



Development and Climate Change in the Mekong Region

Case Studies



edited by

Chayanis Krittasudthacheewa

Hap Navy

Bui Duc Tinh

Saykham Voladet

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Email: gerak@gerakbudaya.com / Website: www.gerakbudaya.com

and

Stockholm Environmental Institute - Asia (SEI-Asia)

15th Floor, Witthyakit Building,

254 Chulalongkorn University, Soi Chula 64, Phyathai Road,

Pathumwan Subdistrict, Bangkok 10330

Thailand.

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Knowledge coproduction for recovering wetlands, agro-ecological farming, and livelihoods in the Mekong Region

Carl Middleton, Kanokwan Manorom, Nguyen Van Kien, Outhai Soukkhy and Albert Salamanca

The Mekong Region contains extensive wetlands of high levels of biodiversity that have long provided a wide range of ecosystem services that are equally important to human well-being (ADB 2012). In many cases, these wetlands have long been important for agro-ecological production, including rice and vegetable farming, livestock raising, fishing and aquaculture, and the collection of non-timber forest products (NTFPs), thus supporting local livelihoods and economies (MEA 2005; Wezel et al. 2009; Arthur and Friend 2011). Unfortunately, many wetlands in the Mekong Region have been degraded or even lost, largely due to agricultural intensification, large-scale water infrastructure development, and land use changes associated with urbanization (Hughes 2017). The extensive loss of wetlands is a threat to sustainable economic development through the loss of core ecosystem services that they provide. It also threatens the enjoyment of a range of human rights, including the rights to life, health, food, water and culture (Knox 2017). When traditional wetlands agro-ecological practices are lost, so too are the local knowledge and culture associated with them.

Addressing complex problems such as the loss of wetlands requires gathering and activating a range of different types of knowledge, including scientific (expert), local, practical, and political (van Kerkhoff and Lebel 2006). In this chapter, we present three case studies of knowledge coproduction research in Thailand, Vietnam and Laos aimed at the more inclusive ecological governance of wetlands degraded by large-scale water infrastructure and the recovery of associated agro-ecological

systems and livelihoods. We consider knowledge coproduction to be the dynamic interaction of multiple actors, each with their own types of knowledge, who coproduce new usable knowledge specific to their environmental, sociopolitical and cultural context and that can influence decision-making and actions on the ground (Schuttenberg and Guth 2015).

The first case study focuses on collaborative wetland zoning and educational tourism at the Rasi Salai and Hua Na irrigation projects in Si Sa Ket province, northeastern Thailand. The second case study addresses four floodplain floating rice–vegetable agro-ecological systems in An Giang province and Dong Thap province, in the Vietnamese Mekong Delta. The third case study is on organic rice production in two villages in Xaybouly district, Savannakhet province, Lao PDR. All three case studies were selected on the basis that they have experienced wetland degradation due to water infrastructure projects which have had adverse impacts on farmers and fishers whose livelihoods were linked to the wetland ecosystems, as well as the willingness of various boundary partners to engage in the project.

Van Kerkhoff and Lebel (2006: 448) argue that it is “the interaction between research and other sources of knowledge that is often crucial for understanding the role of research-based knowledge in action.” In other words, producing expert knowledge alone is not enough to result in competent decisions and robust solutions (Cash et al. 2003). Multiple state and non-state actors must often collaborate to identify and implement solutions (Lemos and Agrawal 2006), although where there are divergent interests, values or beliefs between actors, contestation is the more likely outcome (Smajgl and Ward 2013). Indeed, expert knowledge may be treated with suspicion by civil society and community groups that consider it aligned with powerful state and private sector agendas (Wells-Dang et al. 2016). In mainland Southeast Asia, various forms of local research have emerged since the 1990s, including *Tai baan* (villagers’ research) sometimes deployed as a “counter-hegemonic” response to expert knowledge (Scurrah 2013). In other cases, local knowledge has been documented in collaboration with universities (Manorom 2009) or the state, as in the case of Community Health Impact Assessment in Thailand (Middleton et al. 2017).

There is a growing body of literature exploring how designed knowledge coproduction processes that catalyze interaction among researchers and multiple state and non-state actors can create usable knowledge for action towards inclusive and sustainable development (van Kerkhoff and Lebel 2006; Clark et al. 2016). Here, knowledge coproduction is understood as both a governance strategy and a research strategy (Schuttenberg and Guth 2015).

Researchers have already amassed insights into how to design knowledge coproduction processes within complex environmental resource governance environments (van Kerkhoff and Lebel 2006; 2015; Frantzeskaki and Kabisch 2016). For example, Schuttenberg and Guth (2015) propose the need to consider: individual and organizational co-productive capacities; the socio-ecological system context; and the co-productive process, each of which contribute towards attaining immediate, intermediate and long-term goals. They emphasize that goals can only be achieved when there is a shared understanding of the problem and a genuine constituency formed to solve it (see also Lang et al. 2012). This requires appropriate representation, capacity, trust, and commitment to learning. The process involves iterative stakeholder interaction “which facilitate a shift from disparate, self-focused perspectives of a problem into a holistic, collective framing” (Schuttenberg and Guth 2015:15), and processes of social learning that integrate diverse knowledge systems. Frantzeskaki and Kabisch (2016) highlight that for successful knowledge coproduction, processes should encourage: openly shared knowledge; inclusiveness to multiple types of knowledge; and knowledge that is perceived as legitimate. They furthermore emphasize that knowledge produced through the process should ultimately be usable (i.e. it can directly influence decisions), and actionable (i.e. applicable and relevant).

In this chapter, we argue that the knowledge coproduction approach enables research to move beyond weak forms of “participation” and towards social learning that builds trust, partnership and ownership among actors, and can generate innovative solutions for wetland and livelihood recovery. The chapter is structured as follows. In the next section, we outline the overall research methodology. Then, in the following three sections we detail the research process, results and outcomes for each case study in turn. In the final sections, we discuss and conclude on the implications of the research.

Methods

Our methodology draws upon recent knowledge coproduction literature. We aimed for a “learning mode” of knowledge coproduction (van Kerkhoff and Lebel 2006) where researchers engage boundary partners in iterative processes of research and action; researchers sometimes took on the role of facilitator, whilst also providing expert knowledge input at times. Simpson et al. (2015) observe that collaborative processes open up the possibility of “challenging and changing stakeholder interests and positions, and for gaining the acceptance of compromises and trade-offs that are necessary for good problem-solving,” although it is dependent upon the uncoerced convening of boundary partners in the first place. Whilst power imbalances will inevitably persist throughout the process (Schuttenberg and Guth 2015), this mode entails a conscious attentiveness to power relations through the design of the process, in particular to ensure inclusivity (van Kerkhoff and Lebel 2015). To the extent possible, as academic researchers, we were reflexive of our own positionality in the process. In the eyes of our boundary partners, as academic researchers, we were mostly viewed as holding relative objectivity and authoritative knowledge. Indeed, it is this (perceived) position—together with a long-standing relationship with some or all of the boundary partners—that enabled each research team to convene the knowledge coproduction process.

In each case study location, boundary partners were first identified by the research teams including communities, government agencies, and civil society groups. In the case of Thailand and Vietnam, the research teams already had strong relationships with these groups, whilst in the Laos case study the research team had a connection with a local government agency (table 2.1).

Table 2.1. Case study locations and boundary partners

	Rasi Salai & Hua Na dams, Si Sa Ket Province, Thailand	Floating rice, An Giang & Dong Thap provinces, Vietnam	Organic agriculture, Savannakhet province, Laos
Boundary partners			
Community	Community leaders from Nong Kae sub-district	116 households growing floating rice	25 farming households
Civil society	Khon Taam Association, Taam Moon project	Farmers' association at four communes, and district (mass organization)	
Local government	Nong Kae sub-district Administrative Organization	Vinh Phuoc and Luong An Tra People's Committee (commune), Tri Ton district People's Committee; My An and Tan Long People's Committee	Xayaboury District Agriculture and Forestry office (DAFO) staff
State agencies	Royal Irrigation Department (RID), and several related line agency offices (Natural Resources and Environment; Forestry; Fishery; Livestock)	Department of Environment and Natural Resources and Department of Agriculture and Rural Development	Provincial Agriculture and Forestry Office (PAFO) and DAFO
Private sector		Rice producers, traders and nutritional business in Long Xuyen and Can Tho cities, tourist companies (Vietgreen Tour)	Resettlement Management Unit of the Nam Theun 2 Power Company (NTPC)

In each location, we first undertook qualitative scoping surveys with each boundary partner to define the diverse visions, goals, values and beliefs towards the wetlands and the associated agro-ecological farming system. An initial analysis defined areas of agreement and divergence among boundary partners (Smajgl and Ward 2013). This led to inception

workshops in each location that brought together all partners and initiated a process of co-framing the problems faced. At the workshops, participants shared perspectives and deliberated goals and potential research projects. The inception workshop and subsequent activities and meetings can be understood as intentionally created “arenas of knowledge coproduction” (van Kerkhoff and Lebel 2006) (see discussion). Within this arena, we brought together different groups of actors, cognizant of their different interests and relative alliances and networks (van Kerkhoff and Lebel 2006; Simpson et al. 2015).

Following the inception workshop, divergent pathways were taken in each country, according to the proposed project emerging from the inception workshops. Details are discussed in each case study below, where we outline the background and study area; the research process; and outcomes. We undertook activities with our boundary partners from October 2014 to March 2017, as detailed below. Documentation of the process was via qualitative interviews, recorded observation, and documentation of the activities and meetings. At the mid-way and end points of each project, most-significant-change interviews were conducted with selected boundary partners.

Northeast Thailand: Collaborative wetland zoning and educational tourism

In 1993, the Rasi Salai irrigation dam was built on the Mun River in Si Sa Ket province, Northeast Thailand—the dam would lead to over two decades of, at times, intense conflict between the communities whose livelihoods were harmed by the project and the government agencies that built and operated it. The dam was built without an environmental or social baseline assessment or an Environmental Impact Assessment, and has been estimated to irrigate only 1,600 ha of the originally planned 5,500 ha (Living Rivers Siam 1999; 2000). The project’s reservoir inundated around 10,000 ha of a wetlands area locally called *Pa Boong Pa Taam*, which was important for rice and fishery production, vegetables and herbs, and cattle grazing, with impacts on livelihoods (Sretthachau et al. 2000).

In response to the construction of the Rasi Salai dam, affected communities organized protests, including occupying the dam area for 189 days in 2007, after which the government began to provide long-promised compensation. Since then, conflict surrounding the project has gradually

de-escalated, although it occasionally still flares up. A Participatory Social Impact Assessment (PSIA) was finally published in 2009, and negotiations began on how lost livelihoods could be recovered (Manorom 2009). Based on the recommendation of the PSIA, the Ministry of Agriculture and Cooperatives in partnership with Ubon Ratchathani University has supported, since 2012, activities to recover degraded wetlands for food security and ecological services, demonstrate local development activities (organic agriculture/green market), and promote integrated farming systems and fish conservation, and conduct information and education campaigns on wetland conservation. To coordinate negotiations with the government, communities affected by the Rasi Salai dam, together with communities affected by a second dam called Hua Na located approximately 80 km downstream, formed the Taam Moon Association. As part of the compensation package, the Royal Irrigation Department (RID) provided 30 *rai*¹ of land to the Taam Moon Association and a grant to build a community learning center.

Study area

The research was undertaken where Rasi Salai is located, in Nong Kae subdistrict (NKS). NKS is mostly downstream of the dam, and has also been impacted by the Hua Na dam reservoir downstream. NKS comprises of 17 villages with a population of 7,708 people. Hydrologically, NKS is a floodplain of the Mun River, with a diversity of wetland ecologies. The main occupation in the area is agriculture, with the most important activities being wet-season rice farming, dry-season rice farming that relies on water pumped from ponds in the wetlands, vegetable cash crop production (onions, garlic and chili), and livestock raising (cattle, poultry). Other activities include fishing; handicrafts; and the collection of products from the forest and wetlands. The younger generation tend to migrate to work in urban areas, as well as to access higher education. Meanwhile, middle-aged and elderly family members stay behind to farm and take care of the children.

Many community members in NKS who have lost farmland and wetlands have been highly active in social movements in Northeast Thailand over the past 20 years. As a result, they have: experience and a deep knowledge of the concept of participation; developed skills to articulate their claims and negotiate with the government; and have a

sophisticated analysis of the issue of “development” in Thailand, and what their rights are, including under the various iterations of Thailand’s Constitution.

Process

The Mekong Sub-region Social Research Center (MSSRC), Ubon Ratchathani University team, who are the conveners of this sub-project, held several rounds of individual meetings and interviews with each boundary partner identified in table 2.1 in February 2015 to discuss their values and vision for wetland recovery, and to identify shared visions and potential collaborative research projects. These interviews informed the design of a joint workshop, held in late March 2015 with 18 participants from nine boundary partners. Following a presentation analyzing the findings of the scoping survey by MSSRC, presented to key village leaders and boundary partners, subsequent discussion among the boundary partners explored the values of the wetlands, the impacts of the Hua Na and Rasi Salai irrigation dams, and the importance of recovering the wetlands. There was broad agreement that: 1) wetlands have been dramatically declining both in terms of quantity (one-third of the whole area around the Rasi Salai dam was identified as affected areas) and quality (degradation or loss of wetlands have harmed local livelihoods that depended on the wetlands); 2) there is a lack of coordination to manage and recover wetlands; 3) there are baseline data gaps on the wetland in terms of biophysical and socioeconomic data; and 4) there remain challenges on how to manage and recover lost wetlands, including flooded forest, fishery, aquatic resources, and dry-season rice farming in the wetland that have already been compensated for by RID, as many community members have continued to use the areas.

From this meeting, all boundary partners committed to work together on a research project. Two follow-up workshops in April 2015 led to an agreement that the research would focus on two themes:

- Collaborative wetland zoning, on the basis that there was a shared perceived need to clearly categorize the wetland area affected by the Rasi Salai dam, and designate permitted uses of particular areas within it. The focus would be on areas already compensated for by RID, and would balance community use with conservation objectives.

- Educational ecotourism, which was particularly supported by the community-based organizations, who had recently opened the “community learning center” near the Rasi Salai dam.

In mid-June 2015, another meeting was held to finalize the wetland zoning research strategy, which included a larger number of community leaders from NKS and other community-based organizations and government boundary partners. They prepared a resource mapping form that used Google maps to locate the data gathered. The research design allowed for the diverse forms of knowledge of those involved, ranging from GIS techniques by the government agencies, to knowledge of local ecosystems and their uses among the communities. From 20 to 22 June, the mapping exercise was undertaken in three locations: upstream of the Rasi Salai dam, in the flooded zone and non-flooded zone; downstream of the dam; and beyond the NKS area on the Naam Seiw River, a tributary of the Mun where community members also utilize natural resources. In three subsequent workshops, the group verified the data and agreed that there is a need to clearly categorize the wetland areas affected by the dam, and designate permitted uses within them.

The degree of collaboration between the state and non-state boundary partners in Rasi Salai was unprecedented, and the ongoing interaction through the collaborative research, as well as the knowledge generated, built a measure of trust in each other. However, it soon emerged in the post-mapping meetings that wetland zoning remained a contested issue between the groups participating, and also among community members outside of the meetings. Some land that had received compensation in the past from RID remained in private use or subject to disagreement over the level of compensation, whilst the RID’s general position was that this land should now be either allocated for conservation or collectively used by the community. In addition, long-standing disagreements over the level of water in the reservoir, which in turn relates to access to currently inundated land, also re-emerged. Thus, despite the measure of trust generated on all sides through the collaborative research, it became apparent that more time and resources beyond the scope of the project would be required to work through all the issues related to wetland zoning. Furthermore, a civil society leader trusted by many community members and who could also maintain a connection with the state

partners passed away during this period, leaving a significant gap in the relationship.

For educational ecotourism, over a series of meetings, tourism experts from the Faculty of Liberal Arts, Ubon Ratchathani University, worked with the boundary partners. In this project, civil society and community members emerged as most active over time, as it was intended that students would come to stay at the community learning center near the Rasi Salai dam. However, the government agencies generally supported the initiative, and met visiting students in their office as a part of the educational tourism agenda. The community members prepared an ecotourism brochure, identified tourist hot spots and stories associated with each place, designated tour guides, and managed the necessary logistics.

The educational tourism pilot was held from 14 to 15 November 2015 with masters-level students from Chulalongkorn University. Activities included: learning about the Taam Moon Association; a group discussion with dam-affected people; visiting the RID office to meet government officials; experiencing wetland livelihood activities, such as collecting wild potatoes and vegetables; listening to traditional music; making merit at the local temple; visiting and learning about the spirit forest; and a boat-trip through the wetlands.

Following feedback from the participant students, the university team and community leaders revised the design. Subsequently, a “grand tour” was organized in March 2016 with many local boundary partners, including government officials, complete with a booklet “Touring Around Wetlands” (fig. 2.1). Since the “grand tour,” at least three more tours were organized in the following six

Figure 2.1: “Grand Tour” participants’ booklet



months that have included university students, NGOs, academics and independent researchers, and now that the design is complete more tours can take place.

Outcome

The most visible outcome from the process was the shift from conflict to a greater degree of cooperation towards the Rasi Salai dam among boundary partners. Given the past history of social conflict in the area between the government agencies and the affected communities, the boundary partners were pleased to be part of the joint research, as they had never made this happen before. Trust was generated through the social interaction and joining activities of the project, such that a degree of cooperation emerged to resolve conflict over the wetland agro-ecosystems. This led to all boundary partners agreeing that the wetlands must be managed based on both local and scientific knowledge and participatory methods, although more remains to be done about this issue.

The educational tourism project has raised the profile of the wetlands as a resource for local livelihoods and ecological services for the outsiders who visited. It also generated legitimacy for wetland protection among the boundary partners. Community members could generate income from the activity, whilst government officers accomplished their mandate on sustainable wetland management.

Vietnamese Mekong Delta: Floating rice

Deepwater rice—also known as floating rice—is native to Vietnam’s Mekong River Delta, and, in the past was grown widely across its floodplains, particularly in the Long Xuyen Quadrangle and the Plain of Reeds. Floating rice begins to be grown in June with the start of the rainy season. River floodwater arrives in mid-August, during which time the rice stalks rapidly grow with the rising water levels. When the water level recedes in November, the rice stalks lie flat on the ground and they flower and produce grain which is then harvested in December. No pesticides, and only a small amount of chemical fertilizer (less than 50 kg of nitrogen/ha), are used (Nguyen et al. 2015). During the dry season, various vegetables and crops are grown, including cassava, leeks, pumpkins, chili, maize and mung bean, depending on the soil type and relief.

Before 1975, the total area of floating rice was estimated to be greater than 500,000 ha; by 1994, this had been reduced by 80 percent, and, as of 2012, only very small pockets of tens of hectares remain, mostly in An Giang province (Nguyen et al. 2015). The reduction is linked to Vietnam's agricultural policy of promoting agricultural intensification, including the introduction of high-yielding varieties (HYV) of rice and extensive dike construction (Nguyen and Pittock 2016). This has increased food production for domestic consumption and export, but also created a range of environmental and health problems including rising agrochemical pollution and reduced soil fertility (Käkönen 2008). There is a growing recognition among farmers, researchers and the government about the need for more sustainable agriculture. Some have focused on promoting integrated pest management and rice–fish farming that modifies existing practices (Berg et al. 2017). The revival of floating rice has also received some consideration (Nguyen and Pittock 2016).

Study area

The Research Center for Rural Development (RCRD) at An Giang University organized a knowledge coproduction process around the benefits and challenges of floating rice agro-ecological systems, including resilience during a drought year in 2015 when the Mekong's floodwaters were very low. RCRD collaborated with floating rice farming households in four communes:

- 30 households in Vinh Phuoc and Luong An Tra communes of Tri Ton district, An Giang Province, farming about 100 ha in total of floating rice;
- 43 households in My An commune of Cho Moi district, An Giang province who cultivate about 26 ha of floating rice; and
- 53 householders in Tan Long commune of Thanh Binh district, Dong Thap province who cultivated about 53 ha of floating rice.

Process

In order to map the opportunities and challenges faced by floating rice, and to co-design an intervention, first a participatory rural appraisal (PRA) was undertaken between December 2014 and March 2015 in each commune. In addition to the 126 farming households who cultivate floating rice, the RCRD team worked with the state agencies identified in table 2.1. A key expectation of these boundary partners emerging from this initial assessment was the desire to increase the market price of floating rice. Suggestions were made to build better relationships with rice traders and sellers, and also to promote awareness of the benefits of floating rice among consumers. Therefore, in two workshops held at An Giang University in February 2015 and Cho Moi district in June 2015, private sector rice traders and sellers from Long Xuyen and Can Tho cities were also invited, as well as the local media.

Although relative to HYV rice the yield of floating rice is low, when combined with dry season agriculture (cassava/ leeks/ chili/ corn) the PRA results indicated that the annual economic value of floating rice-based farming generated more financial returns to farmers per 1,000 m² (*cong*) (table 2.2). For the purpose of comparison, Table 2.3 details the cost-benefit ratio for other farming systems in the Vietnamese Mekong Delta, including additional studies on floating rice detailed in Nguyen et al. (2015).

Table 2.2. Cost-benefit analysis of floating rice farming systems

Locations	Farming systems	Net return (VND/1000m ²)	Cost-benefit ratio
	Floating rice-cassava	4,425,000	1.81
Vinh Phuoc & Luong An Tra communes	Floating rice-leeks	24,895,000	1.68
	Floating rice-chili	17,745,000	2.68
Tan Long commune	Floating rice-chili	16,763,314	1.12
	Floating rice-sticky corn-baby corn-baby corn-cattle	18,557,500	0.48
My An commune	Floating rice-sticky corn-baby corn-baby corn	11,025,000	1.24

Table 2.3. Cost–benefit analysis of rice farming systems

Locations	Farming systems	Net return (VND/1000m ²)	Cost–benefit ratio
Chau Phu district	3 rice crops/year	4,827,200	0.71
	2 rice crops/year	2,484,363	0.62
	2 rice crops + one cattle/year	13,959,780	0.56
Thanh My Tay commune	Chili + one cattle/year	15,685,217	0.54
	Chili + one <i>Sesbania sesban</i> crop	7,858,700	0.62
	2 rice crops + one <i>Sesbania sesban</i> crop	6,133,263	0.71
My Phu commune	2 rice crops	2,620,881	0.57
	2 rice crops + one cattle/year	11,960,101	0.50
	Maize–mung bean	11,047,000	1.07
	Mung bean–pumpkin–rice	4,496,826	0.40
	Maize–maize	21,014,000	1.75
	Floating rice–cassava	4,425,000	1.81
Tri Ton district	Floating rice–leeks	24,895,000	1.68
	Floating rice–chili	17,745,000	2.68
Thanh Binh district – Dong Thap	Floating rice–chili	16,763,314	1.12
Cho Moi district	Floating rice–sticky corn–baby corn- baby corn- cattle	18,557,500	0.48
	Floating rice–sticky corn–baby corn- baby corn	11,025,000	1.24

Source: Nguyen et al. 2015.

The PRA and subsequent workshops identified a range of qualitative values from floating rice production:

- Floating rice creates large amounts of straw which in the dry season is used as a mulch to cover soils on which vegetables are grown. This conserves soil moisture, reducing the need for watering, and adds to soil organic matter. As a result, farmers can save money on hired laborers and inputs.
- Floating rice during the flood period provides habitats for freshwater black fish, such as snake head, and white fish for daily consumption. They also make fish sauce during this time to store for home consumption for the year. These freshwater fish provide rich protein and micronutrients.
- In places where floating rice was reintroduced, wild freshwater fish returned. In contrast, there were less fish or even no fish in the HYV rice fields nearby using high dike compartments (fig. 2.2).
- Allowing natural flooding in the fields increases alluvial sediment deposition, reducing the need for chemical fertilizers.
- Income is diversified, as land used for floating rice is turned to vegetable production during the dry season.

Figure 2.2. Diversity of fish, crustaceans, and amphibians recorded by farmers at the stakeholders' workshop in Cho Moi district, June 2015



A shared objective among boundary partners that emerged from the PRA and workshops was to improve the marketing of floating rice. Reflecting on the qualitative values above, they proposed to emphasize that floating rice is nutritious, tasty and almost without chemical input. The latter is particularly salient with consumers in Vietnam who are increasingly concerned about food safety. From the early stages of the project, it was apparent that the marketing of floating rice was a key priority of all boundary partners. Thus, in December 2014, at the provincial fair in Long Xuyen city, 35 floating rice consumers were interviewed to understand their perceptions and willingness to pay for floating rice. 31 percent said they were willing to pay a higher price for floating rice, with a key reason being that the rice was perceived as good for health and “clean”, with no chemicals. At the fair, and subsequent similar events and individual meetings, farmers could connect directly to consumers and rice traders.

Before the project in 2014, in Tan Long and My An communes, most farmers cultivated floating rice to feed animals (stems from rice) or to sell to local customers who are generally older people or religious groups in various temples in Ho Chi Minh City, and in other sites they only sold to local farmers at a low price (VND5,000 per kg). From 2014 to 2015, when the farmer groups began marketing floating rice including via the local media, conferences, workshops, and at the floating rice harvest festivals, the price of paddy rose to VND 12,000 per kg–15,000 per kg. Many of the farmers have now signed contracts with companies who will buy their harvest, package and sell it in Ho Chi Minh City, and trust between farmers, researchers and business has improved. This is a pathway for promoting chemical-free rice farming for smallholders in the region.

In 2015, a major challenge experienced by floating rice farmers was that the level of the Mekong floodplain inundation was very low, leading to much of the floating rice paddies being destroyed by rats (VNS 2015). RCRD conducted interviews with the floating rice farmers in August 2016 to evaluate how they could adapt to and cope with droughts. Whilst the drought severely affected floating rice production, it was found that growing vegetables in the dry season instead resulted in a resilient farming system so that farmers could recover from the shock of income loss following the serious drought. Most farmers interviewed said they would continue to grow floating rice because they needed the straw for

dry season crops. They also noted that their income had improved since 2014 due to a significant rise in the price of floating rice. The floating rice-based system is diversified, so farmers can mitigate the impact of droughts with other income sources such as vegetable growing.

Outcome

The research process helped farmers—and the other boundary partners—to appreciate the value of floating rice for safe food production, maintaining biodiversity, recovering inland fisheries, improving the environment, maintaining good soil quality, and providing other necessary resources (rice straw) for crop production in the dry season. Based on interviews with floating rice farmers, the co-designed and implemented research made them feel more connected and more trusting towards the government and private sector. The project has also provided the farmers with links to consumers who would like to purchase the floating rice, which, in the process, increased the price of the rice sold. Consumers were willing to pay a higher price because they believe that floating rice is healthier. The nutritional value of floating rice and its ecosystems services were communicated via local and national media (newspaper and television) to the wider public.

The local government also became more aware of the importance of floating rice conservation. During the research period, the An Giang Provincial Department of Agriculture and Rural Development targeted to conserve 500 ha of floating rice by 2030 in agricultural development policies in Tri Ton district (AGDARD 2014). Recognizing the negative impact of agrochemical-intensive HYV rice production on the biophysical environment, one of the strategies of the Mekong Sustainable Development Goals is the restoration of traditional agro-ecological agriculture (Government of Vietnam 2017).

To cope with future uncertainty (droughts and floods), the local government of Tan Long, Vinh Phuoc and Luong An Tra communes now plan to upgrade their low dike systems to regulate water levels for floating rice. Also, the Tri Ton district people committee has developed a long-term program to promote agro-ecotourism at floating rice conservation sites to improve non-farm income for farmers.

Laos: Organic rice in Savannakhet province

Savannakhet is the most important rice-producing province in Laos, growing approximately 27 percent of the country's total production (DOA 2016). In recent decades, the intensity of agrochemical use has risen for dry-season rice, and to a lesser extent, wet-season rice. Recent Government of Laos (GoL) policy, however, has encouraged "Good Agricultural Practice" (GAP) for rice production that are broadly aligned with organic agricultural practices, although in some cases limited agrochemicals may be applied (although not in our study area). In October 2017, following several policy commitments by the GoL over previous years, China announced it would increase its import of GAP rice from Laos from 8,000 t in 2016 to 20,000 t in 2020 (*Laotian Times* 2017). Farmers from southern Savannakhet province officially began exporting rice to China in December 2015 (Xinhua News Agency 2016).

Study area

Our study area in Laos was located in Phonethan and Dong Yang villages in Xayaboury district, Savannakhet province. Xayaboury district is second only to Champhone district in Savannakhet in terms of rice production, producing 62,901 t of wet-season rice and 49,910 t of dry-season rice in 2016 on 14,600 ha and 8,928 ha, respectively (DOA 2016). Both villages are principally Lao Loum (i.e. ethnically lowland Lao), and mainly engaged in rice farming, although many villagers also seasonally migrate to work in Thailand. Fishing and livestock raising are also important secondary occupations. Phonethan village has a registered population of 452 people in 75 households, and Dong Yang village has a registered population of 321 people in 70 households.

Both villages are located near the Xe Bang Fai River that flows through Khammouane and Savannakhet provinces. Since 2010, the flood regime of the river has been altered by the operation of the Nam Theun 2 (NT2) dam, which has impacted water levels, rice production, fisheries, riverbank gardens and wetlands (Baird et al. 2015). According to local villagers, in the past, it would take seven to eight days of heavy rain to flood the farmland of Phonethan and Dong Yang villages. However, since NT2, they say it now takes only between two to three days to submerge the rice fields due to the new river hydrology. This has been a sensitive issue and can be difficult for the community to raise with the GoL.

Process

In January 2015, researchers from the Northern Agriculture and Forestry College (NAFC) undertook a series of individual interviews with the key boundary partners identified in table 2.1. Similar to the other case studies, the visions and strategies for livelihood improvement were discussed with each group. From the interviews, it became apparent that improving agriculture was a key concern.

Subsequently, in March 2015, a workshop was organized at the District Agriculture and Forestry Office (DAFO) in Xayboury district for 16 participants representing all of the boundary partners. At the meeting, DAFO proposed to increase the value of agricultural production including via targeting export markets, improving technology, and promoting contract farming. The Resettlement Management Unit of Nam Theun 2 (RMU) proposed livelihood diversification strategies, such as fish and frog raising. Farmer groups proposed organic rice production with their own brand with a goal of increasing income, and it was this latter proposal that was agreed among all boundary partners. DAFO and NAFC offered technical support for the transition to organic rice production using GAP principles.

In May 2015, a meeting was organized with fifteen farmers from Phonethan village and nine farmers from Dong Yang village, NAFC and DAFO to detail the strategy for organic rice production. The farmers believed organic rice production would be low cost, offer higher market prices, be safer for the environment, produce healthier final products, and was aligned with the government's new policies to promote rice exports. They also said that they had experience of organic production in the past, as this was how they used to grow rice. They were also keen to utilize the natural resources available in the village (cattle and poultry manure, green waste and legumes).

To minimize risk, it was agreed that each family would plant one *rai* of organic rice, which ranged between 10 percent and 30 percent of their total land area. Reflecting a principle of knowledge coproduction, NAFC and DAFO provided training on the principles of GAP and how to produce organic manure and bio-extracts. The NAFC researchers and DAFO team also visited several times over the duration of the wet season (May–October 2015) to provide technical advice. As per the farmers' request, the organic rice production was designed to use local resources and utilized low quantities of input.

With a satisfactory yield from the perspective of the farmers during the first wet-season of production, organic production continued over three further seasons with the support of the project: November 2015 to March 2016 dry season; May to Oct 2016 wet season; and November 2016 to March 2017 dry season. The number of participating farmers also grew, together with the area under production. In the first two seasons, there were 24 and 25 farmers cultivating 3.84 and 4 ha, respectively. In the final two seasons, there were 30 farmers cultivating 4.8 ha.

Outcome

Following the GAP transition, the calculated average yield was 2.3 t/ha for the rainy season crop in 2015,² which was satisfactory for the farmers especially given the soil was still in transition. Participating farmers expressed their satisfaction with the GAP system, with important reasons including: fewer inputs required during production, which were also available locally; more healthy food for producers and consumers; and better soil quality. The challenges encountered, however, included: the extra work required to produce GAP rice; the availability of local resources for fertilizers; and the difficulty of learning new techniques. Furthermore, although there is now a growing opportunity to sell organic rice to China, at present, the price increase for GAP rice compared to non-GAP rice is not significant; farmers consider an important next step to be to develop a brand and to market it so as to increase its market price.

Whilst the challenges and opportunities of GAP are relatively well documented, we suggest that the process of transition is also important. Farmers and DAFO both stated the project had enabled a closer collaboration through the knowledge coproduction approach, whereby new farming techniques were combined with local knowledge and existing practices and values. In the process, other issues could also be broached, such as the impact of the Nam Theun 2 dam upstream on farmers' livelihoods. Given the GoL's policy to promote GAP, based on the experience of our modestly scaled project, we suggest that building partnerships through collaborative research can benefit policy implementation and sustainability.

Discussion

The three case studies above reflect a range of types of degraded wetlands/floodplains and sociopolitical contexts within mainland Southeast Asia. Across this diversity, boundary partners were willing to engage in the knowledge coproduction approach, where the precise method was adapted to each particular context. In each case, we worked with boundary partners towards attaining a shared understanding of the real-world problem related to degraded wetlands, and how a research project could be collaboratively undertaken to contribute towards resolving the problem. Our own intention was to explore the possibility for collaborative approaches to work towards the resolution of complex problems, within which various forms of local and practical knowledge would be combined with expert knowledge to create new usable knowledge.

To catalyze knowledge coproduction, one key role of the researcher is to create “arenas of knowledge coproduction” (van Kerkhoff and Lebel 2006). In this project, these arenas included the workshops and other events that we organized, as well as interaction during the various research activities. Such arenas do not emerge spontaneously, but must be designed within the opportunities and constraints of existing power relations and through building trust among groups. Thus, a second key role of our research team was that of facilitator. Schuttenberg and Guth (2015: 15) propose as a principle for method design that “Even if there are power imbalances in the broader social context ..., the coproduction process needs to create an oasis in which stakeholders are given an equal voice so that trust, creativity, and shared understanding can develop.” In our approach, power asymmetries were acknowledged and, to the extent possible, reduced so as to encourage exchange and participation as equals. Within our process, for example, we emphasized the role of community members to define and legitimize research goals. As van Kerkhoff and Lebel (2006: 466) write: “power can no longer be ignored as it is intimately entwined with the ability to act.”

Knowledge coproduction by definition involves combining together local and expert knowledge through a process of co-convened research. In this project, we incorporated—but did not overly emphasize—the introduction of academic expert knowledge into the knowledge coproduction process. Examples of academic knowledge include: the provision of technical knowledge of organic GAP techniques in Laos;

guidance on educational tourism from Ubon Ratchathani University in Thailand; and in all three cases input into the boundary partners' research designs where needed. We sought to emphasize how the boundary partners' interactions in themselves could produce new usable knowledge, while also contributing towards building trust and shared perspectives among them. For example, in the wetland resource mapping at Rasi Salai, the government contributed practical knowledge of GIS techniques, whilst the participating community members shared their local knowledge of ecologies and social practices in each place. As highlighted by Olsson et al. (2004; see also van Kerkhoff and Lebel 2006), the emphasis is on how boundary partners not only participate in knowledge production, but learn through the process of situating themselves and understanding a particular knowledge system within which they are embedded (and producing). Thus, boundary partners interactions among themselves both produces new knowledge *and* social learning.

Van Kerkhoff and Lebel (2015) state that the quality of relationship is an important factor in knowledge coproduction, and that often 'sub-optimal conditions' exist that can test these relationships when a knowledge coproduction initiative is undertaken. In each of our cases, there was an element of historical contestation and thus limited trust among boundary partners. This was most evident at Rasi Salai, given the history of the project, and to a lesser extent in Laos where Nam Theun 2 dam had affected the community. The case of Rasi Salai in particular can be considered an "unstructured" problem (Smajgl and Ward 2013, citing Hisschemöller and Hoppe 1996), where there is high factual uncertainty or disagreement, and conflict over values/ beliefs/ norms among boundary partners. In contrast to "structured problems" when there is little dispute, unstructured problems are complex and require extensive analysis, negotiation, and possibly conflict resolution. At Rasi Salai, trust-building was attained through the meaningful participation of and deliberations among the boundary partners, but also based on a tentative desire for closer cooperation emerging from the PSIA completed in 2009 (as discussed above). All the steps of the wetland zoning and educational ecotourism activities were openly discussed and agreed upon prior to their implementation. Without such deliberation and agreement, the joint activities could not have gone ahead. Once they did, further interaction helped build relationships and trust between boundary partners. In the

case of Vietnam, meanwhile, the limited initial trust, in particular between the farmers and rice trading firms, was due to it being a new relationship, but once initiated by RCRD, trust rapidly grew as these boundary partners established practices of mutual benefit.

Conclusion

Agro-ecological farming has long been practiced in the Mekong region's productive and biodiverse wetlands. A contemporary challenge faced both by policy and practice is how to support wetlands and associated agro-ecological farming practices as an important foundation for regional resilience. This chapter has explored knowledge coproduction in three case studies in Thailand, Vietnam and Laos. We found that knowledge coproduction methodologies that meld together different types of knowledge, including scientific and local knowledge, have significant potential to produce usable knowledge for real-world problems. The process of co-identifying social challenges, research questions and research designs, achieved through a shared understanding among boundary partners, was necessary to proceed with the research itself. The role of a knowledge broker/facilitator/mediator, in this case our research teams, helped to build bridges between boundary partners and create "arenas of knowledge coproduction."

We found that once there was agreement to proceed with the research, which took multiple rounds of individual and group meetings, the interactions among participants in themselves increased trust, encouraging each actor to understand the problem from other points of view. This enhanced the possibilities for further collaboration, especially when there was concrete progress in addressing the real-world problem identified, as demonstrated in the Laos and Vietnam case studies, and in Thailand for educational tourism. However, entrenched conflicts, such as over wetland zoning at Rasi Salai dam, also reveal the limits of this approach. Thus, it is within limits that knowledge coproduction can contribute towards resolving social and environmental challenges achieved through building trust and partnership between boundary partners, generating usable knowledge and enabling social learning.

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Notes

¹ 1 rai = 1,600 m².

² The average yield for GAP rice production in Savannakhet province was 4.32 t/ha in 2015 (DOA 2016).

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