Research article

Awareness of Conversion from Conventional Farming System to Sustainable Farming System in Kampong Cham Province, Cambodia

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Abstract In Cambodia, 71% of labor force engage in agricultural sector and contribute for creating 36% of Gross Domestic Products on 2010. Besides, Cambodia suits for agriculture because Mekong River and Tonle Sap Lake provide fertile soil. In the research site, Samroung commune in Kampong Cham province, agriculture is the source of income for farmers. Eleven villages are located in this commune and 1,792 families present. Main crop in the commune is rice. Also, some farmers grow vegetables such as cucumber or morning glory in this area. In this country, conventional farming system based on agro-chemicals application becomes a major farming style in recent years. But the ways how to apply the purchased agricultural inputs of farmers, especially chemical pesticides, are not appropriate from a point of view of rural sustainability. It means popular farming systems depending on agro-chemicals are not only deteriorating natural environment and ecosystem but also affecting health of humans. For preventing these impacts, attention has been paid to sustainable farming system. But it also has difficulties for applying. For example, especially in the beginning, it may difficult for farmers to apply its techniques effectively because techniques of sustainable farming system are new techniques. In addition, these techniques needs more care, load and time period for getting the maximum effects compared to applying agro-chemicals. So farmers may be difficult to keep their motivation for adapting sustainable farming system. So, this study dealt with the awareness of conversion from conventional farming system to sustainable farming system, based on the questionnaire and interview survey conducted in Samroung commune of Kampong Cham province, Cambodia. This study concluded that extension approaches which are applied in Samroung commune are effective in order to change farmer's awareness of convert farming system. Addition to this, possibility of reducing the amount of agro-chemicals used was also observed.

Keywords sustainable farming system, conventional farming system, awareness, agro-chemicals, conversion

INTRODUCTION

Agriculture has utmost important role for reducing poverty and improving the capacity for human resource development in rural area. On 2010, 14 million people live in Cambodia and 71% of labor force engages in agricultural sector and it contributes creating 36% of Gross Domestic Products. In this country, mono cropping based on conventional farming system by applying chemical fertilizer and pesticide become a major style, because commercial agriculture has been advanced in recent years. But chemical pesticides effect not only positive but also negatively for the environment and human directly and indirectly. It is also a problem that farmers do not have enough and appropriate knowledge about applying agro-chemicals.

The Royal Government of Cambodia noticed and regarded this abuse of pesticide as a big problem in the country concerning food security, environment and human health. For example, most of the pesticides applied to agricultural lands may affect non-target organisms and contaminate soil and water. In addition, government is concerned that dangerous pesticides such as extremely toxic and banned pesticides are still in use in Cambodia (Royal Government of Cambodia, et. al., 2002).

For producing foods and fiber materials on a sustainable basis harmonizing agricultural production with the natural environment, conversion from conventional farming system to sustainable farming system is considered. In this study, sustainable farming system is defined as a system that can evolve indefinitely towards greater human utility, greater efficiency of resource use and a balance with the environment which is favorable to humans and most other species (Harwood, 1990).

In order to solving the problems, techniques used for sustainable agriculture based on natural resource circulation were extended towards local farmers with distributing materials. So the objective of this study is discussing about effective extension approaches for extending techniques and possibility of reducing using amount of agro-chemicals.

STUDY SITE

Study site consists of 11 villages which are located in Samroung commune, Phrey Chhor district, Kampong Cham province, Cambodia. 11 villages consist of Bonteay Thmey, Takrit, Kondal Koang, Tompang Risey, Svayprey, Samroung, Sodey, Thmey, Veal, Smei and Preykhcheay village. This commune is 83 kilometers from Phnom Penh city (Fig. 1). The commune is consisted of 11 villages and 8,111 people are living in 2011. Main production is rice mainly for both sale and self-consumption. On the other hand, farmers who produce vegetables for sales were much less than that of rice. In Samroung commune, conventional farming system is mainly applied for production in order to increasing yield.

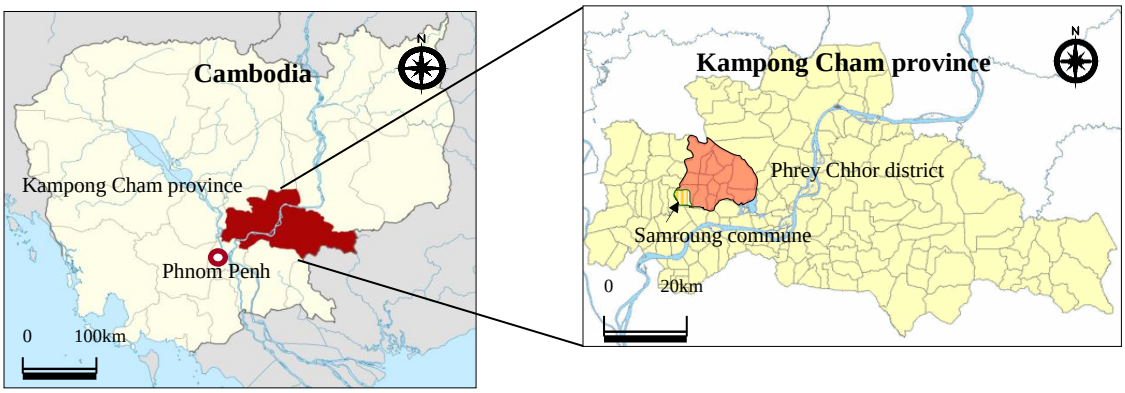

Fig. 1 Location of Samroung commune in Kampong Cham Province

METHODOLOGY

In this study, effectiveness of extension approaches and possibility of reducing amount of agro-chemicals used were studied. Effectiveness of extension approaches was measured by farmer's implementation after technical training. For achieving objectives, the study was advanced with activities included 1) questionnaire surveys, 2) technical trainings, and 3) field investigation. Questionnaire surveys are divided into baseline survey and 2 kinds of questionnaire surveys which conducted after technical training. Between July and October 2011, baseline survey for 443 farmers was conducted in order to understand current fundamental information and thought towards agro-chemicals proper use and sustainable agriculture. It consists of questions about personal

information, economic situation, agricultural practice, perception of using agro-chemical and organic inputs and so on.

Besides, questionnaire survey, about composting and making bio-pesticide were conducted for participants at technical trainings (Fig. 2). From April 2011 to March 2012, a total of 29 technical trainings were held in order to extend about techniques for sustainable agriculture based on natural resource circulation such as composting, making bio-fertilizer and bio-pesticide, preventing insects by using net. The trainings were aim to change farmer's awareness of convert farming system. The techniques were explained with pamphlets and demonstration by local facilitators. At end of the training, questionnaire survey were conducted in order to know the understanding of participants. Totally 928 people participated in trainings and 95% of them answered questionnaire surveys. The main questions of the survey were focused on 1) understanding of trainings, 2) current situation of using agro-chemicals, and 3) perception on sustainable agriculture based on natural resource circulation. Further explanations and monitoring were conducted regularly in the process of extension activities from April 2011 to October 2012.

Fig. 2 Explanation about composting at workshop (left) and demonstration of making bio-pesticide (right)

RESULTS AND DISCUSSION

Extension approaches at Samroung commune

Effective extension approaches for converting sustainable farming system can be studied by comparing references, farmer's technical implementation, result of field investigation and questionnaire surveys.

Neils Roling, et al. (1994) stated that changing to more sustainable practices is more like a paradigm shift, involving a learning path leading to new perspectives on risk avoidance, new professionalism, a greater reliance on one's own expertise and observation.

For promoting paradigm shift of local farmers and so on, extension seems to be an effective way because it is activities related to technology transfer, attitude change and others. The Australasia Pacific Extension Network (1999) stated that extension involves "the use of communication and adult education processes to help people and communities identify potential improvements to their practices, and then provides them with the skills and resources to effect these improvements". According to Neils Roling and Elske van de Fliert (1994), effective extension seems to be based on checks and balances that match intervention power with farmer's countervailing power, and mobilize farmer's creativity and participation in technology development and exchange. They also stated paradigm shift involved seems easier when participatory and group approaches is applied and when learning is experiential and occurs together with other farmers. A. W. Black (2000) explained about 4 extension strategies such as 1) linear top-down transfer of

technology, 2) participatory bottom-up approaches (also termed group empowerment), 3) one-to-one advice or information exchange, and 4) formal or structured education and training.

Although A. W. Black (2000) also mentioned participatory and group-based approaches to agricultural extension have various advantages when they are well implemented, he also mentioned that it should not be regarded as the one and only strategy that can or should be used to facilitate the adoption of sustainable farming system. He also mentions one-to-one exchange of information and advice, where from farmer to farmer or from professional adviser to farmer, will continue to be important. In addition, importance of learning activities that are directly relevant to the farm and that require relatively short blocks of time – from a few hours to a few days (Johnson et al. 1996).

In Samroung commune, techniques for sustainable agriculture based on natural resource, circulation were extended by mixing three extension strategies. There are 1) participatory and group approaches which is included in participatory bottom-up approaches, 2) training, and 3) one-to-one exchange of information and advice. In technical trainings, 10 to 60 farmers participate in and learn new techniques through explanation and demonstration. There are not only farmers and local facilitators but also officer of provincial department of agriculture participate in the training. For demonstration on technical training of composting, participants visit farmers who already start and apply compost. Visited farmer not only show their compost box but also give answers of the questions to participants. For technical training of making bio-pesticide, local facilitator asks a participant to conduct demonstration with their explanation in front of other participants. These demonstrations make participants to understand clearly than just learnt from pamphlet and explanation. From result of questionnaire survey after trainings, many participants answered they could understand the contents well and hope to join in the training again.

In the extension process, there are not only technical trainings but also individual visiting and explanation was implemented. Few months after technical training, local facilitators visit farmer's house individually in order to check technique of implementation. They also provide additional explanation if visited farmers have questions or local facilitators observe visited farmers has any problem on their implementation.

Creativity of some farmers is also mobilized by this extension process. For example, some farmers apply bio-fertilizer into their compost in order to make better quality of compost. For other case, farmers establish compost box near bio-gas facility in order to use waste of bio-gas as material for compost.

However, not only extension approaches but also participation of farmers is important for continuing sustainable farming system. So, it was considered that conversion of farmer's participation level is needed to be studied in order to understand awareness of farmers properly. Besides, sustainability of technical implementation also needed to be studied.

Current situation of Samroung commune

Awareness of conversion from conventional farming system to sustainable farming system can be observed from answers of baseline survey and questionnaire surveys. Local facilitators visit farmers individually for baseline survey but farmers fulfill answers to questionnaire sheet by themselves for 2 kinds of questionnaire surveys about composting and making bio-pesticide.

On 2011, nearly half of the farmers answered that insects and diseases are the main problems on agricultural activities (Table 1). For preventing pest, applying chemical pesticide (72.77%) and pulling up by hand (20.94%) were the major methods.

Table 1 Problems of agriculture

Problems	Answer	Percent (%)
Insects and diseases	187	46.98
High expense for chemical fertilizer and pesticide	73	18.34
Lack of technique and tools	59	14.82
Degradation of soil	52	13.07
Impact to human health and environment	27	6.79

Source: Questionnaire surveys in 2011, ERECON

All of respondents apply fertilizer and almost all of them apply pesticide such as herbicide (40.22%), insecticide (57.22%) and fungicide (1.75%). 84.94% of farmers expend less than 40 USD for pesticide but 60.48% of farmers expend more than 201 USD annually. It seems that farmers apply agro-chemicals for preventing insects and disease.

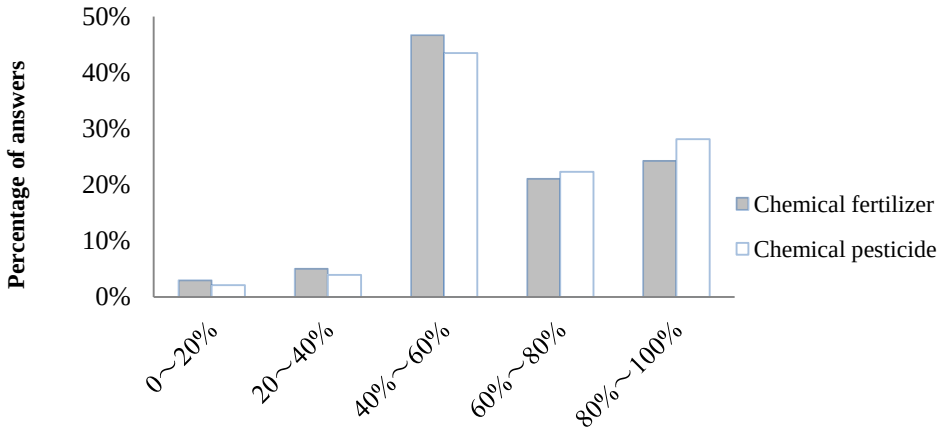

Fig. 3 Desired reduction rate of agro-chemical using amount

However, almost all of farmers hope to reduce using amount of chemical fertilizer and pesticide. In addition, almost all of farmers hope to reduce more than 40% of using amount of chemical fertilizer and pesticide (Fig. 3). For both of fertilizer and pesticide, main reasons for desiring reduction are health and better quality of products.

Farmers' perception for converting farming system to sustainable farming system

Through workshops about composting, 97.59% of the farmers desire to continue composting. As same as conclusion of Tim, et al. (2011), the compost technology was highly accepted by local farmers. Their main objectives are increasing soil fertility and avoiding negative impact for human health. After technical training, local farmers apply compost on rice and vegetables.

Farmers also show a high interest for making bio-pesticide even 88.18% of the farmers does not have experience for making it before participating in the training. It is because the farmers think bio-pesticide has less negative impact to human health and environment (52.70%) (Table 2). Tim, et al. (2011) also stated that local farmers found bio-pesticide is really good for farmer's health, food safety and environment. It is applied for rice and vegetables such as tomato and cabbage after technical training.

From point of view of local farmers, they mentioned compost and bio-pesticide has positive impact on their cultivation. But they also need to share more time for taking care of crops under sustainable farming system.

When the baseline survey was conducted, 76.52% of the farmers did not know what sustainable agriculture was. But 94.58% of them hope to grow and sell products with low chemical input because they think sustainable agriculture lead to positive impacts such as soil fertility, decreasing amount of agro-chemicals.

Table 2 Reasons of interest in bio-pesticide

Reason	Answer	Percent (%)
Less harm to human and environment	156	52.70
Make soil fertile	73	24.66
Decrease expense for pesticide	61	20.61
Other	6	2.03

Source: Questionnaire surveys in 2011, ERECON

CONCLUSION

According to the results and discussions done in this study, it can be concluded that extension approaches which is applied in Samroung commune was effective in order to change farmer's awareness to convert farming system because local farmers in Samroung Commune has a high potential to conduct sustainable farming system and start implementation of techniques. In addition, possibility of reducing the amount of agro-chemicals used was also observed.

Mixing extension strategies seems to work effectively in Samroung commune. As same as references, paradigm shift of farmers seems to happen by extend techniques through group trainings and demonstration. Not only paradigm shift but also creativity of farmer's is also mobilized by the extension process.

In current situation, farmers face problems like pests, diseases and soil degradation. For overcoming these problems, they apply agro-chemicals and lead to negative impacts to human health, soil fertility, finance, etc. Although almost all of the farmer's apply agro-chemicals for their farmland when the baseline survey was conducted, possibility of reducing agro-chemical was observed as a result of the study. It was also exposed that almost all of the farmer's hope to reduce more than 40% of agro-chemicals amount use. They are also eager to grow and sell products with low chemical input at the market. Through technical trainings, farmers became highly interested in applying and continuing techniques for sustainable agriculture based on natural resource circulation such as composting and making bio-pesticide. It is because that they think these techniques have many advantages such as less harm to human health and improving soil fertility.

By this study, it was showed that the farmers at Samroung commune have motivation and potential for converting from conventional farming system to sustainable farming system. However, not only effective extension approaches but also participation of farmers is important for continuing sustainable farming system. So, it was considered that the conversion of farmer's participation level is needed to be studied in order to understand awareness of farmer's properly. Besides, sustainability of technical implementation also needed to be studied.

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