Knowledge Translation Process
of the Sustainable Rice Platform (SRP) Standard in Thailand

Patcharin Sae-heng, Noppol Arunrat, Nathsuda Pumijumnong

Uthai Chareonwong, Thomas Neal Stewart and Sukanya Sereenonchai[*]

Faculty of Environment and Resource Studies, Mahidol University

No. 999 Phutthamonthon 4 Road, Salaya, Phutthamonthon, Nakhon Pathom 73170, Thailand

[*]Corresponding author. E-Mail address: sukanya.ser@mahidol.ac.th

Abstract

The rice sector in Thailand is in the process of introducing the Sustainable Rice Platform (SRP) Standard for Sustainable Rice Cultivation. A pilot implementation of the SRP standard was first conducted at Ubon Ratchathani province in the Northeast in 2013-2017 and has been extended to other provinces. This study describes the process of knowledge translation in the out-scaling implementation of the SRP Standard in Thailand and identifies the success factors of the SRP Standard's implementation. Data was collected by conducting in-depth interviews with 15 stakeholders from the Rice Department of Thailand and from the study site, Ubon Ratchathani province. Data analysis was done by employing the Knowledge to Action (KTA) framework, consisting of knowledge creation and an action cycle. SWOT analysis and TOWS Matrix were used to analyse the success factors of the SRP Standard implementation. This study supports an evidence-based explanation and systematic approach to translate agricultural knowledge into action and promote behavior changes for sustainable rice cultivation.

During knowledge creation, the main mechanisms of knowledge inquiry were stakeholder workshops and public consultation. The knowledge was then synthesised according to the suitability of the knowledge with the local context and knowledge needs of the farmers. In the action cycle, a baseline study along with pre- and post- assessments of farmer trainings were done to identify existing problems. Creating farmer participation and ownership of the knowledge helped to obtain more acceptance and usage of the knowledge. Moreover, knowledge use and knowledge outcomes were monitored and evaluated through farmer diaries which were mechanisms for encouraging record keeping by the farmers. The success factors of the SRP Standard implementation are feedback from the farmers, criteria for selecting the proper knowledge products and knowledge transfer methods, the development of the farmers' knowledge network and participation of the relevant stakeholders.

Keywords: Knowledge Translation, Knowledge to Action, Sustainable Rice Platform, SWOT, TOWS Matrix

Introduction

Development of rice production is a crucial policy in Thailand with the aims to improve production efficiency by using technology, to reduce the production cost and to improve quality of products to meet the standard (Thai Rice Department, 2016). The Sustainable Rice Platform (SRP) Standard for Sustainable Rice Cultivation promotes efficiency of natural resource use and sustainability in rice production, supply chain and consumption (Watcharapongchai, Yooprasert, & Keowan, 2018). A pilot implementation of the SRP standard in Thailand was conducted in Ubon Ratchathani province in the Northeast in 2013-2017 by the Better Rice Initiatives Asia (BRIA) project with the purpose to support resource-poor farmers to have more market access (Thai Rice Department, & Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, n.d.). Thai Rice Department in cooperation with Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH is in the process of scaling out the SRP Standard' production in Ubon Ratchathani, Roi Et and Surin provinces in the Northeast and in Chainat, Ang Thong, Pathum Thani, Suphan Buri, Ayutthaya and Sing Buri provinces in the

central plain (Thai Rice Department, & Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, n.d.).

Some agricultural knowledge has techno-scientific characteristics, as it is based on the problems which are solved by scientific evidence. Quality of knowledge-action linkage is significantly influenced by the processes of communication across the science-practice interface (Harrison et al., 2012). Thus, knowledge translation is an important component of knowledge transfer which is the process to ensure that research knowledge is realisable and accessible to decision makers in all levels in order to enable evidence-based decision making which requires more than only knowledge creation, knowledge distillation and knowledge dissemination (Bennett et al., 2016). Knowledge translation frameworks give a systematic approach for translating knowledge into action as well as promotes practice or behavior change. Knowledge to Action (KTA) framework outlines the complex and dynamic process of knowledge translation. It consists of two main components: 1) knowledge creation; and 2) action cycle (knowledge application) (Molfenter et al., 2009). This study aims to describe the process of knowledge translation in the out-scaling implementation of the SRP Standard in the northeastern Thailand by using this Knowledge-to-Action framework as well as to identify success factors influencing the SRP Standard's implementation.

Methods and Materials

Population and Sampling

The population of this study is all the stakeholders, namely decision makers, technicians, extension officers and farmers, who take parts in the knowledge transfer and the extension system for the out-scaling implementation of the SRP standard. In this study, purposive sampling was conducted. Fifteen participants (n/15) were selected based on their responsibilities of work and their involvement in planning for the extension model. The criteria for selecting the samples are 1) officers from the Rice Department's head quarter (n = 3); 2) extension officers from provincial rice research/seed centers (n = 3); 3) representatives from GIZ (n = 3); 4) lead farmers (n = 3); and 5) general farmers (n = 3).

Research Tool

This study gathered the primary data by using in-depth interviews. An interview guide is the data collection tool which was constructed beforehand and was employed in the semi-structured interview settings. The interview guide is based on Knowledge to Action (KTA) framework which consists of two main components: *knowledge creation*; and *action cycle* (knowledge application). The first component has three stages: 1) knowledge inquiry; 2) knowledge synthesis; and 3) knowledge tools/products. The action cycle component includes seven stages: 1) identify problems; 2) adapt knowledge to the local context; 3) assess barriers to knowledge use; 4) select, tailor and implement intervention; 5) monitor knowledge use; 6) evaluate outcome; and 7) sustainable knowledge use.

Data Collection

Data collection was done by in-depth interviews of stakeholders who are involved directly in these extension projects. As all the interview participants have roles in the knowledge transfer and the extension system, the data collected from the interviews are about the domain of their interventions and functions, such as knowledge translation, information tailoring into local context and knowledge dissemination. Due to the situation of Corona Virus (COVID19) and traveling across provinces was not allowed, the interviews of extension officers and farmers were conducted with phone calls instead. Only interviews of the officers from the Rice Department in Bangkok and of the representatives from GIZ were conducted face-to-face.

Data Analysis and Interpretation

The collected qualitative data was analysed by content analysis. The collected data from the interviews were about the interviewees' roles in this extension system, and the data analysis was done by transforming the raw data from the interviews into the KTA framework (Field et al., 2014). SWOT analysis was used to identify strengths, weaknesses, opportunities and threats of the knowledge translation process. SWOT is a tool for conducting an evaluation of current or future situation by a list of factors described as internal and external environments. The internal environment indicators are described by strengths and weaknesses and the external environment indicators are described by opportunities and threats. Attributes of internal environment can be controlled by actors involved. The strengths should be reinforced, whereas the weaknesses are to be minimised or eliminated. The opportunities and threats which are the external attributes are beyond the actors' control. Advantage can be taken from opportunities, whiles constraints from threats should be avoided (Mansour et al., 2019). TOWS matrix was used to find the success strategies. The TOWS Matrix is a supporting tool of SWOT analysis in developing success strategy. The TOWS Matrix is the combination of the internal and external factors, used in selecting the strategies suitable for strengths, weaknesses, opportunities and threats (van Asselt, 2018).

Results

The followings are the results for Objective 1 on the process of knowledge translation in scaling out the SRP Standard in the northeast and for Objective 2 on the success factors of the SRP Standard implementation. Knowledge translation frameworks give a systematic approach for translating knowledge into action. Knowledge to Action (KTA) framework consists of two main components: 1) knowledge creation; and 2) action cycle (knowledge application). KTA framework is used in this study to describe the process of knowledge translation in the out-scaling implementation of the SRP Standard in Thailand. The in-depth interview results can be described in the KTA framework as the following.

Process of Knowledge Translation in Scaling Out the SRP Standard

Knowledge Creation

1. Knowledge Inquiry

The SRP Standard provides a normative framework for supporting sustainability performance claims in rice supply chain. As stated by the Rice Department's officer, the Sustainable Rice Platform aims for practical implementation of the standard in the national context. Thai Rice Department, as a member of the platform, conducted a pilot implementation as field test of the standard. The platform reviewed pilot results of the members, and the standard was revised in 2017–2018. The revision process included a stakeholder workshop in August 2017 and public consultation process from September to November 2017. Then, Version 2.0 of the standard was released in January 2019 (SRP, 2019). In the studies on the interfaces between science and practices, scientific information is likely to be influential to the social responses if it is perceived as credible, salient and legitimate. Credibility is perceived when the information is valid, accurate and high quality. Salience refers to the information's level of relevance which should meets the needs and interest of decision makers or knowledge users. Legitimacy is the extent that the knowledge production is respectful of divergent beliefs and values and unbiased in the treatment of opposing views (Ingram et al., 2016). SRP's reviewing process in the stakeholder workshop and the public consultation is necessary for making the knowledge products legitimate to achieve acceptance from knowledge users.

The main objective of transferring knowledge about the SRP Standard to farmers is to change farmers' farming practices to sustainable rice cultivation. Based on Kania & Żmija, (2016), there are three types of knowledge transfer: diffusion, dissemination and implementation. Diffusion is in form of raising awareness of knowledge recipients, whereas dissemination aims for changing recipients' behaviors, and implementation is for changing behaviors and attitudes of recipients. The knowledge transfer of the SRP Standard in Thailand is, therefore, considered knowledge dissemination and also implementation. According to the Rice Department's officer, the objective is to make rice cultivation in Thailand sustainable for the next generations which mean that the Rice Department aims for the action of knowledge in long term. That is why only obtaining the knowledge from the SRP Standard (Version 1.0 and 2.0) is not enough in knowledge inquiry process. Consulting experts about the local context and crosschecking with farmers are necessary for obtaining the highest possibility of farmers' adoption.

Based on the interview informants, all the extension officers, lead farmers and general farmers obtain knowledge about the SRP standard only from the trainings which are organised by the Rice Department and GIZ. Local farmers are mostly given trainings by extension officers from the provincial rice research and rice seed centres. This information about knowledge inquiry implies that the model of Transfer of Technology (ToT) is used in transferring the knowledge about the SRP Standard to farmers. This classical model is a top-down approach in which knowledge flows from the policy maker to the bodies of agricultural extension and then to farmers (Kania & Żmija, 2016).

2. Knowledge Synthesis

The first important part of knowledge synthesis is the process of reviewing knowledge suitability with the local context. The relevant agencies and stakeholders in the local levels are involved in this process because they are the resource persons for the rice cultivation situation in the local context. Legitimacy of knowledge production depends on inclusion of their opinions and participation as well as treatment of opposing opinions among them (Ingram et al., 2016). The second important part of knowledge synthesis is an analysis of farmers' knowledge demands. Farmers are the end users of knowledge and are the ones who put the knowledge into practices. The third part of knowledge synthesis is reconsideration on the type of farmer adoption. There are four main types of farmers' adoption which are 1) adoption for political and social rewards; 2) adoption for local consumption; 3) adoption for cash income; and 4) adoption for a sustainable environment (Minh et al., 2011). As suggested by the Rice Department's officer, one lesson learned from implementation of the GAP standard is that it is necessary to address economic needs of farmers, otherwise long-term adoption will not be possible. The SRP Standard implementation has farmers' adoption for cash income as the target by aiming at the adoption for a sustainable environment as a long-term target.

3. Knowledge Products

Oliver et al. (2012) emphasised that "knowledge-based information is very effective in order to get adoption of decision making among farmers" (as cited in Adnan et al., 2018, p. 107). Knowledge can be divided into two categories: "know that" and "know-how". "Know that" refers to information and descriptive knowledge, whereas "know-how" is procedural knowledge to explain how something can be done (Adnan et al., 2018). Many knowledge products are required in the SRP Standard implementation because firstly, there are many levels and functions of knowledge users. Moreover, to change knowledge into practices, farmers need "know-how". Thus, the knowledge products which focus more on practical skills, namely farmer diary, demonstration plots,

study visit as well as smart officers and farmers as trainers, are necessary. In addition, the Farmer-to-Farmer (F2F) model does not only address the weaknesses of the Training and Visit (T & V) model in term of being not inclusive and irrelevant but also has various strengths in transferring knowledge. Lead farmers have in-depth knowledge about local practices, culture and conditions, speak the local language and use expressions suitable to the environment (Kiptot & Franzel, 2015). In the SRP project, lead farmers are trained to be "smart farmers" or farmer trainer who transfer knowledge to local farmers in the community, and they are considered one of the knowledge products.

Action Cycle

1. Problem Identification

There is a number of assessments conducted to identify problems, such as the baseline assessment of SRP Standard performance and the pre- and post- assessments in farmers' trainings. Park et al. (2018) stated that tailored training, which is the training shaped to meet the participants' needs, increases knowledge and self-efficacy of participants, and those developments can help spread the knowledge translation. The assessments that are used in identifying problems and farmers' knowledge needs are helpful in developing the trainings or other knowledge transfer channels to suit the participants. Regarding the existing problems, farmers sometimes refuses the adoption because they think that the new practices are too complicated. One factor is the nature of the provided knowledge. The knowledge products of the SRP Standard are mainly in forms of handbooks or texts. The academic language can deter farmers from learning or understanding the knowledge. Besides, as explained by one farmer informant, farmers lost their trust in the government activities because there have already been many projects without any sustainable outcomes.

2. Adapting Knowledge to Local Context

Most of local context information is provided by extension officers. At the same time, they are the main communicators who provide information to farmers in the community. According to Dirimanova & Radev (2017), scientific centres, such as rice research centres or university, provide information to agricultural producers through many channels, namely demonstration fields, agricultural advice and selling points for seeds and seedlings. These are the roles of provincial rice research and rice seed centres in Thailand. Moreover, extension officers are also the ones who send feedbacks or information from farmers to the policy-making level. These characteristics of extension officers in place can be developed further. Introduced by the Food and Agriculture Organisation (FAO), the framework of an Agricultural Knowledge and Information System (AKIS) encourages mutual learning and sharing agricultural-related information and knowledge among institutions and people by developing the institutional arrangement which favours the network among stakeholders, and farmers should not be just passive learners (Demiryürek, 2014).

3. Assessing Knowledge Barriers

As the implementation of the SRP Standard is project-based, After-Action-Review (AAR) is used for making sense of belongings on its own development issues. AAR is a knowledge management technique to identify lessons learned from any activities, such as failure and success factors in projects as well as plans for future steps based on the consideration of what occurred (Inter-American Development Bank, Knowledge and Learning Sector (KNL), 2009). There are two existing barriers which need to be overcome. The first one is about subsidies or some gifts that farmers tend to receive when participating in any government activity, and the second barrier is on low level of farmers' education which could limit their ability in learning new knowledge. To overcome these

barriers, communication strategy is important. As suggested by the Rice Department's officer, farmers' economic needs should be addressed. Therefore, in communication with farmers, the benefits from the SRP Standard adoption particularly in term of cost reduction, profitability increase or reduction of chemical use, should be highlighted. The SRP Standard promotes the use of fertilisers based on soil analysis. Therefore, the problems from chemical fertiliser overuse will be addressed when farmers adopt this standard. Consequently, the production cost on excessive chemical fertiliser use will be reduced. Moreover, low-literacy learning is employed in the knowledge transfer process. Low-literacy learners can read easy words and sentences but cannot read a page-long text. In low-literacy learning, the words used in the knowledge transfer should be simple with a lot of images. Conveying new information is mostly based on visual, discussion and practical methods. Simple written materials still need for improving the literacy which is necessary for their lives (Pamphilon, 2017).

4. Selecting, Tailoring, Implementing Interventions

Farmers' ownership is an important aspect in the process of planning and implementing interventions because it influences farmers' acceptance and helps strengthen the community empowerment. This concept is based on the "Participatory Communication", or "Participatory Action Research" (PAR) in which farmers as the ones who face the problems and are the owner of community issues, they know very well about their problem, social capitals and characteristics of the local farmers. The lead farmers are the key persons to translate and transfer the new knowledge and practice. Another crucial point is suitability of the message senders. Extension officers and particularly lead farmers are the most suitable as the sender in communicating the information about the SRP Standard to other farmers. Lead farmers in the Farmer-to-Farmer model have four key roles in transferring knowledge and innovation which are 1) a demonstration role by which they have a field applying new technology for peers' casual observation; 2) a focal point role by coordinating with outside agents when local farmers come for instruction; 3) a tutelage role by promoting and explains new knowledge and innovation as well as solving problems for follower farmers; and 4) a peer pressure role by establishing a social standard (Taylor & Bhasme, 2018).

5. Monitoring Knowledge Use

The farmer diary is a major monitoring tool which send data and information up and down among officers in policy-making level, extension officers, lead farmers and general farmers and is used to encourage farmers' behaviour in keeping record. According to Razeghi et al. (2018), one of the factors that influences the linkage among agencies based on the framework of an Agricultural Knowledge and Information System (AKIS) is action strategies which include consistent monitoring and evaluation, efficient and flexible structure and vision and mission. Another factor strengthening the linkage of AKIS is capacity building of individuals, communities and organisations. Individual farmers are trained to keep record of their farming activities mainly for improving farm management, and at the same times, the information of the individual farmers is aggregated for monitoring purpose as well as for feeding into the database of the Rice Department. Moreover, a suggestion from GIZ informant is that the monitoring system should be based on joint ownership between extension officers and farmers. Lead farmers should have a major role in monitoring farmers' knowledge use which can be in both formal and informal channels, such as community meeting or direct conversation calls. This concept of monitoring system would help in establishing the knowledge transfer model of social interaction. In the model of social interaction, farmers give their feedbacks to policy makers, extension officers and scientists (Kania & Żmija, 2016).

6. Evaluating Knowledge Outcomes

The farmer diary is also used in evaluating the outcomes of knowledge use. The eight sets of information in the farmer diary, namely 1) general information of farmers and their paddy fields; 2) farmers' soil analysis results; 3) training experience; 4) water management; 5) farming calendar; 6) farming activities and expense; 7) productivity and income; and 8) summary of farming expense, are used in analysing the further outcome of farmers' adoption of the practices. Some examples of knowledge outcomes are farmers' income increase, reduction of cost as well as mitigation of GHG emission from rice farming activities which can be analysed from the collected data of farmer diary, as mentioned above. For instance, the information about farmers' water management is used in evaluating GHG emission from rice farming. The evaluation results need to be reflected to farmers and are very useful in sending the messages about the positive outcomes of their actions. According to Unger & Austin (n.d.), different levels of reflection influence learning, and the loops of learning and reflection are beyond monitoring and evaluation. The deepest level of reflection is transformational learning which results in changing the fundamental patterns and making new designs of learning process. Moreover, the assessments by the end-line study on the project outcomes and the third-party audit on farmer practices after the knowledge transfer are also useful in extracting and reflecting the lessons learned.

7. Sustaining Knowledge Use

Farmer-to-Farmer (F2F) is also used in the SRP knowledge transfer. This model is useful in encouraging more farmers' participation and creating farmers' ownership of the knowledge which help to sustain the knowledge use. Farmers have been doing rice farming for the whole life, so sometimes it is difficult to change their attitudes and practices. However, sense of community identity is still influential. It was explained by a lead farmer that before adopting any introduced practice by the extension officers, farmers tend to consult in the community meeting. Knowledge network can be developed based on this context in place. According Fesenmaier & Contractor (2001), the concept of knowledge networks is based on the concept of social network, focusing on relationships of social entities. The informant from GIZ stated that the bottom-up approach encourages adoptions locally, and spillover effect could then happen to other areas. Another way of sustaining knowledge use is to conduct regular review and planning. As the implementation of the SRP standard is project-based, After-Action-Review (AAR) can help pursue the regular review and planning as well as extract and manage knowledge and lessons learned from the project implementation.

In this study, the Knowledge to Action (KTA) framework was used to understand the knowledge translation process of the SRP Standard implementation in northeastern Thailand.

Success Factors Influencing the SRP Standard's Implementation

SWOT Analysis

A theoretical framework of implementation strategies of knowledge translation is used to support SWOT analysis of the implementation of the SRP Standard in order to find success factors. Effectiveness of the specific implementation strategies in knowledge translation includes: 1) Audit and Feedback (AF); 2) Tailored Intervention (TI); 3) Organisational Structures (OS); and 4) Interactive Strategies (IS). Firstly, to analyse effectiveness of audit and feedback, four characteristics which differ the low- from the high- performing facilities are timeliness, the degree of receiving feedback individually, impunity of the feedback and the feedback customization. Secondly, tailored intervention is a chosen intervention for overcoming barriers that are identified before designing and implementing the intervention. Thirdly, effectiveness of organisational structure can be

assessed based on the extent to which the implementation of knowledge translation will be promoted by change in organisational structure. Lastly, the interactive strategies refer to the strategies in which knowledge generation is integrated with knowledge utilisation and diffusion, and connectors and interactions are used in the process of knowledge translating (Sudsawad, 2007).

1. Strengths (S)

The knowledge translation of the SRP Standard has the strengths which fulfill all the four implementation strategies of knowledge translation. In audit and feedback aspect, the Rice Department conducted a pilot project to crosscheck and get feedback from farmers before implementing the SRP Standard. Besides, there are many evaluation mechanisms in place, namely farmer diary, third-party audit and end-line assessment. In term of tailored intervention, baseline study and After-Action-Review (AAR) are conducted to identify problems and barriers in the process of translating knowledge. Moreover, to support the tailored intervention, several knowledge materials have been produced for different audiences and purposes. The language, content and visuality of knowledge products are designed differently to meet the needs and characteristics of the target audiences. Multiple knowledge transfer methods, namely demonstration plot or field study, are in place in order to give "know-how" knowledge which focuses more on practical skills to farmers. Regarding organisational structure, farmers' knowledge network based on Farmer-to-Farmer (F2F) model which helps sustain knowledge use is being developed, and the knowledge transfer process of the SRP Standard is project-based, so there is the established project structure in place, such as reviewing or reporting systems. Lastly, the strength that address the interactive strategy aspect is existing roles of extension officers or local officers who are as connectors between the policy-making level and farmers because they are the resource persons for information about the local context to the Rice Department and are the ones who give the knowledge to farmers.

2. Weaknesses (W)

There are also weaknesses in all the implementation strategies. The weakness about audit and feedback is a lack of channels for farmers to share the success stories or feedbacks to other stakeholders particularly policy makers in the implementation of the SRP Standard, Besides, the mechanism to monitor effectiveness of Farmer-to-Farmer model is not in place yet. As stated by the Rice Department's officer, multiplying factors is the main purpose of employing the Farmer-to-Farmer model. However, the out-scaling impacts from the lead farmers' performance still cannot be monitored yet. One of the tailored interventions which needs to be developed is the media used in communicating the knowledge. Media for farmers should have less texts and focuses more on visualization because farmers mostly have low education and they are considered low-literacy learners. Regarding the organisational structure aspect, the top-down approach is used in the knowledge transfer process, which might have limitation or barriers in term of creating mutual learning or knowledge network. Extension officers, smart farmers and general farmers obtain knowledge only from the SRP trainings, organised by the Rice Department. In term interaction strategies, the establishment of farmers' community identity and ownership in the SRP Standard knowledge transfer process still needs development. As commented by one farmer informant, local traditions are not included in the knowledge materials.

3. Opportunities (O)

The opportunities exist in three implement strategies, namely tailored intervention, organisational structure and interactive strategies. Firstly, the tailor intervention aspect benefits from the fact that there have been lessons learned from the Good Agriculture Practices (GAP). The implementation of the SRP Standard should address what

are lacking in the GAP implementation to meet the needs of farmers. Two opportunities fulfill the strategy on organisational structure. The first of is that the Rice Department is a member of the Sustainable Rice Platform, so it can receive information or knowledge requested and can give feedbacks to the platform. The second one is that Farmer-to-Farmer (F2F) model is planned and there have been already the structure in place, namely the selection of lead farmers and the establishment of the community committee. Regarding interactive strategies, relevant agencies and stakeholders in all levels are addressed to be involved in the process of reviewing the suitability of the SRP Standard with the local context, and in the community, lead and general farmers discuss and try to solve problems together in the groups.

4. Threats (T)

The implementation of the SRP Standard has threats in terms of tailored intervention and interaction strategies. Concerning the tailored intervention, there are several aspects in the standard which are not applicable with the local context, such as the alternate wetting and drying which are not applicable in the North East as it is a rain-fed area. Besides, the difficult points in making the tailored intervention is that farmers have perspectives against the introduced knowledge, namely the perspective on the knowledge complexation or on their ability to adopt the new practices, and that farmers mostly have limited education, so the tailored intervention need to concern and have strategies to manage with low literacy of farmers. Lastly, there are two existing threats in fulfilling the interactive strategies. Firstly, the communication about the SRP Standard among stakeholders can be critical and needs communication strategies because the SRP Standard is not widely accepted. Secondly, farmers get used to the condition that when they attend any government activity, they tend to receive some things or gifts from the officers.

Discussion

In this study, the Knowledge to Action (KTA) framework is applied with agricultural extension field by which the framework was used to understand the knowledge translation process of the SRP Standard implementation in northeastern Thailand. The diagram in Figure1 below shows the Knowledge to Action (KTA) framework for the SRP Standard implementation.
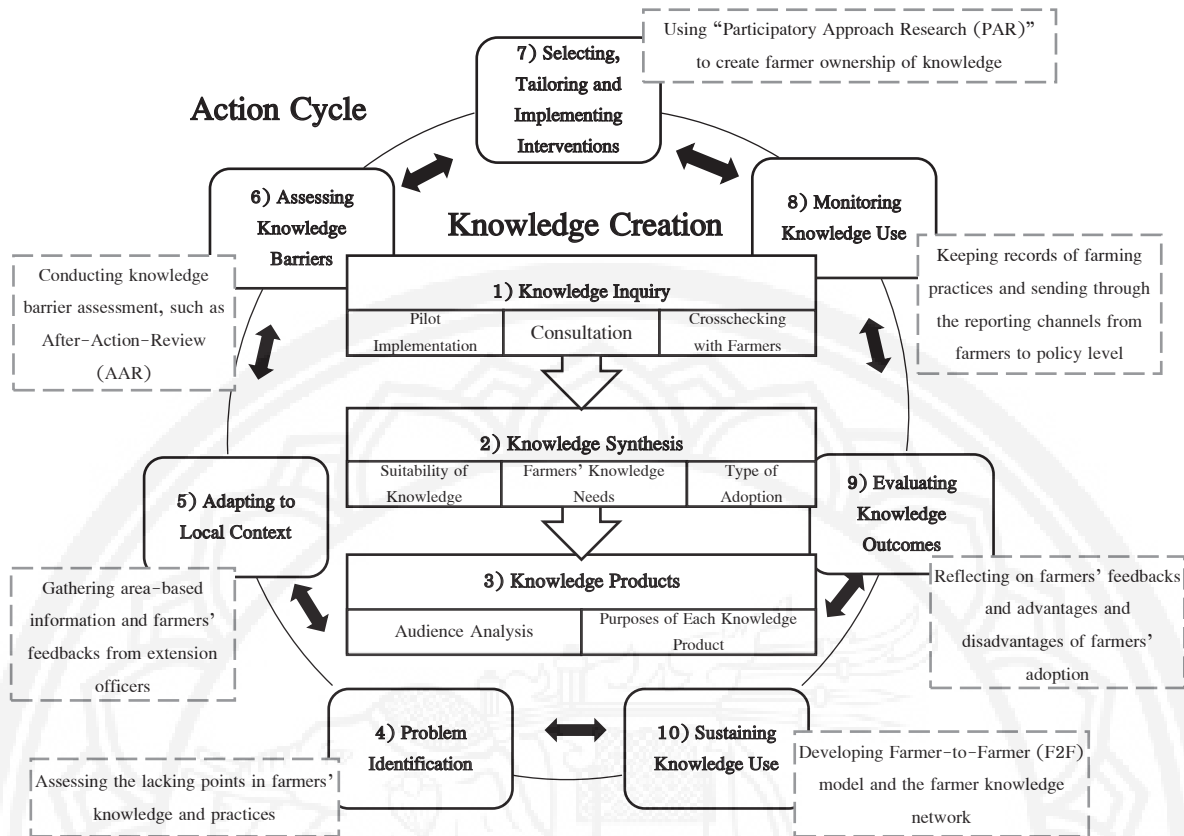
Figure 1 Knowledge to Action (KTA) of the SRP Standard's implementation

TOWS matrix was used to develop the strategies in order to translate knowledge into actions. The results from TOWS Matrix analysis of the SRP Standard knowledge transfer process in the Better Rice Initiatives Asia (BRIA) in Northeastern Thailand would be the success strategies based on the concepts of knowledge translation's implementation strategies, as shown in Table 1.

Table 1 TOWS Matrix Analysis of the SRP Standard Implementation

TOWS Matrix	Strengths (S)	Weaknesses (W)
	• The Rice Department crosschecked with local farmers by conducting the pilot project. (S-AF1)	• Extension officers, smart farmers and general farmers obtain knowledge only from the SRP trainings, organised by the Rice Department. (W-OS1)
	• Many mechanisms for evaluating knowledge outcomes are in place. (S-AF2)	• Local traditions are not included in the knowledge materials. (W-IS1)
	• Baseline study and AAR are used for analysing farmers' knowledge needs. (S-TI1)	• Videos and demonstration plots which provides practical samples better than texts in handbooks or leaflets are not focused much. (W-TI1)
	• There are several knowledge materials about the SRP standard which have been produced for various occasions and audiences. (S-TI2)	• The mechanism to monitor effectiveness of farmer to farmer model is not in place yet. (W-AF1)
	• Multiple methods, namely demonstration plots, field study or study visit are used in transferring the knowledge. (S-TI3)	
	• Information about the local context can be received from extension officers. (S-IS1)	

Table 1 (Cont.)

TOWS Matrix	Strengths (S)	Weaknesses (W)
	• Effects of farmer network which helps in sustaining knowledge use are focused. (S-OS1) • The project-based mechanism is used in implanting the SRP standard in the community. (S-OS2)	• The feedback system in which the collected data are reported from the farmers to the policy-making levels does not exist yet. (W-AF2)
Opportunities (O) • The Rice Departments receives the knowledge and other information by taking part in the Sustainable Rice Platform. (O-OS1) • Relevant agencies and stakeholders in all levels are included in reviewing suitability between the new and the local practices. (O-IS1) • Thailand has lessons learned from the Good Agricultural Practices (GAP). (O-TI1) • Farmers discuss and try to solve problems together in the group. (O-IS2) • Lead farmers are as samples or models for other farmers. (O-OS2)	**SO** **"Strategies that Use Strengths to Maximize Opportunities"** • Participation approach should be used in planning and making knowledge products. (S-OS2) (O-IS1) (O-IS2) (S-AF1) 4* • Baseline study and AAR should be used more in identifying knowledge barriers and problems. (S-TI1) (O-TI1) (O-IS2) (O-OS1) (S-AF2) 1* • Farmer network can be used to encourage farmer participation and roles of lead farmers in the community. (S-OS1) (S-OS2) (O-IS2) 3*	**WO** **"Strategies that Minimize Weaknesses by Taking Advantage of Opportunities"** • The roles of farmers should be strengthened to reduce the barriers from limitation of the top-down approach. (O-OS2) (W-OS1) 4* • Feedbacks of farmer groups on the knowledge materials and knowledge transfer methods should be concerned. (O-IS2) (W-AF2) (W-AF1) 1* • Lead farmers should be engaged to have more roles in monitoring and evaluation system. (O-OS2) (W-AF1) (W-AF2)1* • The network of farmers groups should be strengthened particularly in collecting data, reporting and giving feedbacks. (O-IS2) (O-OS2) (W-AF1) (W-AF2) 3*
Threats (T) • There are several aspects in the standard which are not applicable with the local context (T-TI1) • The SRP standard will also be voluntary based, as it is currently not widely accepted yet. (T-IS1) • Farmers think that new practices are complicated, and it is impossible for them to practice them. (T-TI2) • Farmers get used to the condition that when they attend any government activity, they tend to receive some things or gifts from the officers. (T-IS2) • Farmers mostly have low education. (T-TI3)	**ST** **"Strategies that Use Strengths to Minimize Threats"** • The knowledge should be transferred to other stakeholders apart from farmers. (T-IS1) (S-TI2) 4* • The network model should be used to change farmer perspectives and behaviors. (T-TI2) (T-IS2) (S-OS1) 3* • The suitable knowledge transfer methods should be used to get over barriers from farmers' low education. (S-TI3) (T-TI3) (S-IS1) 2*	**WT** **"Strategies that Minimize Weaknesses and Avoid Threats"** • More stakeholders should be engaged in transferring the knowledge to get more acceptance and more channels of knowledge flow. (W-OS1) (T-IS1) 4* • Knowledge products which give visualisation, such as videos or demonstration plots, should be used to reduce knowledge barriers from farmers' limited education and farmers' perspectives. (W-TI1) (T-TI3) 2* • Local contexts should be concerned and included more in the content of knowledge transfer. (W-IS1) (T-TI1) 2*

Remark: 1* = Audit and Feedback; 2* = Tailored Intervention; 3* = Organisational Structure; and 4* = Interactive Strategies

1. Audit and Feedback

Regarding the strategies on auditing and feedback system, the baseline study and Pre- and Post- assessment which are used mostly in assessing farmers' practices particularly based on the SRP performance indicators, and an After-Action-Review (AAR) which is used for extracting lessons learned should be used more in identifying knowledge barriers and problems based on the local context. Besides, feedbacks of farmer groups on the knowledge materials and knowledge transfer methods should be taken into account. As farmer groups are quite strong in the local context, the farmer groups' feedbacks should be used in improving knowledge materials and knowledge transfer methods. Lastly, lead farmers should be engaged to have more roles in monitoring and evaluation system because they have major demonstration role as well as leading the community meetings. Adding their roles in monitoring and evaluation will improve the feedback channels.

2. Tailored Intervention

First of all, as there are multiple methods, namely demonstration plots, field study or study visit (i.e. inviting farmers to visit other farmers' field) in place, there should be criteria to select the suitable knowledge transfer methods should be used to get over barriers from farmers' low education. The second strategy is to cope with farmers' acceptance of the new knowledge and their perspectives in participating in the knowledge transfer activities. One potential alternative is to use knowledge products which give visualisation, such as videos or demonstration plots, to reduce knowledge barriers from farmers' limited education and farmers' perspectives. The last strategy of tailored intervention is that local contexts should be concerned and included more in the content of knowledge transfer in order to improve knowledge application.

3. Organisational Structure

The Farmer-to-Farmer (F2F) model is used in developing farmers' knowledge network and is acknowledged as a potential way to sustain knowledge use. One strategy to improve organisational structure is to use farmers' knowledge network based on social relationship in the community to encourage farmer participation and roles of lead farmers. Moreover, this knowledge network should be utilised also in overcoming the threats, namely farmers' perspectives on difficulties of the new practices and on their benefits from participating the knowledge transfer activities. Lastly, this knowledge network of farmers should be strengthened particularly in collecting data, reporting and giving feedbacks in order to establish the bottom-up channels of knowledge and information flows.

4. Interactive Strategies

There are four interactive strategies from TOWS Matrix analysis. Firstly, apart from reviewing the suitability of the knowledge with the local context, participation approach should be used in the knowledge transfer planning and making knowledge products. Secondly, as the knowledge products are made for various audiences, the knowledge should be transferred to other stakeholders apart from farmers, such as private sector, universities and consumers. Thirdly, more stakeholders, such as private companies, university and the community leaders, should be engaged in transferring the knowledge to get more acceptance and more channels of knowledge flow. Lastly, the roles of farmers should be strengthened to reduce the barriers from limitation of the top-down approach.

Conclusion and Suggestions

This study describes the process of knowledge translation in the out-scaling implementation of the SRP Standard in Thailand and identifies the success factors of the SRP Standard's implementation. The Knowledge to

Action (KTA) framework, which consists of 1) knowledge creation; and 2) action cycle, is used to understand the knowledge translation process of the SRP Standard implementation in northeastern Thailand. SWOT analysis and TOWS Matrix are used to analyse the success factors of the SRP Standard implementation.

To achieve knowledge creation, the Sustainable Rice Platform inquired knowledge by the stakeholder workshop and the public consultation. In the national level, the Rice Department consulted with experts and crosschecked with farmers to develop the knowledge about the SPR Standard in Thai context. In the process of knowledge synthesis, two important points were concerned: 1) the suitability of the knowledge with the local context; and 2) farmers' knowledge demands, and various kinds of knowledge products and knowledge transfer methods, namely demonstration plots, field visit or the Farmer-to-Farmer (F2F) model, are needed because farmers need to receive knowledge in "know-how" category. In the F2F model, lead farmers who have in-depth knowledge about local practices, culture and conditions and speak the local language are the ones who transfer knowledge to other community farmers.

For the action cycle, the existing problems are identified by the baseline assessment and the pre- and post-assessments in farmers' trainings in order to find the lacking points in farmers' knowledge and practices. The process of adapting knowledge to local context relies mostly on the local or extension officers because they are resource persons for the information about the local context. Knowledge barriers are assessed by After-Action-Review (AAR) which is a knowledge management technique to identify lessons learned from any activities and is regularly conducted in the project. In planning and implementing interventions, "Participatory Action Research" (PAR) approach is used in creating farmers ownership of the knowledge. Knowledge use is monitored by farmer diary which is a tool for sending information about farmers' farming practices. This farmer dairy is also used in evaluating knowledge outcomes. The data collected from farmer diary can imply the impacts of farmers' adoptions, such as farmer's income, production cost as well as GHG emission from farmers' paddy fields. Lastly, the knowledge use is sustained by encouraging more farmers' participation and creating farmers' ownership of knowledge about the SRP standard.

Success factors influencing the SRP Standard's implementation are: 1) farmers' feedbacks on knowledge products and knowledge transfer methods; 2) criteria for selecting the proper knowledge products and knowledge transfer methods; 3) the development of farmers' knowledge network; and 4) participation of the relevant stakeholders to enhance more understanding and help to overcome the limitation of the top-down approach.

References

Adnan, N., Nordin, S. M., Rahman, I., & Noor, A. (2018). The Effects of Knowledge Transfer on Farmers Decision Making toward Sustainable Agriculture Practices: In View of Green Fertilizer Technology. *World Journal of Science, Technology and Sustainable Development, 15*(1), 98-115. https://doi.org/10.1108/WJSTSD-11-2016-0062

Bennett, S., Whitehead, M., Eames, S., Fleming, J., Low, S., & Caldwell, E. (2016). Building Capacity for Knowledge Translation in Occupational Therapy: Learning through Participatory Action Research. *BMC Medical Education, 16*(1), 257. https://doi.org/10.1186/s12909-016-0771-5

Demiryürek, K. (2014). Agricultural Knowledge and Innovation Systems and Social Communication Networks. In M. Sayılı, E. Oruç, H. Günal, & Önen (Eds.), *Agricultural Extension and Consultancy: Volume II Agricultural Extension and Consulting Methodology* (2nd ed., pp. 299-320). Tokat, Turkey: Gaziosmanpaşa University Publication.

Dirimanova, V., & Radev, T. (2017). The Knowledge Transfer in the Agricultural Sector in South-Central Region of Bulgaria. *Bulgarian Journal of Agricultural Science*, *23*(3), 505-511. Retrieved from https://www.researchgate.net/publication/318232017_The_knowledge_transfer_in_the_agricultural_sector_in_south-central_region_of_Bulgaria

Fesenmaier, J., & Contractor, N. (2001). The Evolution of Knowledge Networks: An Example for Rural Development. *Journal of the Community Development Society*, *32*(1), 160-175. https://doi.org/10.1080/15575330109489697

Field, B., Booth, A., Ilott, I., & Gerrish, K. (2014). Using the Knowledge to Action Framework in Practice: A Citation Analysis and Systematic Review. *Implementation Science, 9*(1), 172. Retrieved from http://www.implementationscience.com/content/9/1/172

Harrison, M. B., Nicklin, W., Owen, M., Godfrey, C., McVeety, J., & Angus, V. (2012). Activating Knowledge for Patient Safety Practices: A Canadian Academic-Policy Partnership. *Worldviews on Evidence-Based Nursing, 9*(1), 49-58. https://doi.org/10.1111/j.1741-6787.2011.00231.x

Ingram, J., Mills, J., Dibari, C., Ferrise, R., Ghaley, B. B., Hansen, J. G., Iglesias, A., Karaczun, Z., McVittie, A., Merante, P., Molnar, A., & Sánchez, B. (2016). Communicating Soil Carbon Science to Farmers: Incorporating Credibility, Salience and Legitimacy. *Journal of Rural Studies, 48*, 115-128. https://doi.org/10.1016/j.jrurstud.2016.10.005

Inter-American Development Bank, Knowledge and Learning Sector (KNL). (2009). *Guidelines for Conducting After Action Reviews.* Retrieved from https://publications.iadb.org/publications/english/document/Guidelines-for-Conducting-After-Action-Reviews.pdf

Kania, J., & Żmija, J. (2016). Changes in Agricultural Knowledge and Information Systems: Case Study of Poland. *Visegrad Journal on Bioeconomy and Sustainable Development, 5*(1), 10-17. https://doi.org/10.1515/vjbsd-2016-0002

Kiptot, E., & Franzel, S. (2015). Farmer-to-Farmer Extension: Opportunities for Enhancing Performance of Volunteer Farmer Trainers in Kenya. *Development in Practice, 25*(4), 503-517. https://doi.org/10.1080/09614524.2015.1029438

Mansour, T. G. I., Abdelazez, M. A., Eleshmawi, K. H., & el- Ghani, S. S. A. (2019). Environmental SWOT Analysis for Agricultural Extension in North Sinai Governorate, Egypt. *Turkish Journal of Agriculture - Food Science and Technology, 7*(10), 1503-1508. https://doi.org/10.24925/turjaf.v7i10.1503-1508.2216

Minh, T. T., Neef, A., & Hoffmann, V. (2011). Agricultural Knowledge Transfer and Innovation Processes in Vietnam's Northwestern Uplands: State-Governed or Demand-Driven? *Southeast Asian Studies, 48*(4), 425-455. https://pdfs.semanticscholar.org/bc67/732a2078b6e8bbdf995d8964e4d2431bf7ad.pdf

Molfenter, S. M., Ammoury, A., Yeates, E. M., & Steele, C. M. (2009). Decreasing the Knowledge-to-Action Gap through Research–Clinical Partnerships in Speech-Language Pathology. *Canadian Journal of Speech-Language Pathology and Audiology, 33*(2), 82-88. Retrieved from https://tspace.library.utoronto.ca/bitstream/1807/17677/1/Molfenter_etal_Summer2009.pdf

Oliver, D. M., Fish, R. D., Winter, M., Hodgson, C. J., Heathwaite, A. L., & Chadwick, D. R. (2012). Valuing Local Knowledge as a Source of Expert Data: Farmer Engagement and the Design of Decision Support Systems. *Environmental Modelling & Software, 36*, 76-85. https://doi.org/10.1016/j.envsoft.2011.09.013

Pamphilon, B. (2017). *The Farmer-to-Farmer Adult Learning Manual: A Process and Resources for the Development of Farmers as Peer Educators*. Canberra, Australia: Australian Centre for International Agricultural Research (ACIAR). Retrieved from https://aciar.gov.au/publication/books-and-manuals/farmer-farmer-adult-learning-manual

Park, J. S., Moore, J. E., Sayal, R., Holmes, B. J., Scarrow, G., Graham, I. D., Jeffs, L., Timmings, C., Rashid, S., Johnson, A. M., & Straus, S. E. (2018). Evaluation of the "Foundations in Knowledge Translation" Training Initiative: Preparing End Users to Practice KT. *Implementation Science, 13*(1), 63. https://doi.org/10.1186/s13012-018-0755-4

Razeghi, S. M., Sadighi, H., & Chizari, M. (2018). Development of a Conceptual Model Based on Factors Affecting the Strengthening of Linkage between Actors of Akis. *Journal of Organizational Behavior Research, 3*(S2), 81S2378. Retrieved from https://odad.org/tr/article/development-of-a-conceptual-model-based-on-factors-affecting-the-strengthening-of-linkage-between-actors-of-akis

SRP. (2019). *The SRP Standard for Sustainable Rice Cultivation (Version 2.0), Sustainable Rice Platform*. Bangkok: Sustainable Rice Platform. Retrieved from http://www.sustainablerice.org/assets/docs/SRP%20Standard%20Version%202.0%20Final.pdf

Sudsawad, P. (2007). *Knowledge Translation: Introduction to Models, Strategies and Measures*. Austin, TX: Southwest Educational Development Laboratory, National Center for the Dissemination of Disability Research. Retrieved from https://ktdrr.org/ktstrategies/ktstrategies_search.cgi?location=sr&sel_1=127

Taylor, M., & Bhasme, S. (2018). Model Farmers, Extension Networks and the Politics of Agricultural Knowledge Transfer. *Journal of Rural Studies, 64*, 1-10. https://doi.org/10.1016/j.jrurstud.2018.09.015

Thai Rice Department. (2016). *The Sustainable Rice Platform (SRP) Standard Handbook*. Bangkok: Thai Rice Department, Ministry of Agriculture and Cooperatives.

Thai Rice Department, & Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. (n.d.). *Smart Officer Handbook on the SRP Standard*. Retrieved from https://www.asean-agrifood.org/?wpfb_dl=614

Unger, B., & Austin, B. (n.d.). Learning Together: Monitoring, Evaluating, Reflecting. *Berghof Foundation*. Retrieved from https://www.berghof-foundation.org/en/publications/glossary/monitoring-evaluating-reflecting/

van Asselt, S. (2018). *A SWOT Analysis of the Vertical Farm* (Unpublished bachelor's thesis). Wageningen University & Research, Wageningen, The Netherlands. Retrieved from https://edepot.wur.nl/457619

Watcharapongchai, A., Yooprasert, B., & Keowan, B. (2018). Area Based Management Extension for Sustainable Rice Production: Lessons Learned from Sustainable Rice Farmers Groups in Det Udom District, Ubon Ratchathani Province. *International Journal of Environmental and Rural Development, 9*(1), 1-6. https://doi.org/10.32115/ijerd.9.1_1