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Recognizing farmers' practices and constraints for intensifying rice production at Riparian Wetlands in Indonesia

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ABSTRACT

Despite its large acreage, riparian wetland has been underutilized in Indonesia. Intensity of agricultural activities on this wetland was very low mainly due to two unfavorable extremes, i.e. unpredictable occurrence of flooding during rainy season and drought during dry season. Relevant, affordable, and acceptable technologies are required as solution to this problems. The technologies should be developed based on actual needs, preferences, and absorptive capacity of smallholder farmers, to ensure adoption. Objective of this study was to explore needs, preferences, and absorptive capacity of smallholder farmers through direct observation on their farming practices and dialogs on constraints in intensifying food production at riparian wetlands in Indonesia. The study was conducted at five villages in riparian wetland ecosystem in South Sumatera, Indonesia, from January to June 2016. This qualitative research was conducted in two stages: started with no-preconception Grounded Theory procedure; then, followed by questionnaire-guided survey. Results of this study indicated that intensive observation on farmer's practices and dialogs on constraints in intensifying food production could reveal needs, preferences, and absorptive capacity of smallholder farmers. Observed farmers' practices include land preparation and soil quality improvement, seedling preparation, transplanting, cropping management, and harvesting. Dialogs disclosed that unmanageable constraint but urgently needed by smallholder farmers in intensifying food production was technology solution for uncertain and uncontrollable natural flooding and drought occurrence at riparian wetlands. Government intervention is expected for constructing infrastructure for water management at riparian wetlands, i.e. polder system.

1. Introduction

Riparian wetlands in South Sumatra cover about 2.98 million hectares. Of the total acreage, only about 298.189 ha or 10.0 percent of the total acreage has been utilized for agricultural production (BPS, 2015). This riparian wetland has long been traditionally cultivated with monoculture of rice at a relatively low productivity, around 2–4 tons/hectare. This underutilization and low productivity translate to an opportunity for increasing food production by sustainably intensifying agricultural practices and/or expanding the cultivated area.

Increasing rice productivity in suboptimal wetland ecosystem has always relied on application of appropriate technologies. Lakitan (2014) reminded that success in agricultural development had no longer been assessed solely based on increase in crop productivity or national production. It should also include inclusiveness and sustainability. However, despite the availability of rice-related technologies, their adoption by smallholder farmers in Indonesia has been low, especially at riparian wetlands, due to agronomical, financial, and/or socio-cultural constraints.

Pamuk et al. (2014) argued that slow rate of technology adoption by smallholder farmers was the key factor explaining why agricultural productivity in developing countries across the globe was stagnant, including in Indonesia. Technology adoption was associated with farmer's need, preference, and absorptive capacity (Kebede and Zizzo, 2015; Mariano et al., 2012; Wood et al., 2014), access to information (Asfaw et al., 2012), access to financial institution (Abate et al., 2016),

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and prospect for earning additional profit (Marra et al., 2003).

Pamuk et al. (2014) believed that a standardized, top-down innovation agenda was unlikely to fit heterogeneous farmers' need. Priority setting at the local level seems to be better if it was able to capture the diversity of needs. Moreover, Aguilar-Gallegos et al. (2015) suggested that diversified and tailor-made technology diffusion should be designed to optimally support diverse clusters of farmers.

Persuading farmers to adopt a new technology would not be simple, since it is associated with changing what has been practiced for many generations to something that farmers are not yet familiar with. Albeit the new technology promises higher productivity and better income. To mitigate these constraints, intermediary organizations had emerged to assist agricultural entrepreneurs to articulate demand, and forged linkages with those who can provide innovation support services and managed innovation processes. Minh et al. (2014) suggested that agricultural extension office could play role in intermediating communication and interaction between technology developers and farmers. Based on its role, Klerkx and Leeuwis (2008) endorsed agricultural extension to become an innovation intermediary.

In Indonesia, smallholder farmers and rural communities were familiar with cooperative institution. This cooperative could be an effective complementary partner of agricultural extension. Abebaw and Haile (2013) found that cooperative membership had a strong positive impact on technology adoption, suggesting that cooperatives could also play an important role in accelerating adoption of agricultural technologies by smallholder farmers.

Many modern technologies have been introduced to farmers at riparian wetlands in Indonesia. However, only few have been adopted and regularly used by smallholder farmers. Low adoption of the technologies might be due to: (a) technically unsuitable for riparian wetlands (agronomic incompatibility), (b) economically less profitable compared to current farmer's practices (economic disadvantage), (c) socio-culturally unacceptable to the local community (social constraint), or any combination of these three.

Aerni et al. (2015) revealed that there were frequent mismatches between supply and actual demand in agricultural innovation system. These mismatches could be reduced by aligning the agricultural innovation systems towards demand-oriented and responsive to the needs of smallholder farmers. Klerkx and Leeuwis (2008) recognized the need of balancing supply and demand sides. Both supply side (technology developers) and demand side (technology users) had experienced constraints in effecting transactions and establishing the necessary relationships for engaging in demand-driven innovation processes.

Majority of related stakeholders and supporting actors thought of agriculture innovation as a linear process. From this perspective, key actors in agricultural innovations were researchers as technology creators, extension workers as mediators, and farmers as technology users (Pamuk et al., 2014). Lakitan (2013) observed that research and technology development activities in Indonesia were mostly academic-oriented and rarely focused on solving real problems or providing relevant technologies for enhancing economic development and/or improving social welfare.

Recently, the global trend towards demand-driven agricultural research has focused attention on inclusion of farmers in the process of research planning and executing. Theoretically, this approach would enhance ownership, increased applicability of the research, and increased technology adoption (Klerkx and Leeuwis, 2009).

Technology adoption was a decision at the individual farmer's level (Saka and Lawal, 2009). At community level, technology adoption was a gradual process because of heterogeneity among potential adopters (Barham et al., 2015; Nielsen et al., 2013). Genius et al. (2013) found that farmer decision to adopt the technology mainly based on potential economic benefits. Lambrecht et al. (2014) divided technology adoption into three-step processes, i.e. awareness, trial, and adoption. First, this information was received from extension services and peers. Through trials, the farmer accumulated knowledge on using the technology. Then, decision to adopt the technology was based on farmer's own experiences.

Muzari et al (2012) suggested that for encouraging farmers to adopt new technologies, researchers must look beyond simply boosting productivity. They should emphasize certain variables which reduce farmer's vulnerability to loss of income, health problems, natural disasters, and other factors. Moreover, an understanding of the local cultural practices and preferences were also important. Based on the importance of knowing farmer's needs, preferences, and absorptive capacity; technology development should be shifted from supply-pushed to demand-driven approach. Technology developed based on demand will likely be more relevant to farmer's needs and preferences; therefore, it has better possibility to be adopted (Lakitan, 2013). Klerkx and Leeuwis (2009) agreed that demand-driven research would enhance ownership and increased the applicability of research and improved probability for successful technology adoption.

There were main challenges that had been identified: (1) adoption of agricultural technology by smallholder food crop farmers was low; (2) recent agricultural technologies were mostly not developed based on demand; (3) direct involvement of farmers in the process was very limited; and (4) regulations and public policies fall short in creating conducive ecosystem for agricultural innovation system. These factors can be explored through dialogs with farmers and/or direct observation on their agricultural practices. Objective of this study was to explore needs, preferences, and absorptive capacity of smallholder farmers through direct observation on their farming practices and dialogs on constraints in intensifying food production at riparian wetlands in Indonesia.

2. Methods and academic rationale

This study was conducted during the first half of 2016, at five villages within riparian wetland ecosystem of Pemulutan District, South Sumatera, Indonesia. The villages were Pemulutan Ulu, Pelabuhan Dalam, Teluk Kecapi, Sukarami, and Muara Dua. The study used a mixed qualitative methods, organized in two stages. The first stage was employing Grounded Theory procedure. The second stage was employing questionnaire-guided survey to measure magnitude of selected issues and strength of relationship between interrelated issues.

2.1. The first stage: identifying main issues and mapping links among issues

Objectives of the first stage study were to identify issues and capture linkages and pattern of crop cultivation practices by smallholder farmers at studied locations, conducted from January to April 2016. Instead of justifying established theory (deductive approach), the grounded research was used for capturing real issues and for developing a new theory (inductive approach) through continuous interplay between data analysis and collection. There were no up-front hypothesis and preconceived ideas formulated in this research (Glaser and Strauss, 2009).

Data and information on farmer's needs and preferences were collected through an up-close-and-personal dialogs with local farmers. Absorptive capacity was analyzed from farmer's responses and statements during the dialogs. Absorptive capacity reflects ability of farmers to apply recommended technological inputs that have been proven beneficial to crop cultivation. For instance, in rice cultivation, the recommended application rate of nitrogen fertilizer is 200 kg per hectare, based on local soil condition. If a farmer does not or only apply the fertilizer less than recommended rate, then the farmer is categorized as low absorptive capacity. For quantitative variables, absorptive capacity can be quantifiable. This principle is also applicable to other recommended agricultural inputs, i.e. other beneficial agrochemical, water supply, seed of high-yielding variety, agricultural machinery, etc.

In general, farmers will have higher absorptive capacity if there is only small adjustment required from their common practice. For