region where fishing and seaweed farming are major income sources. It underwent the community visioning and action planning (CVAP) and revisiting of dreams (ROD) as shown in Table 1.

Pinamgo is one of the eight island barangays of the Municipality of Bien Unido in the northern part of the province of Bohol. It is found in Jao Island which, in turn, is shared by two other barangays of the Municipality of

Talibon. All island barangays of Bien Unido are part of the Danajon Bank Double Barrier Reef, an important conservation site in the Philippines for two reasons: first, it is one of the only six double barrier reefs found in the world, and the only one in the Philippines and Southeast Asia; and second, this reef complex serves as a huge "sea bank", being the breeding area for the fishery supplies of Bohol and the surrounding provinces of Cebu, Leyte and Southern Leyte. This site is, however, a severely damaged reef and a focus of management interventions (Christie *et al.*, 2006; FISH, 2010, Hill, 2011).

Pinamgo is the fifth largest barangay in Bien Unido in terms of land area, and also the fifth most populated with 2,177 people. But because of its relatively large area, it is among the barangays of Bien Unido with the smallest population density of 781 persons per sq km. Nonetheless, this figure is more than twice the national average of 308 persons per sq km. Some islands of Danajon Bank have very high densities (Hill, 2011). Basic services in Pinamgo are limited to a health center, primary education, and power supply. Potable water is a scarce resource, as well as water for farm irrigation. The residents are dependent on rain and open freshwater wells.

Table 1 Quick facts of the CVAP and revisiting activities in Brgy. Pinamgo

| Barangay	Date, Venue and Participants	
	CVAP	**Revisiting**
Pinamgo (Bien Unido, Bohol)	22-23 July 2013 at Bohol Yacht Club, Pto. San Pedro, Bien Unido, Bohol	2-4 August 2014 at the Sto Niño Chapel, Brgy. Pinamgo, Bien Unido, Bohol
	28 participants representing fishers, seaweed growers, farmers, women, youth sectors, and the Barangay Council	38 participants representing fishers, seaweed growers, farmers, women, and the Barangay Council
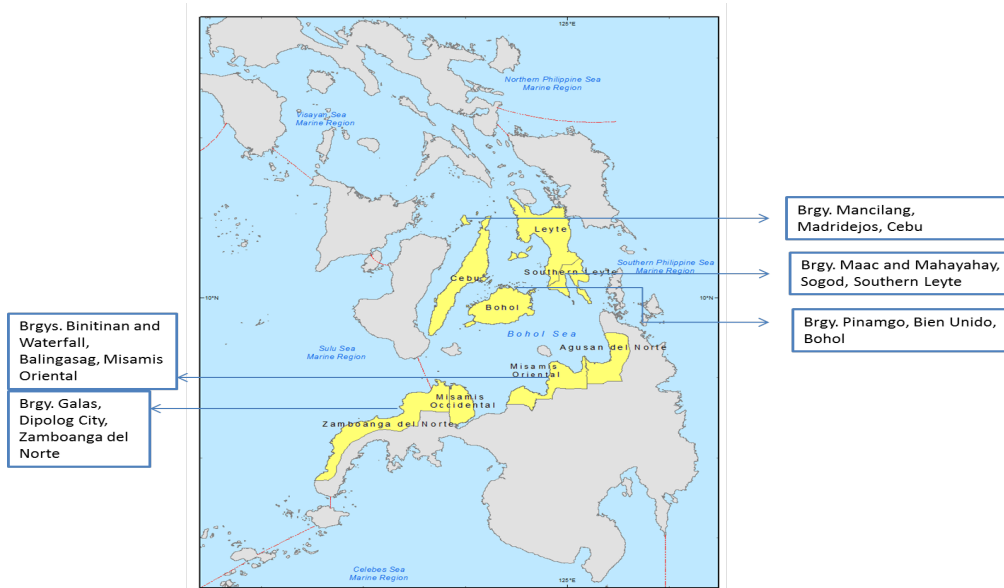
Figure 1. Map of the VisMin Hub.

Fishing is the main livelihood, but seaweed farming has gained popularity since it was tried by local fishers in the 1990s when Super Typhoon Ruping incidentally brought ashore fragments of the red algae *Kappaphycus*. The seaweeds were cast adrift from other island barangays already into producing and drying seaweeds for export since the 1980s (Neushul and Badash, 1998). Bien Unido is currently the top seaweed producer in the Central Visayas region (Anon, 2007; Hurtado, 2013; Largo, 2006; Trono, 1999).

Endowed with natural resources, Pinamgo had been the focus of many biodiversity conservation programs in the past (Peñalba *et al.,* 1994; World Bank, 1989; FISH, 2010); a marine protected area (MPA) has been established near it. Pinamgo has consistently been a recipient of funding aids for mangrove rehabilitation and conservation. It also produces rice, coconut, and other economic crops. Despite this stature, this barangay remains poor.

More than 64 percent of the barangay's families are food and income poor (www.bohol.gov.ph). In the whole of Bohol, the annual per capita poverty threshold is pegged at US\$ 8 per day (Poverty Status of the Philippines, 2012), but in Pinamgo families earn less than this, or about US\$ 6 per day. To compensate for the low income, many are engaged in multiple livelihoods. Some seaweed farmers are also into fishing, and fishers into seaweed growing or rice farming and other land-based livelihoods. Others provide labor services, i.e. fetching water and splitting of seaweeds. These are among the critical reasons for placing Pinamgo, along with seven other barangays, under the CRP 1.3 AAS.

4. Evolution of Organically-Developed PM&E in Pinamgo

The Community Life Competence Process (CLCP) facilitated our team's entry into Pinamgo. It was a process or a journey of facilitating and supporting a "community to become competent", i.e., the community members were enabled to address their concerns or problems by themselves (CGIAR

AAS, 2012b). Our team, hereinafter referred to as the "AAS team," was made up of members from WorldFish, partner organizations and local community facilitators (LCFs) of varied disciplines and experiences. CLCP allowed us to do the same in the context of the team and the communities we started to work with.

Following initial SALT ('S' for support, stimulate and share; 'A' for appreciate; 'L' for listen, learn and link; 'T' for transfer and team) visits to the site, we facilitated the development and implementation of CVAP together with the community.

In between the CVAP and ROD, the community carried out activities outlined in their plans or ToCs with the AAS team expediting the proceedings. The AAS team followed the broad guidelines of the program (CRP AAS, 2012b; Apgar and Douthwaite, 2013; Douthwaite *et al.,* 2014; Dugan *et al.,* 2012) and at the same time bridged the community partners with stakeholders both internal and external to them that the team has had prior or current links and are seen as potentially beneficial in addressing the community's ToCs through voluntary or facilitated buy-ins.

While the CRP 1.3 AAS program is in itself the intervention applied globally, regionally and locally (CRP AAS, 2012a), activities done locally to address the initial specific requirements of the communities' plans may be regarded as "intervention" as well but in the sense of "plausible promise" (Douthwaite, 2006; 2010) or "follow-the-technology" (Douthwaite *et al.,* 2003a) approaches *only* to catalyze learning and innovation by PAR (Apgar and Douthwaite, 2013;

Douthwaite *et al.,* 2014). These approaches lent themselves conveniently to the present case study not only because they addressed real life problems of our partner community, but also led to the shaping of research themes in the context of the ToC, resulting in local stakeholder- or farmer-/fisher-centric inquiries making up the *research initiatives* of the program. This is diametrically in contrast to the prevailing conventional researcher-led framing of research inquiries in development programs. The RinD (Dugan *et al.,* 2013) approach of AAS is thus rooted or may yet take root in this nested heuristic of the program.

Having been through SALT, the AAS team wove in seamlessly into CVAP. Pinamgo derived its action plans from a series of separate workshops within CVAP, with the community's representative sectors participating: women and youth (WY), fishers and farmers (FF), and the Barangay Council (BC). In the "business-as-usual" planning approach done in the past or by most NGOs or development organizations, this is usually preceded by a "needs-based approach" (e.g., technology needs) or "deficiency-based approach" (e.g. problem-based). AAS, however, is a strength-based approach. Hence, although they were first asked to discuss and list down issues and concerns, the participants were also asked to articulate their dreams for the community through sketches and drawings, explain to each other what those meant, and used each individual's dream to form what emerged as their sector's dream for the community. Each sector then discussed how their issues and concerns affected their dreams and what they would do to achieve the latter. Issues

and concerns tended to weigh down the discussion, which drifted towards the need for "capital" and "funding." This caused tension because expectation for funding support was surfacing as paramount. Probing on elements of the dreams, however, tempered this trend and re-directed the discussion towards the need to improve agricultural productivity.

The following day, the community again examined its dreams, grouped the issues and concerns into common themes, and assessed their current state in relation to how they were addressing the listed concerns,

adopting CLCP's self-assessment tool in Table 2. It was introduced as a game which allowed the participants to self-rate and come up with a collective decision on how the community might be rated based on their individual ratings -- a process simulating critical thinking, comparative assessment (i.e., between individuals, among themselves), decision-making and "crowd sourcing" (Surowiecki, 2003). Had this been business-as-usual, the mean of individual scores could have been used to represent them collectively. While this reductionist thinking is

Table 2 Self-assessment framework used in the CVAP

Scale	1	2	3	4	5
Description	We are aware of the practice, but do not know what to do.	We know enough what to do, but do not do it yet.	We do it once in a while with some results.	We do it regularly and systematically, with good results.	We do it naturally. The process has become part of our lifestyle.
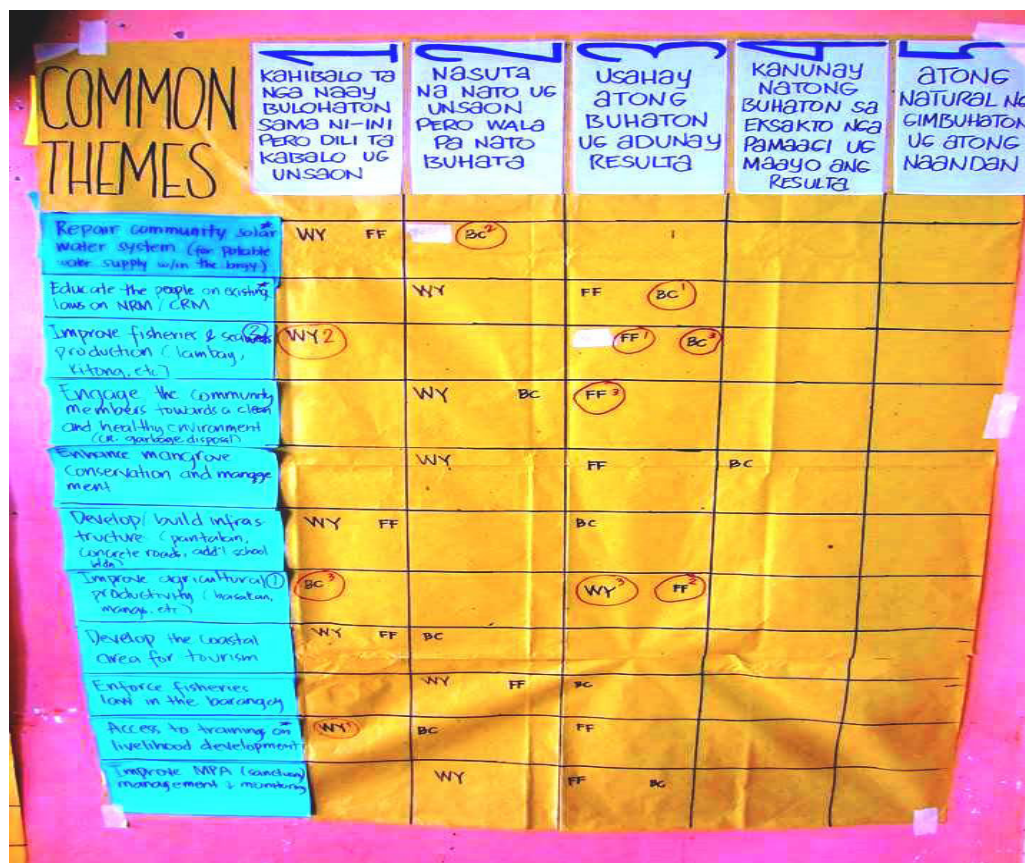
Figure 2. The common themes gathered from the group dreams and their corresponding self-assessment ratings.

quantitatively ingenious and makes for a fast draw, it puts a ceiling on the strength of diversity (Surowiecki, 2003) with which this tool was precisely designed to harness in the first place.

The ratings for each common theme by sector were presented in a plenary (Fig. 2). The community viewed them to decide which theme to consider practicable to take up in the first year of the program and to prioritize 3 themes to address out of the 11 presented.

The results show that sector WY chose "access to trainings in livelihood development" as its first priority and thought that the community was at Level 1, i.e., "we are aware of the practice but do not know what to do." Its second priority was "improve fisheries and seaweed production" at Level 1, while the third priority was "improve agricultural productivity (*basakan*, mango)" at Level 3, i.e., "we do it once in a while with some results."

Sector FF chose the themes "improve fisheries and seaweed production" at Level 3, "improve agricultural productivity (*basakan*, mango)" at Level 3, and "engage the community members towards a clean and healthy environment" at Level 3 as its first, second and third priorities, respectively.

Sector BC's first priority was the theme "educate people on creating laws on natural resource management (NRM)/coastal resource management (CRM)" at Level 3; second, the theme "repair community solar water system (for potable water supply within the barangay)" at Level 2, i.e., "we know enough what to do, but do not do it yet", and third, the theme "improve fisheries and sea-

weed production" at Level 3.

The prioritization in Figure 2 indicates that the theme "improve fisheries and seaweed production" was shared by all sectors, with WY assessing their group to be at Level 1. The theme "improve agricultural productivity (*basakan*, mango)" was shared by the WY and FF sectors, both at Level 3. These then automatically emerged as the community's first two priority themes.

Across sectors only two themes were common to them; they differed in their third choice. After an intense discussion/negotiation the third priority turned out to be "repair community solar water system (for potable water supply within the barangay)", with the women at first disappointed but eventually accepted it.

In summary, of the 11 common themes assessed, these three priority themes emerged as a collective decision of the community: 1) Improve fisheries and seaweed production; 2) Improve agricultural productivity; 3) Repair the community water system

After knowing how these would be addressed, the participants constructed action plans for each theme, which are summarized in Table 3.

In retrospect, the concerns should not have been quickly translated into English, but discussed fully with the participants through facilitation. Since it was our first experience, however, the pacing was hurried and quickly resulted in the listing in Figure 2. This actually could have been the opportunity to *bridge* knowledges (Berkes, 2009; Kristjanson *et al.,* 2009; Rogers *et al.,* 2013), not letting one knowledge dominate over the other, but each discipline exerting

Table 3 Action plan of Brgy. Pinamgo for the three priority themes

Priority Actions/ Dreams	Action to Take	Resources Needed	Person Responsible	When?
Improvement of fisheries and seaweed production (from Levels 2 – 4)	**Fisheries** . New fishing gear and study the ways and impact of the nature of fish cage operations	Researcher; expert	BFAR; Councilors F. Dabasol and E. Valmoria; Barangay Resolution	August 2013: Finding expert September 2013 or July 2014: conduct of study
	Seaweed . Sourcing of good quality seedlings from neighboring barangay/island	Funds to buy seedlings; people's organization (PO)	BFAR; DTI; GOs; NGOs; Barangay Council; Seaweed farmers; POs	August/ September 2013
	. Identification/ Selection of appropriate materials for seaweed farming (expert) . Technical assistance on seaweed farming . New technologies in seaweed farming	Consultant Researcher	Resolution; Councilors F. Dabasol and E. Valmoria; WorldFish	August 2013: Finding of expert September 2013/July 2014:Start of the study
	.Research on value chain of seaweed; .Formulation of strategies for market price negotiation; . Organizing the seaweed farmers	Researcher; person who will lead the organization	Resolution	
Improvement of agricultural production (from level 3 – 4)	. Trainings on appropriate technology for mango and pineapple production	Barangay Resolution; Venue; BYOP (Bring Your Own *Pagkaon*)	Barangay Council c/o Hon. R. Margate and Hon. R. Librado	Resolution: August 2013 (2nd week) Actual training: 10 August 2013
	.Backyard gardening; production of seedlings, other suitable crops, fertilizers	Seedlings; organic fertilizers; hand axe; experts	All households	September 2013 onwards
	. Training on proper care of livestock (carabao, cow, native chicken, goat)	Barangay Resolution; Venue	DA; DOST; Councilor Margate	November 2013
	. Construction of small water impounding system	Resolution (barangay, municipal & provincial)	DA; Councilors Margate and Gentapa	Resolution: August 2013 Construction: January 2014 onwards
	Planting of hybrid coconut trees	Seedlings (aromatic coconut seedlings)	Provincial Board Garcia; Councilor Margate; Philippine Coconut Authority	August 2013 (2nd week) Actual planting: December 2013 onwards
Repair of community water system (from level 3 – 4)	. Inspection of existing pipe/faucet stand . Estimation of the main wiring and materials required for pump installations . Ask WorldFish to identify funding sources . Seeking of funding support from barangay/municipal/ provincial LGU and Congressman . Barangay Resolution - submit workplan to provincial, municipal and congressman	Skilled worker (plumber, electrician); electric water pump; water pipe and pipe fittings; funds	Barangay Council; Municipal Engineer; Municipal Committee on Infrastructure	August 2013
	Project proposal preparation		Municipal and Barangay Councilors and Barangay Chairman; WorldFish	September 2014
	Follow-up of the barangay resolution		Barangay Chairman	February 2014

effort to understand how each one perceived the problem in relation to context, and how a common understanding of it might then be derived. This could have been *transdisciplinarity* (Apgar *et al.,* 2009; Reyers *et al.,* 2010) in the making.

Nevertheless, to demonstrate one of Pinamgo's ToCs, we extracted the action plan on mangoes as example and showed it in Table 4. The training plan stated that for their community to improve its agricultural productivity (particularly mangoes), the participants should want to undergo trainings on mango production for them to move from Level 3 ("we do it once in a while with some results") to Level 4 ("we do it systematically with good results") (Table 2) using only a barangay resolution to legitimize the

plan of action and using the community's own resources (i.e., bring your own food), with the barangay officials in charge of coordination and for the trainings to commence on 10 August 2013. With "trainings" as input to cause them to produce mangoes in a "systematic" manner "with good results" as outcome to achieve the community's dream of improving agricultural productivity sums up a *theory of change* wherein WorldFish provided the expert ("plausible promise," cf. Douthwaite 2002; 2010) to take charge of the trainings.

Each row in the action plan matrix (Table 3) represents a theory of change which attempts to home in on the overarching theory of change of Pinamgo: "improve agricultural productivity." This matrix may be regarded in part as a logical framework because it is and has "means and end" (Dale 2003) yet ceases to be a conventional logical framework strategy (i.e., donor-agency-centric) that development organizations employ or deploy. It is a product of partner participation, an emergent PAR, devoid of rigid indicators feeding into a static M&E that may strangle the ToC surreptitiously (Bakewell

and Garbutt, 2005), and is thus adaptive to context and to *unpredictable* future events.

Had business-as-usual been followed, the community might have required a restricting 4 x 4 matrix of rows (goals, purpose, project output, and activities) set against columns (narrative summary, project targets or objectively verifiable indicators, means of verification, and assumptions), producing the conventional "logframe" - a convenient can of plans and indicators and a presumably very easy to audit checklist that would have no bearing at all on the dynamic learning of and between partners implementing the actions. In contrast, as flexible and adaptive as it is (Douthwaite *et al.,* 2003b), the ToC in the AAS RinD approach gives in to the truism that there can indeed be no simple solutions to complex problems (Appleyard, 2011; Douthwaite *et al.,* 2003b).

4.1 Testing the ToC by Revisiting the Dreams

A year after CVAP, the community revisited its dreams, with the AAS Team facilitating, to assess the results of the implementation of its ToC and determine whether actions in the plan produced outcomes con-

Table 4 Action plan of Brgy. Pinamgo for improving agricultural productivity

Community Dream	Current Level	Target Level	Actions to Take	Resources Needed	Person/s Responsible	When?
Improve Agricultural Productivity	3	4	Trainings on appropriate technology on mango & pineaple production	Barangay resolution; Venue; meals (bring-your-own-food)	Barangay Council c/o Kagawad R. Margate Brgy. Captain Librado	Resolution: 2nd week August 2013 Training:10 August 2013
			Backyard gardening; production of seedlings (other suitable crops), fertilizers	Seedlings; organic fertilizers; pickaxe; *bolo* (large cutting tool); experts	All households	September 2013 onwards
			Training on proper care of livestock (carabao, cow, native chicken, goat)	Barangay resolution; venue	Barangay Councilor R. Margate; DA; DOST	November 2013
			Construction of a small water impounding system	Resolution at the barangay, municipal & province levels	Barangay Councilor R. Margate; DA; Municipal Councilor E. Gentapa	Resolution: August 2013 Construction: January 2014 onwards

sistent with their vision. We looked back on what had been accomplished; identified the constraints and opportunities encountered; adjusted or redefined the plans; and *defined* the variables for monitoring progress. The focus was to determine whether change occurred as a consequence of the ToC, or if it did not, what impeded it. To assist us in this reflection activity, simple methods/tools were used such as timeline review and a modified self-assessment where the participants, with our facilitation, described their current status and set targets, and action plans.

To reinforce our demonstration of the impact of ToC as explained earlier, we continued using the mango ToC as example, the timeline chart derived from sectoral focus group discussions or FGDs (mango group now) identified as "improvement of agricultural productivity (mango and vegetables)" group -- a plenary of which an extract of their reconstruction is shown in Table 5.

Except for the months of October through December 2013, a subset of the community, the mango group, had full schedule. Although they were a month late on the trainings, the participants trained together with the mango expert until some of their trees bore fruits that were harvested in June, the exact duration of the training. The lull months of 2013 coincided with the Bohol earthquake in October and Typhoon Yolanda in November. Traveling to Bohol during those times was deemed risky, hence no trips to it were made.

The ROD proved that the ToC for mangoes did produce outcomes such as the on-site trainings on mango production which were based at first on tree baseline assessments led by the expert, followed by lectures and demonstrations on pruning, flower induction, integrated pest control, bagging to post-harvest treatment.

What had been learned from this process? In Table 5, a lot of details were omitted. These details, written in cards, however, were recovered from the photographic documentation of our partners' expression of outcomes (Figure 3).

Table 5 Timeline of Brgy. Pinamgo for improving agricultural productivity

Priority Action	2013							2014					
	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Improve agricultural productivity	SALT visits	CVAP	Survey visit to Pinamgo of mango production expert, Dr. Conrado Oliveros	Conduct of mango training and orientation by Dr. Oliveros				Flower induction training conducted by Dr. Oliveros with Dr. Avila (WorldFish) & Mr. Quiao	Start of spraying		Bagging of mangoes (18-20 April)		Harvest of mangoes
				Start of pruning					Checking by Dr. Oliveros if flowers had bloomed already & the progress and/or problems encountered; spraying of trees started 26 Feb				Hot water treatment; mango group after-action review
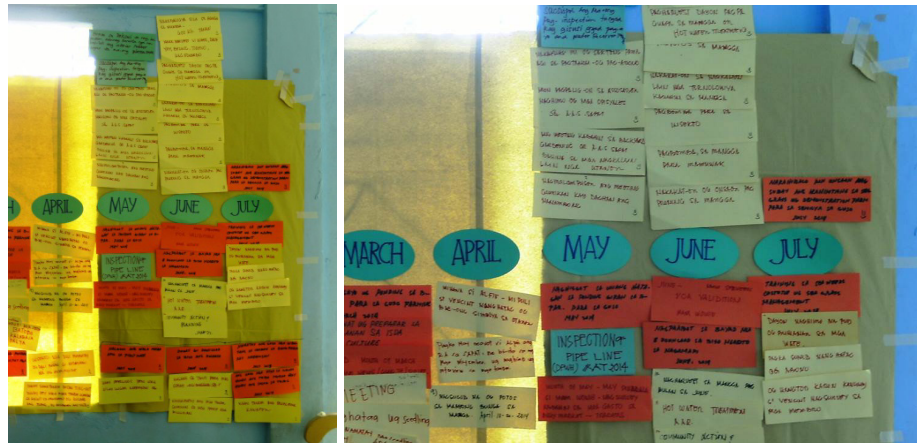
Figure 3. Assessment of the actions taken by the community towards the achievement of Brgy. Pinamgo's dreams detailed in a timeline.

Some of the cards contained the participants' insights and statements indicating significant outcomes of the mango production initiative, such as:

- *"Nakabaligya sila bunga sa mangga, 600 kilos tanan"* (They sold [fruits of the] mango [trees], 600 kilos altogether).

- *"Naka-harvest si* Nahil, Dave, Beling, Yoy, Torino, Kagawad Eduardo" (Nahil, Dave, Beling, Yoy, Torino, Kagawad Edwardo were able to harvest).

- *"Pag-harvest dayon pag-paguwapa sa mangga on* 'hot water treatment'" (After harvesting, the mangoes were subjected to hot water treatment to make them blemish-free).

- *"Nakakat-on lain-lain nga teknolohiya kabahin sa mangga"* (I learned a variety of technologies applied on mangoes; in Cebuano, "nakakat-on" is profound as when one learns from mistakes).

- *"Pagbomba para sa insekto"* (Spray against insects).

- *"Nakakat-on unsaon pag pronning sa mangga"* (I learned how to prune the trees).

- "Nakaharvest sa mangga sa bulan sa June" (I was able to harvest during the month of June).

- "Hot water treatment AAR"

- "Community action planning"

- *"Kulang sa tawo para maka-spray"* (Lack of people to do the spraying).

Summarizing such outcomes in one-line statements such as "harvest of mangoes" shown in the timeline above precludes what Douthwaite et al. (2014) have pointed out -- that the focus in AAS is less on how a "project goes from inputs to impact", but more on "using theory of change" for people to become "more *aware* (our emphasis) of how change happens and what they can do to influence it towards commonly agreed goals". Besides, "the validity of a ToC depends in part on the process to develop it," the same authors have stressed, and we agree.

Because the outcomes were recorded in the language (Cebuano) used by participants in their day-to-day affairs, such change in behavior or practice increased the likelihood that these changes were indeed internalized. As in CVAP a year ago, the next move was to plot the steps based on outcomes emerging

from the ToC (mango) just examined by PAR (timeline reconstruction) using self-assessment to determine future outcomes to concentrate on. CVAP's assessment tool could have been used, but the AAS Team designed a straightforward instrument for the participants. Table 6 shows the result of the assessment of their status vis-à-vis their dream of an improved agricultural productivity, which consequently defined each level in the self-assessment framework.

With the levels now defined (mangoes only), the AAS or facilitation team asked the mango group "to map their current and desired situations for each priority project", with the assessment tool emerging as the "self-assessment framework" (Table 4) featuring Level 1 as the lowest and Level 5 as the highest situations. Level 5 automatically became the "desired situation". From this framework, the facilitation team asked the mango group to "craft" the resultant action plan shown in Table 7.

These are now the emerging ToCs (in mango production) boxed in a logframe and replete with expected output and milestones. The action plan reads: To improve agricultural productivity through the production of mangoes off-season, they will prune the mango trees before spraying on such date using money from a source, with members of the NAGAMAPI providing labor. The accomplishment of such will be indicated by "cleaned mango orchard" which then will lead to the next action, that is, "apply fertilizer immediately after cleaning" -- exactly the logical stepwise flow of "means to end" described by Dale (2003) whose uses are critiqued by Dale (2003) himself and Bakewell and Garbutt (2005), and likewise, exactly what Douthwaite et al. (2014) are cautioning their audience about.

Crafted this way, the ToC becomes a good management tool for managers, as well as implementers to execute the project not only in a linear fashion, but ensuring that

Table 6. Self-assessment framework of the revisited dream of Brgy. Pinamgo on improved agricultural productivity

Levels	Mangoes	Vegetable Gardening
5	• Production of good quality mangoes • Increased mango harvest, preferably three times a year • Increased demand for the barangay's services for mango production • Enhanced accessibility and application of new technologies on mango production	• Establishment of vegetable planting as one of the main sources of livelihood in the community • Improved vegetable harvests sold to neighboring islands
4	• Good price and good harvest	• Supply 80% of the required vegetables in the island
3	• Proper scheduling of spraying (i.e., not coinciding with the in-season mango production)	• Weekly harvest of vegetables • Supply 30% of the required vegetables in the island
2	• Cleaning of mango planting area and fencing as protection from theft and stray animals	• Improved vegetable planting for increased harvest
1	• Need to plant additional mangoes • Lack of farm input and equipment (e.g., insecticide, handsaw for pruning)	• Vegetables in good condition because of rain or adequate water supply • Additional technical training on planting techniques

Table 7 Action plan for mango production in Brgy. Pinamgo

Outcome Target	Action	When to Start	What	Who	Expected Output	Milestones
Mango production out of season Target harvest thrice than the recent 600 kg	Pruning of mango trees before spraying Fertilizer application immediately after clearing/ cleaning Flower induction to start in September 2014	August 2014	Finances; cleaning materials	NAGAMAPI*; DA; LGUs from the barangay & municipal levels; DOST; community members and owners of mango trees/orchard	Mango trees to bearing fruits even off-season	Cleaned mango orchards Materials for mango production ready and available
Planting of additional mango seedlings (5/member)	Planting of mango seedlings Application of the learned mango production technologies	September 2014	Seedlings, fertilizers, pesticides	NAGAMAPI members	500 trees planted by 100 members	Mango seedlings planted and survived
Training and orientation on mango production	Find a mango expert to conduct training and orientation for new members	September 2014	Notebook, ballpen, visual aid	Mango expert and NAGAMAPI members	New members trained already on mango	Trainer identified with the help of DOST & WorldFish

* NAGAMAPI – Nagkahiusang Gagmay'ng Mananagat sa Pinamgo (Federation of Small Fishers in Pinamgo)

targets are indeed met. As such, this tool gives itself the power to direct and *predict* outputs. The above results demonstrate how powerful the ToC is when used as PM&E as it warns the PAR group that the trajectory of implementation, while logical, is now a linear step-by-step path quite unlike that of AAS. The next course of action is obvious.

The resultant action plan(s), however, is not unwelcome as it is since the targets appear to have been based on assumptions derived from knowledge obtained from the training courses and practice with the expert during the year, and thus can be regarded as learning outcomes. They are stepwise objects, i.e., "need to plant additional mangoes", "proper scheduling of spraying"

to "production of good quality mangoes" are the steps actually undertaken (practice) when managing mango production, and explain the resultant management logframe (i.e., linear ToC). The specific "targeting" appears to have been a function of the tool used (self-assessment tool) since tools do not emerge spontaneously but are designed according to purpose.

This then reveals the difference between the tools used during the CVAP and the ROD, with the former perhaps designed to foster innovation and the latter, good management practices and predictability of outcomes. Tools can be cognitive and hence educational or simply deterministic. What may be valuable in AAS, however,

is a ToC that allows flexibility for "unusual suspects" to emerge -- "harnessing" and not "controlling" the elements of the system (Axelrod and Cohen 2000; Meadows and Wright 2008; Surowiecki 2000). Clearly, it stresses the importance of tools in PM&E. There is an opportunity to further test the ToC dynamically in real time -- the advantage of RinD over other approaches.

On reflection, the definition of specific output/milestones can be a *major* turn-around from the systems approach (Axelrod and Cohen 2000; Meadows and Wright 2008) that took AAS-Philippines off the ground in 2013. Having recognized it as such is also a major lesson that may take the program forward, when remedial actions are made to correct the trajectory by PAR. As seen now we are addressing the ToC as the PM&E of RinD, a learning tool as well, and a dynamic one at that.

The mechanism of change is not the program of activities per se but the response that the activities generate (Weiss 1995; Stame 2004).

5. Learnings from Implementation

5.1 Building a Monitoring and Evaluation (M&E) System on ToC by PAR

As stated by Douthwaite et al (2014: 10, MS), "we are now in the process of building an M&E system that will in part work to bring data and insight to the periodic reflection and revisiting of ToC" just described – a PAR process.

From the experience mentioned, it is clear that since planning for implementation, data were already being collected in the form of notes, photographs, journals, after action

reviews (AARs; CGIAR AAS 2012b; EC-FAO n.d.; Serrat, 2010), during SALT visits, FGDs, plenary sessions, and others. Doing this is an act of observing or monitoring because these are records or evidence of what has occurred or is occurring (Burns, 2014) that will eventually be evaluated within the context of the ToC and the program. Because by nature this is action research, the evaluated data then may constitute the "next moves" or plans to be deliberated on and eventually acted on again.

Since not all "next moves" are accepted or have actually worked, unsuccessful ideas are weeded out. The accepted ones are then fed into the M&E and categorized according to its five components: performance reporting, outcome reporting, M&E for learning, information management, and evaluation research with their corresponding tools (Douthwaite *et al.,* 2014).

The iteration goes on – allowing recombination analogous to genetic recombination in sex, only that those weeded out are not deleterious alleles in meiosis and sex as in the latter, but ideas or plans of action that seemingly are not practicable or those that are reasonably opposed in negotiation - a kind of idea recombination (Douthwaite, 2002; 2010; Ridley, 2010) when contributed by different people of a group to form a new idea. Ideas that work when acted upon are thus *selected for* and those that do not are *selected against* and may be regarded as mimicking natural selection (Darwin, 1958) or Douthwaite's (2002, 2010) learning selection model. Here in this project, as change occurred, our M&E similarly evolved (Douthwaite *et al.,* 2003b).

PAR requires explicit articulation of intent and all members of a PAR group agree to solve a problem identified by their group (Burns, 2014). Although not apparent in the beginning, the community engagement just described was already using elements of PAR, i.e., plan, act, observe and reflect. Only, it was not yet a trust-building process towards PAR since trust would precede agreement. In this sense though the process could already be regarded as PAR towards building the PAR group and as shown the resultant plans of action were not imposition, but plans emerging from engaging a putative PAR group, i.e., engagement with the community in CVAP, an outcome of CLCP-AAS.

Business-as-usual planning does not have room for this flexibility because by convention, the logframe cannot be changed.

6. Conclusion

From the empirical observations discussed, the CVAP ToC, at this point, which in effect is an outcome of the CLCP engagement, has emerged and evolved as functional PM&E and as such, a process of being tracked by community partners (Douthwaite *et al*., 2003b; Kania and Kramer, 2013; Patton, 1994; Rogers, 2008) during the revisiting of dreams using time-line as tool. This in turn has yielded an action plan due for another PAR evaluation, underscoring the dynamism (Kania and Kramer, 2013) accorded to it by PAR itself, which is in part the nested RinD.

The project has demonstrated that the ToC in AAS has generated its own PM&E by PAR. In so short a time, our experience has yielded outcomes likely to support AAS'

overall theory of change, perhaps through the so-called Intermediate Development Outcomes or IDOs, and hopefully the System Development Outcomes or SDOs (CRP 1.3 AAS 2012a) in the future, hence the title of this paper.

It has not escaped our notice though that it is highly unlikely that the lessons we learned from this reflection approximate most closely the lessons our partners gained from their own reflections. This is because the lessons they obtained from the mango training are more of value to them now than the lessons we learned together from them learning how to grow mangoes. But the insight about how they learned how to grow mangoes is precisely that which can help us make them learn even more about farming mangoes.

References

Acosta, A. and B. Douthwaite. (2005). Appreciative inquiry: An approach for learning and change based on our own best practices. ILAC Brief 6, The Institutional Learning and Change (ILAC) Initiative, hosted by the International Plant Genetic Resources Institute (IPGRI), CGIAR, July 2005, 4p.

Anon. (2007). Bohol seaweeds industry: Value chain analysis and development plan. Bohol Agricultural Value chain study (BHL-02). AusAID Philippine-Australia Local Governance Development Facility and SDC-Asia, Strategic Development Corporation – Asia. 154pp.

Apgar, M. and B. Douthwaite. (2013). Participatory Action Research in the

CGIAR research program on aquatic agricultural systems. CGIAR Research Program on Aquatic Agricultural Systems. Penang, Malaysia. Program Brief, AAS-2013-27.

Apgar, J.M., A. Argumendo, and W. Allen. (2009). Building transdisciplinarity for managing complexity: Lessons from indigenous practice. *International Journal of Interdisciplinary Science,* 4(5): 255-270.

Apgar, M., B. Douthwaite, W. Allen and R.P. Ybarnegaray. (2015). Getting beneath the surface in program planning, monitoring and evaluation: Learning from use of Participatory Action Research and Theory of Change in the CGIAR Research Program on Aquatic Agricultural Systems. Draft Paper submitted to Action Research.

Appleyard, B. (2011). The brain is wider than the sky: Why simple solutions don't work in a complex world. London: Phoenix.

Axelrod, R. and M.D. Cohen. (2000). Harnessing complexity: Organizational implications of a scientific frontier. New York: Basic Books.

Bakewell, O. and A. Garbutt. (2005). The use and abuse of the logical framework approach: A review of international development NGOs' experiences - A report for SIDA. INTRAC, International NGO Training and Research Centre. November 2005. 27p.

Berkes, F. (2009). Evolution of co-management: Role of knowledge generation, bridging organizations and social learning. *Journal of Environmental Management* 90: 1892-1702.

Burns, D. (2014). Assessing impact in dynamic and complex environments: Systemic action research and participatory systemic inquiry. Centre for Development Impact, Practice Paper, 8 September 2014, 10pp. www.ids.ac.uk/cdi

Campbell, B.M. and J.A. Sayer. (Eds.). (2003). Integrated natural resource management: Linking productivity, the environment and development. Cambridge, MA: CAB International Publishing and Center for International Forestry Research (CIFOR), xii+315p.

CGIAR Research Program on Aquatic Agricultural Systems. (2012a). CGIAR Research Program on Aquatic Agricultural Systems Program Proposal, Penang, Malaysia. AAS-2012-07.

CGIAR Research Program on Aquatic Agricultural Systems. (2012b). CGIAR Research Program on Aquatic Agricultural Systems Roll-Out Handbook, Ver. 1.0, May 2012, Penang, Malaysia, AAS-2012-05.

CGIAR Research Program on Aquatic Agricultural Systems. (2012c). Program Partnerships. CGIAR Research Program on Aquatic Agricultural Systems. Penang, Malaysia. AAS-2012-19.

Chambers, R. (1988). Sustainable livelihoods, environment and development: Putting poor rural people first. Institute of Development Studies, Discussion Paper 240. 30p.

Christie, P., N.B. Armada, A.T. White, A.M. Gulayan and H.H.Y. de Dios. (2006). Coastal environmental and fisheries

profile of Danajon Bank, Bohol, Philippines. Fisheries Improved for Sustainable Harvest (FISH) Project, Cebu City, Philippines. 63p.

Dale, R. (2003). The logical framework: An easy escape, a straitjacket, or a useful planning tool. *Development in Practice*, 13(1): 57-70.

Darwin, C. (1958). The origin of species by means of natural selection or the preservation of favoured races in the struggle for life. New York: Mentor.

Douthwaite, B. (2002). Enabling innovation: A practical guide to understanding and fostering technological change. London: Zed Books.

Douthwaite, B. (2010). Enabling innovation: Technology- and system-level approaches that capitalize on complexity. *Innovations /Tech4Society*. pp.179-196.

Douthwaite, B. and S. Schulz. (2001). Spanning the attribution gap: The use of program theory to link project outcomes to ultimate goals in INRM and IPM. Paper presented at the INRM Workshop, 2001, Cali, Colombia, 28-31 August. 18p.

Douthwaite, B., M. Apgar and C. Crissman. (2014). Monitoring and Evaluation Strategy Brief. CGIAR Research Program on Aquatic Agricultural Systems. Penang: Malaysia. Program Brief: AAS-2014-4.

Douthwaite, B., J.D.H. Keatinge and J.R. Park. (2002). Evolutionary learning selection: A model for planning, implementing and evaluating participatory technology development. *Agri-cultural Systems* 72(2): 109-131.

Douthwaite, B., N. de Haan, V.M. Manyong and J.D.H. Keatinge. (2003a). Blending "hard" and "soft" science: The "follow-the-technology" approach to catalyzing and evaluating technology change. *In*: BM Campbell and JA Sayer (Editors). 2003. Integrated natural resource management: Linking productivity, the environment and development. Center for International Forestry Research, Cambridge, MA: CABI Publishing. pp. 15-36.

Douthwaite, B., T. Kuby, E. van de Fliert and S. Schultz. (2003b). Impact pathway evaluation: An approach for achieving and attributing impact in complex systems. *Agricultural Systems* 78: 243-265.

Dugan, P., M. Apgar and B. Douthwaite. (2013). Research in development: The approach of AAS. AAS Working Paper. CGIAR Aquatic Agricultural Systems, 7p.

EC-FAO. n.d. After action reviews and retrospects. Food Security Information for Action Practical Guides, Overseas Development Institute's Research and Policy Development (RAPID) Programme. http://www.fao.org/elearning/course/FK/en/pdf/trainerresources/PG_AARRetrospects.pdf

Estrella, M. and J. Gaventa. (1998). Who counts reality? Participatory monitoring and evaluation: A literature review. IDS Working Paper 70. 70pp. (https://www.ids.ac.uk/files/Wp70.pdf)

Estrella, M., J. Blauert, D. Campilan, J. Gaventa, J. Gonsalves, I. Gujit, D.

Johnson and R. Ricafort. (Eds.). (2000). Learning from change 1: Issues and experiences in participatory monitoring and evaluation. Published by Intermediate Technology Publications.

Fisheries Improved for Sustainable Harvest (FISH) Project. (2010). 7 years & 4 Seas: Our quest for sustainable fisheries. A special end-of-project report to partners on the implementation of the Fisheries Improved for Sustainable harvest (FISH) Project in Coron Bay, Danajon Bank, Lanuza Bay and Tawi-tawi Bay, Philippines, 2003-2010. Fisheries Improved for Sustainable Harvest (FISH) Project, Cebu City, Philippines. 252p.

German, L. and A. Stroud. (2007). A framework for the integration of diverse learning approaches: Operationalizing agricultural research and development (R&D) linkages in Eastern Africa. *World Development* 35(5): 792-814.

Greenwood, D. and M. Levin. (1998). Introduction to action research: Social research for change. Thousand Oaks, California, Sage Publications.

Hill N.A.O. (2011). Livelihood diversification for conservation: Interactions between seaweed farming and fishing in Danajon Bank, Central Philippines. Ph.D. Dissertation, Imperial College of London, University of London and Institute of Zoology, Zoological Society of London, England.

Horton, D. and R. MacKay. (2003). Using evaluation to enhance institutional learning and change: Recent experiences with agricultural research and development. *Agricultural Systems,* 78: 127-142.

Hurtado, A. Q. (2013). Social and economic dimensions of carrageenan seaweed farming in the Philippines. p. 91-113. In Valderrama, D., J. Cai, N. Hishamunda and N. Ridler. (Eds). 2013. Social and economic dimensions of carrageenan seaweed farming. FAO Fisheries and Aquaculture Technical Paper No. 580. Food and Agriculture Organization of the United Nations, Rome.

James, C. (2013). Theory of change: A guide for small and diaspora NGOs. Oxford, United Kingdom: The Peer Learning Programme for Small and Diaspora Organization.

Kania, J. and M. Kramer. (2013). Embracing emergence: How collective impact addresses complexity. *Stanford Social Innovation Review*, 21 January 2013. 15p.

Kantor, P. (2013). Transforming gender relations: A key to lasting positive agricultural development outcomes. CGIAR Research Program on Aquatic Agricultural Systems. Penang, Malaysia. Brief: AAS-2013-12.

Kantor, P. and M. Apgar. (2013). Transformative change in the CGIAR Research Program on Aquatic Agricultural Systems. Penang, Malaysia. Program Brief: AAS-2013-25.

Kristjanson, P., R.S. Reid, N. Dickson, W.C. Clark, D. Romney, R. Puskur, S. Macmillan and D. Grace. (2009). Linking international agricultural research knowledge with action for sustain-

able development. *Proceedings of the National Academy of Sciences in the United States of America,* 106(13): 5047-5052.

Largo, D.B. (2006). Diseases in cultivated seaweeds in the Philippines: Is it an issue among seaweed industry players? p. 61-70. In S.M. Phang, A.T. Critchley and P.O. Ang, Jr. (Eds). Advances in seaweed cultivation and utilization in Asia. Universiti of Malaya, Kuala Lumpur.

Mayne, J., B. Douthwaite and E. Stern. (2013). Evaluating natural resource management programs. Penang, Malaysia: CGIAR Research Program on Aquatic Agricultural Systems. Practice Brief: AAS-2013-23.

Meadows, D.H. and E. Wright. (Eds.). (2008). Thinking in systems: A primer. White River Junction, Vermont, U.S.A.: Chelsea Green Publishing. 218p.

Neushul, P. and L. Badash. (1998). Harvesting the Pacific: The blue revolution in China and the Philippines. *Osiris*, 13: 186-209.

Ostrom, E. (2009). Beyond markets and states: Polycentric governance of complex economic systems. Prize Lecture, 8 December 2009, Nobel Prize. 37p.

Page, S.E. (2007). The difference: How the power of diversity creates better groups, firms, schools, and societies. Princeton, NJ: Princeton University Press.

Patton, M.Q. (1994). Developmental evaluation. *American Journal of Evaluation*, 15: 311-319.

PCARRD-DOST. (2006). Mango production manual. PCARRD Book Series No. 1657-C/2006. Los Baños, Laguna, Philippines: Philippine Council for Agriculture, Forestry, Natural Resources Research and Development, Department of Science and Technology. 127p.

Peñalba, L.M., M.S. de los Angeles and H.A. Francisco. (1994). Impact evaluation of the Central Visayas Regional Project Phase I (CVRP-I). Philippine Institute for Development Studies. Discussion Paper Series No. 94-22. Makati, Philippines 81p.

Perrin, B. (2002). How to – and how not to – evaluate innovation: Evaluation. *International Journal of Theory, Research and Practice,* 1(8): 13-28.

Pretty, J.N. (1995). Participatory learning for sustainable agriculture. *World Development,* 23(8): 1247-1263.

Ridley, M. (2010). The rational optimist: How prosperity evolves. New York: HarperCollins.

Reason, P. and H. Bradbury. (2008). Handbook of action research: Participative inquiry and practice. 2nd ed. London, United Kingdom: Sage Publications.

Reyers, B., D.J. Roux and P.J. O'Farrell. (2010). Can ecosystem services lead ecology on a transdisciplinary pathway? *Environmental Conservation*, 37(4): 501-511.

Rogers, P. 2008. Using programme theory to evaluate complicated and complex aspects of interventions. *Evaluation*, 14(1): 29-48.

Rogers, K.H., R. Lutton, H. Biggs, R.O. Biggs, S. Blignaut, A.G. Choles, C.G. Palmer and P. Tangwe. (2013). Fostering complexity thinking in action research for change in social-ecological systems. *Ecology & Society*, 18(2): 31.

Sangole, N., S. Kaaria, J. Nuki, K. Lewa and M. Mapila. (2014). Community-based participatory monitoring and evaluation: Impacts on farmer organization functioning, social capital and accountability. *Journal of Rural and Community Development,* 9(2): 128-148.

Sayer, J.A. and B.M. Campbell. (2003). Research to integrate productivity enhancement, environmental protection, and human development, p.1-14. In Campbell, B.M. and J.A. Sayer. (Eds.). 2003 Integrated natural resource management: Linking productivity, the environment and development. Cambridge, MA: CAB International Publishing and Center for International Forestry Research (CIFOR), xii+315p.

Serrat, O. (2010). Conducting after-action reviews and retrospects. Washington, DC: Asian Development Bank.

Stame, N. (2004). Theory-based evaluation and types of complexity. *Evaluation* 10(1): 58-76.

Strathern, M. (Ed.). (2000). Audit cultures: Anthropological studies in accountability, ethics and the academy. London: Routledge.

Surowiecki, J. (2003). The wisdom of crowds. New York: Anchor Books.

Trono, G.C. Jr. (1999). Diversity of the seaweed flora of the Philippines and its utilization. *Hydrobiologia,* 398/399: 1-6.

Ward, A., E. Minja, M. Blackie and G. Edward-Jones. (2007). Beyond participation - building farmer confidence: Experience from Sub-Saharan Africa. *Outlook on Agriculture,* 26(4): 259-266.

Waters-Bayer, A., P. Kristjanson, C. Wettasinha, L. van Veldhuizen, G. Quiroga, K. Swaans and B. Douthwaite. (2015). Exploring impact of farmer-led research supported by civil society organisations. *Agriculture & Food Security,* 4: 4, DOI 10.1186/s40066-015-0023-7.

World Bank. (1989). Philippines: Environment and natural resource management study. A World Bank Country Study, PUB -7388. Washington DC: World Bank, xxii+170p.

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