



Introduction and Adoption of Rice Intensification System towards Low-Input Agricultural Production in Vietnam

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Abstract This paper illustrates the viewpoints of the government, farmers' organizations, namely Agricultural Production Cooperatives (APCs), and individual farmers in relation to the introduction and adoption of a System of Rice Intensification (SRI) in Vietnam. It also identifies factors that can promote or impede the social shift towards fewer agricultural inputs through the SRI method. The qualitative analysis is based on field studies in three communes in the Red River Delta as well as interviews with relevant actors in Vietnam in order to describe each actor's viewpoints and the realities of farmers' behaviors towards agricultural inputs. We demonstrated that farmers could correct their overuse of pesticides and herbicides by SRI adoption through training opportunities provided by a Farmer Field School (FFS), inducing farmers to recognize the positive effects of SRI on pest damage and plant protection. However, we also found that the attitude and mental barriers of some governmental bodies and APCs narrowed the opportunities of SRI introduction at a community level. In addition, farmers often faced initial mental barriers and managerial difficulties in adopting the full elements of SRI even if they were trained in the SRI method, leading them to adopt a "modified" SRI in order to meet their personal needs. Nevertheless, the rapid extension of SRI in Northern Vietnam can be explained by: (i) the government's acknowledgement of SRI, together with an administrative focus on the integrated pest management with the extension tool of the FFS, (ii) the role of APCs in coordinating farmers to lower the entry barriers for them to adopt new techniques, and (iii) communities' involvement in SRI adoption in order to manage agricultural production collectively without pesticides and herbicides as well as increasing the product's value, suggesting possible approaches for small-scale farmers to improve their livelihoods while saving agricultural input costs.

Keywords system of rice intensification, Vietnam, low input agriculture, farmer field school, integrated pest management

INTRODUCTION

The rapid growth of agricultural production in Vietnam has often been accompanied by a heavy use of agricultural inputs, bringing serious problems of food safety and environmental stress (Van Hoi, 2009; Khanh, 2006). For many developing Asian countries, the difficult challenges of adopting alternative agricultural methods that have less environmental burden in a sustainable manner remain (Kada, 1998).

Aiming to identify factors behind a social shift towards low input agriculture in Asian developing countries, this paper explores the realities of the uptake and spread of the System of Rice Intensification (SRI) in Vietnam, as one of the low external-input technologies (LEIT) (Tripp, 2006). SRI was first tested in Vietnam in 2002, and it has been drastically popularized in Northern Vietnam since 2007. Approximately 780,000 farmers practiced SRI within an area of about 286,000 ha in 2010 (Plant Protection Department, 2010). The principles of SRI in Vietnam include: (i) transplanting young seedlings with two or three leaves, (ii) transplanting seedlings individually and spacing them widely, giving them maximum access to the sun and room to grow to their full potential, (iii) managing water carefully, providing intermittent irrigation to keep fields moist, but

not continuously flooded, (iv) weeding frequently, either by hand or with mechanical weeding devices, and (v) using organic fertilizers, such as animal and plant waste, to promote the development of a healthy soil ecosystem (<http://vietnamsri.wordpress.com/>). SRI enables plants to grow efficiently by means of more fertile soil and to produce healthier plants with greater root growth.

The objective of this paper is to illustrate and analyze the viewpoints of different actors and to describe farmers' actual behaviors on pesticides and herbicides in relation to SRI introduction and adoption. The experience of SRI extension in Vietnam will be discussed in order to identify factors to promote or impede the introduction and adoption of SRI as a low-input cultivation method.

METHODOLOGY

This paper is based on field studies conducted in November 2009, August and October 2010, and January-February and June-July 2011. The sample population consists of three communities under the management of three Agricultural Production Cooperatives (APCs) in the Red River Delta (RRD), namely the APC "A" of the Chuong My district and "B" and "C" of the My Duc district in the Ha Noi City (former Ha Tay Province). This paper is supplemented by interviews with different actors and informants and a literature review. The qualitative research method is used for analysis, which is supported by semi-structured and open interviews and questionnaire surveys to target actors, namely farmers, managers of APCs, government officials of key agencies, and donors. In addition, the participant observation method is applied as the researcher enters the lives of farmers.

RESULTS

Introduction of SRI to rural communities by government

SRI was first tested in 2002 and 2003 at a small scale and then at a larger scale in 2005 and 2006 under the scheme of the Integrated Pest Management (IPM) program implemented by the Plant Protection Department (PPD), MARD (Ministry of Agriculture and Rural Development). Results from 2005 and 2006 tests indicated that a significant reduction in input use was possible without yield drops: seed and nitrogen volume was reduced by 70-90% and 20-25%, respectively, while average yield increased by 9-15% (Plant Protection Department, 2010). The crop also showed good resistance against pests. Such results were reported to the Council for Science and Technology of MARD for evaluation, sharing with other state management agencies that manage crop production, extension, science and technology and water resource management.

Several agencies, however, interpreted that some principles of SRI contradicted their policies. For instance, the extension policy was focused more on disseminating the direct seedling method nationally with continued herbicide use for rice cultivation to decrease labor intensity. These agencies considered that SRI was applicable to the "transplanting" technique only, requiring more labor, meaning that it was not suitable to extend SRI to southern areas where direct seedling were generally applied and promoted. Political contradictions perceived by several agencies of MARD implicitly influenced the actual dissemination of SRI to limited areas (mainly Northern Vietnam), even though MARD officially admitted the technical advantages of SRI, issuing a decision in 2007. In spite of the negative attitudes of some governmental agencies, PPD, the only state management agency that actively disseminates SRI, considered the SRI method to be compatible and effective with the IPM approach, and therefore determined to extend it through its own extension tool, the Farmer Field School (FFS), which was often used to promote IPM in Vietnam. Moreover, many IPM officers were stationed across the nation in order to teach farmers about SRI methods through the FFS.

It should also be noted that MARD's decision to acknowledge SRI provided new opportunities through additional support with more fund availability. In addition, some international NGOs included SRI extension activities in their own projects in Vietnam, as they observed that SRI could be an effective tool to build farmers capacity because testing SRI at the

FFS requires farmers' openness and confidence towards the new method in addition to a risk-taking attitude.

APCs' agricultural management and organization of the FFS for SRI introduction

Characteristics of agriculture and the role of APCs: Through the policy reform in 1988 and the revised land law in 1993, the land use right of farmland was distributed equally to farmers in Vietnam. For instance, 3-6 pieces of scattered land with a total size of 0.3-0.4 ha were allocated to each household in the RRD. Several farmers use parts of the same paddy plots and operate and manage farming jointly through an agreement on water management and other cultivation activities. APCs typically operate and manage the irrigation system and provide agricultural services in the RRD. They were originally set up as the center of collective agricultural production regime at the end of the 1950s, but transformed to become service providers for farmers along with the Cooperative Law in 1996.

Because of the characteristics of agriculture in the RRD, especially the presence of many small-scale farmers, APCs can be the first contact point to coordinate farmers to introduce the new method. In the case of introducing SRI at community level, the Provincial PPD first asked APC managers if they wanted to introduce SRI to their communities. APC managers were given opportunities to visit the SRI test sites in order to make decisions. Table 1 shows the different characteristics (management style, attitudes towards new techniques and social relations with farmers in the communities) of each APC. Only APCs A and B, but not APC C, were willing to introduce SRI to farmers.

Table 1 Characteristics of APCs and SRI introduction to farmers

	APC A	APC B	APC C
No. of households	1,400	750	1,860
Paddy field area	240 ha	180 ha	436 ha
SRI introduction	2007	2006	Not yet
APC's objectives	Economic development through agricultural activities	Economic development through agricultural activities	Accomplishment of assigned task
APC's attitude towards SRI	Interested in testing SRI after being convinced by the effect during site visit	Interested in testing any new techniques (including SRI) on a small plot	Understood SRI's effect but technically difficult to adopt
Social relation with farmers	Small local production groups are invited to take part in APC management	APC directly coordinates and negotiates with farmers	Lack of trust between APC and farmers observed

Attitudes: (i) APC A introduced SRI to its community after the APC confirmed its performance by visiting other SRI sites. The government's approval of the SRI method also provided a mental ease to the APC A in disseminating the new method to communities with governmental authorization. (ii) APC B was the pioneer of SRI introduction at a community level. The APC wished to experiment any new technique even if it was not well recognized. The early experiment was perceived to be possible in the APC B, as the experiment was always started with a small area to evaluate the results first, lowering potential loss. (iii) APC C also had opportunities to visit SRI sites, and observed that the SRI method would give better results than the conventional method did. However, it decided not to introduce SRI because of perceived technical difficulties.

Relations with farmers: (i) APC A had seven Production Groups, which have been the social and economic core of local communities with historically developed territorial bonds. The APC coordinated well with leaders of each Production Group and arranged core farmers of the Production Groups to participate in SRI experiments at the FFS site that the APC rented from farmers. The APC influenced Production Groups to self-manage the production process while suggesting strategies to produce high-value products, providing fertilizers and high-quality rice varieties. (ii) In APC B, not all farmers necessarily supported the introduction of SRI at the beginning because it was an unconventional agricultural method and the APC had to negotiate well and to guarantee the productivity of SRI for farmers in advance. In addition, APC B risked its

reputation if the new method was to fail. However, it gained its confidence on the SRI method as the rice grew, and eventually gained further trust from farmers after achieving higher yields with reduced inputs. (iii) APC C felt difficulties attracting farmers to challenge SRI or any kind of new techniques under the guidance of the APC. It provided services to the administrative area, which had been established by merging three villages, and as a result local farmers had little attachment to the new “commune” and the agricultural activities of the three villages were not managed easily in a unified manner. Severe criticism about the performance of the APC and farmers was typically heard from both sides, reflecting a lack of trust between them.

Adoption of SRI and use of external inputs by farmers

Adoption of SRI: Core farmers from APC A participated in the FFS without hesitation as it was a pure learning opportunity and did not sacrifice their own fields. Those farmers were given opportunities to evaluate rice growth through the SRI method by themselves and found that the SRI method brought about higher benefits despite reducing labor and input costs. The difficulties that farmers generally felt came mainly from the technical side, such as handling small seedlings at transplanting, careful land preparation, and controlling water. Even with such difficulties, farmers who participated in the FFS were satisfied with SRI because of its cost advantages. Core farmers who were impressed by the advantages of SRI then became farmer-trainers in order to transfer SRI techniques to those who did not participate in the FFS. As core farmers had been selected from leaders of small-scale communities in which neighboring farmers have close relationships, they tended to believe and follow what the leaders learnt at the FFS. Furthermore, farmers who lived near the FFS site had easy access to observe the progress of the SRI experiment despite not being officially involved in the FFS’s training activities. Farmers who lived near the FFS site started to adopt SRI right after its introduction in 2007, followed by neighboring farmers.

Farmers in APC B recalled their feelings of the difficulties in accepting SRI at the beginning, as they could not believe its effects (especially not believing in using small seedlings, transplanting with space and not keeping flooded water), and even remembered disputes among neighbors that disagreed with SRI adoption. With compensation deals offered via the APC for any possible losses associated with testing SRI, farmers finally accepted testing SRI through the FFS using some portions of their own land but not taking any financial risks. The SRI experiment was started from 4 ha in 2006, then expanded to 15 ha in the spring of 2007, 50 ha in the autumn of 2007, and all fields, 180 ha, in the spring of 2008. Farmers were confident about adopting SRI in their own land without having any compensation deal in 2009, while making flexible and innovative adjustments to overcome their technical and mental difficulties of SRI adoption. Modifications to the SRI method in 2010 and 2011 were: 15-18 cm space between ridges (narrower than the FFS’s best results but wider than the conventional method) and the transplantation of seedlings few days older than originally recommended. Narrower transplanting was preferred by farmers with larger farmlands because they preferred to lessen the weeding cost, reducing weed growth with less sunshine.

In the commune C, farmers were unfamiliar with SRI and typically conducted their own cultivation activities, believing in the conventional method.

Use of agricultural inputs: The reduced use of seedlings and water resources is a widely recognized characteristic of SRI because of its SRI principles. In order to understand actual farmers’ behaviors in terms of pesticide and herbicide use, Table 2 summarizes the interviews and observation results. Farmers in A and B reduced or stopped using pesticides as they learnt through the experience of the FFS and SRI adoption that healthier roots with wider spaces between plants brought about fewer occurrences of pests and diseases. By contrast, farmers in C who had not received any opportunities to adopt SRI believed that the more pesticides they sprayed, the more they could protect their rice from pest attacks. These farmers tended to use pesticides in every crop season regardless of the degree of pest damage.

Table 2 Pesticide and herbicide use by farmers

	Village X(*) APC A	Villages Y1 and Y2 APC B	Villages Z1 and Z2 APC C
Pesticides	No use	• Spring rice: No use • Summer-autumn rice: no use or spray once if heavy damage is expected	Spray more than twice for any crop season
Herbicides	No use	Use sometimes to cover labor shortage	Always use (at least once) to cover labor shortage

Note: Based on (i) repeated interviews with six farmers in the Village X, three farmers in the Village Y1 and Y2, and three farmers in the Villages Z1 and Z2, (ii) interviews with APCs to confirm general behaviors and perceptions of farmers, and (iii) participatory observation results in villages.

() FFS site for SRI experiment was located in the Village X of the commune A.*

Farmers' use of herbicides were more complex because of the trade-offs with labor costs. As seen in APC B, farmers kept using herbicides even though they realized that earlier weeding practice made the work easier and also acknowledged the negative influence on their own health. If farmers decided to weed completely by hands instead of using herbicides, farmers with larger land needed to employ additional labor for weeding. Increasing labor cost in Vietnam was a serious burden for farmers, and therefore farmers in APC B still preferred to use herbicides to save labor costs. On the other hand, farmers in the Village X of the commune A had already become accustomed to using no herbicides, establishing an easier way of weeding by strictly following SRI guidance while they were advised not to use pesticides and herbicides to obtain a certificate so that the Production Group as a whole could sell the rice at a higher price. In addition, farmers in the same Production Group in the village had close family-like relationships, and such united farmers' Production Groups worked together to maximize their community's profit by producing high-quality rice without using pesticides and herbicides, planting the same varieties in order not to mix with other varieties in the area. Farmers were able to achieve higher profits this way with less use of pesticides and herbicides and caring for community members' health at the same time.

DISCUSSION

From the experience in Vietnam regarding the introduction and adoption of SRI, multi-layered barriers - government, farmers' organizations (i.e., APCs), and farmers - were found. First, the government's belief in SRI's limitation (i.e., labor-intensiveness or incompatibility with direct seedling) led to narrowing areas of SRI introduction to Northern Vietnam. Second, the introduction of SRI into local communities was influenced by management capacity and attitudes of APCs who could act as coordinating agencies to promote the uptake of SRI in their communities. Finally, farmers' attitudes and their managerial difficulties (e.g., preference to use herbicides over weeding by hands to save labor costs for large fields) could cause farmers not to adopt some elements of SRI. By contrast, the rapid extension of SRI in Vietnam since 2007 can also be explained by efforts made by the government, farmers' organizations (APCs), and farmers. The approval of SRI in Vietnam added confidence to the PPD to disseminate it widely in Vietnam, lowering the political risk for local adopters to implement techniques backed by the government. APCs' strategic support to farmers to test SRI lowered risks while the extension tool of the FFS together with IPM experience gave opportunities for farmers to examine the effect of SRI by themselves, which helped them make rational decisions about whether to adopt SRI, overcoming their initial prejudice against it. Moreover, the introduction of SRI to the community did not only test the APC's managerial capacity but also provided further managerial opportunities. As seen in APC A, rice that was grown without the use of pesticides and herbicides was differentiated by high price, which was realized by a small-scale community's bond and thus secured social and economic profit for the overall community. Such a system to reward the effort of both individuals and the community, together with strong community relations, worked as positive factors to reduce the use of herbicides.

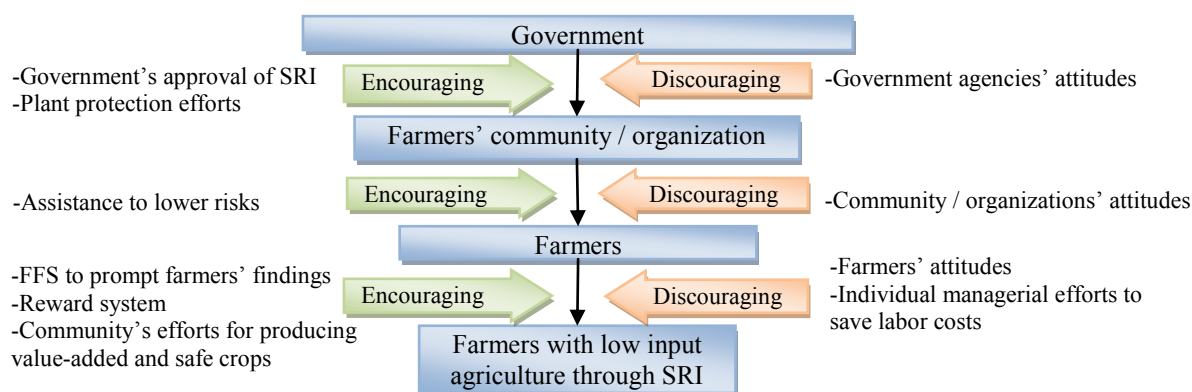


Fig. 1 Multi-layered actors and factors influencing SRI introduction and adoption

CONCLUSION

This research found that two communities (namely areas under APC A and B) that introduced and adopted SRI experienced community-based shifts toward lower agricultural inputs. The case of APC A especially indicated that it was possible for a community as a whole to manage the production of value-added rice without using pesticides and herbicides. Factors that promoted the introduction of SRI included the government's initiative, especially through the IPM program with the FFS and the management efforts of farmers' organizations to lower farmers' entry barriers to adopt SRI, even though the political attitudes of some government bodies as well as the limited capacity and attitude of agricultural organizations could also become barriers to SRI introduction. This research also demonstrated that the social solidarity of rural communities in the RRD could be a source of competitive advantage because it could allow the Production Group to supply high-quality crops without the use of pesticides and herbicides.

Although small-scale farmers in the RRD have limited capacity in the face of the market-oriented economy in Vietnam, this research suggests possible approaches to raise their competitiveness with community-level efforts towards safe crop production while tackling issues related to the overuse of agricultural inputs.

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