The role of engagement among farmers in developing farming knowledge: evidence from northern Thailand

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Abstract. Several studies found science-based knowledge has only able to reach a small fraction of their desired recipient. To compensate for the lack of formal sources, farmers often relied on informal sources of knowledge within their farming community. This study investigates the role of farmer’s social engagement in developing farming knowledge and farmer’s decision-making. A structural equation modelling was used to test the hypothesised moderating role of social engagement among farmers on the effects of service access, training, and knowledge-sharing on farming knowledge. The study used the case of rice farmers in Northern Thailand, wherein a focus group discussion and a series of survey interviews were conducted. Study results found that social interactions among farming communities significantly moderated the effects of training and knowledge-sharing. The findings support the critical role of social engagement among farmers in increasing information flow and experiential knowledge exchange in developing farming knowledge. Furthermore, social interactions promote farming innovation and management practices through advice-seeking with other farmers. Hence, in supporting farming sustainability, extension support should also focus on network building among actors within the farming community and understand how farmers exchange experiential knowledge to compensate for the lack of formal sources of knowledge.

1. Introduction
Innovation in agriculture is essential in driving Thailand towards a sufficiency economy. The philosophy under the sufficiency economy served as the central policy towards sustainable agricultural development of the country [1]. This drives the introduction of new farming technologies and improved practices such as precision farming, bio-pesticides, organic fertiliser, and crop diversification. Access to these innovations can equip farmers with the necessary knowledge and skills to attain the country’s agricultural development goal. However, science-based information from research investment reached only a small fraction of their intended recipients and achieved less than the expected impact [2,3]. In addition, the adoption rate of farming technologies and improved farming practice is lower than the targeted threshold.

Nonetheless, several studies considered that farmer’s social network holds an essential role in diffusing knowledge and boosting adoption rate of improved agricultural technology within farming communities [4,5]. The flow of information within and across farmer’s social networks increases the potential adaptive capacity of farming communities [4,6]. For example, the study found that farmers exchange experiential knowledge among themselves during group meetings and assemblies to discuss farming-related issues. Furthermore, typical daily interaction and even friendly visits to each farm as a form of informal peer to peer advice facilitate information flows. In addition, Isaac et al. [3] found that
farmers with less access to a formal source of knowledge show adoption of farming technologies as influenced by farmers with greater access to formal knowledge. This illustrates how farmers with access to information can serve as a link in bridging formal and informal knowledge. Researcher has recognised the importance of the social network in developing knowledge and skills among farmers. This is evidenced by the growth of research related to social network analysis applied in agricultural research to understand its role in developing farming knowledge [2–5,7,8].

This study contributes to the literature by looking at the possible moderating effects of social engagement among farmers on developing farming knowledge. The social network of farming communities allows higher interactions and engagement wherein information exchange occurs [4]. This facilitates knowledge diffusion and provides opportunities for farmers with less access to information and farming technologies. Thus, we hypothesised that higher social engagement moderates higher access to services, training, and facilitate knowledge-sharing, which influence farming knowledge.

The remainder of the paper proceeds as follows. Section 2 discusses the methodology, while section 3 presents the measurement model’s assessment and discusses the moderating role of social engagement. Lastly, section 4 concludes the paper.

2. Materials and methods
2.1. Study area and data collection
The study used the case of rice farmers in Chiang Rai Province in Northern Thailand. We conducted a focus group discussion with farmers and group leaders. Sampled farmers included in the study were identified based on stratified random sampling. After data processing, a total of 304 farmers were interviewed in the study.

Farmers in the study area rely on irrigation as supplemental during the rainy season (October-December) and enable rice production during the dry season (March-May). In addition, livelihood activities in the area are agriculturally based. Most farmers have more than thirty years of farming experience, indicating that there is already an established form of social networking within the farming community. On the other hand, the focus group discussion found consensus among farmers that their primary source of information includes other farmers. Farmers shared that they could discuss farming issues during assemblies and group meetings. At the same time, farmers also imitate productive neighbouring farms by adopting the other’s farm practices. This indicates the presence of knowledge diffusion that depicts the critical role of networking among farmers in the adoption of improved farming practices and technologies.

2.2. Data analysis and measurement
The study used multiple measurement items using a seven-point Likert scale as indicators in measuring the constructs outlined in Table 1. The analysis used a confirmatory factor analysis (CFA) in assessing the measurement model and evaluate the construct reliability, convergent validity, and discriminant validity. Afterwards, a structural equation modelling (SEM) was used to test the model’s hypothesised relationship.

In testing the moderating effects of the farmer’s social engagement, variable interaction terms were developed by multiplying the composite constructs of service access, training, knowledge sharing with the composite construct of social engagement. The SEM and CFA analysis was performed using the R statistical software with the Lavaan package by Rosseel [9]. At the same time, we use the semTools package by Jorgensen et al. [10] in calculating the variable interaction terms used in the structural model.
Table 1. Definition of construct in the conduct of the study.

| Construct               | Measurement/scale | Definition                                                                 |
|------------------------|-------------------|-----------------------------------------------------------------------------|
| Service access         | 1 = Never, 7 = Very frequently | Refer to how frequent farmers avail themselves of services such as transport, community health care, education and social welfare. |
| Training               | 1 = Never, 7 = Very frequently | Represent the training received related to farming and farm management.      |
| Knowledge sharing      | 1 = Never, 7 = Very frequently | Relate to the activities of the interpersonal network that facilitate learning and information sharing such as group discussion, farmer to farmer, and peer to peer advice. |
| Social engagement      | 1 = Never, 7 = Very frequently | Represent a set of connections among farmer’s networks where information flows [2]. We measure the construct based on how frequent farmers associate with other farmers, social workers, local government units, communities, and groups or institutions. |
| Farming knowledge      | 1 = Not confident at all, 7 = Very confident | The construct relates to the experiential knowledge of farmers. Therefore, we measure the construct based on how confident farmers perform activities related to soil management, pest and diseases, post-harvest, marketing and other farming activities. |

3. Results and discussion

3.1. Measurement evaluation

The fit of the measurement model was assessed using the goodness-of-fit index (0.901), such as the normed fit index (0.903), comparative fit index (0.928), and the root-mean-square of approximation (0.033). Based on these measurement criteria, the model shows an acceptable and adequate model fit. Whereas Table 2 shows the result of the reliability and validity test. The Cronbach’s alpha represents the factor reliability indicating the internal consistency of the measurement model. While average variance extracted (AVE) with values above 0.50 indicate convergent validity. On the other hand, discriminant validity was achieved when the square root of the AVE exceeds the factor correlation. Results of the validity and reliability suggest that all necessary conditions were met.

Table 2. Assessment of the factor reliability and validity.

| Construct              | Cronbach’s alpha | AVE  | Factor correlation a |
|------------------------|-------------------|------|----------------------|
| (1) Service access     | 0.85              | 0.53 | 0.72                 |
| (2) Trainings          | 0.85              | 0.58 | 0.86 0.76            |
| (3) Knowledge sharing  | 0.89              | 0.67 | 0.35 0.28 0.81       |
| (4) Social engagement  | 0.91              | 0.72 | 0.29 0.24 0.56 0.84  |
| (5) Farming knowledge  | 0.82              | 0.56 | 0.23 0.24 0.5 0.33 0.76 |

a The italicised value along the diagonal in the correlation is the square root of AVE for each factor.

3.2. Service access, training and knowledge sharing effects on farming knowledge

The study estimated two structural models- without moderating effects (Figure 1) and a moderating effect of social engagement (Figure 2) while controlling for age, sex, and farming experience. This section presents first the direct effects of service access, training, and knowledge-sharing on farming knowledge. The next section discusses the moderating role of social engagement.

The study found service access to be a not statistically significant factor in developing knowledge. Service access in the study refers to access to basic services such as transport, community health care, education, and social welfare. Therefore, we assumed the possibility of service access to be more of an indirect effect towards farming knowledge rather than a direct one. Other mediating or moderating factors could play a significant role.
The study result also shows that training is not statistically significant in explaining variation in farmer’s knowledge. Several studies also found that training alone does not effectively deliver the expected enhancement in farmers’ farm production and livelihood [7,11]. This outcome may have resulted in most agricultural extension project that views farmers as end-users and adopters of technology rather than partners in the process. While in the focus group discussion, hesitance among sampled farmers in the adoption of newly developed technology is the perceived risk in driving away from their traditional farm practices. However, risk-averse farmers among sampled farms express willingness to adopt if other farmers (risk takers) start adopting and showing promising outcomes. This reflects how each farmer within their network influences each other on their decision-making process.

On the other hand, the effect of knowledge-sharing is straightforward. The study result shows that knowledge sharing has a significant direct effect on farming knowledge among sampled farmers. Furthermore, since social network within a farming community is highly associated with information exchange; thus, interactions that facilitate knowledge-sharing induce learning that improves farmer’s knowledge.

![Figure 1. Result of the structural model.](image)

3.3. Moderating effects of farmer’s social engagement on farming knowledge

The role of social engagement in the information flow within their farming community is considered a potential moderating factor in the model, as illustrated in Figure 2. The structural model results show that training and knowledge sharing effects are moderated by social engagement; however, service access remains statistically not significant.

Social engagement statistically moderated the effects of training on farming knowledge. This indicates that knowledge and information transferred by the researcher to farmers through training shows greater impact when information flows within farmer’s networks. Also, the study found that farmers with higher social engagement are associated with more training attended. This suggests that social networks play a role in facilitating greater access to sources of information. In Ghana, Isaac et al. [3] observed that farmers with access to training and formal sources of knowledge have able to transfer acquired knowledge with other farmers within their network. At the same time, spillover effects wherein farmers often imitate successful farmers could also amplify the impact of training and facilitate technology transfer [7]. For example, Wood et al. [12] found in their social network analysis that branching of information from farmers who have close contact with a group of agricultural researchers to the non-participating farmers who have no direct close contact.
As mentioned previously, knowledge-sharing has a significant direct effect, while Figure 2 shows that social engagement has a significant moderating effect. Both direct sharing of information and extracting information embedded within the social network of farmers through social engagement is positively associated with farming knowledge. During a focus group discussion, farmers reveal that they often talk and share about their farming practices. Farmers seek learning they can use in their farm; this shows how farmers value knowledge-exchange in developing their farming knowledge. For instance, Cadger et al. [8] found that the influence of agricultural intervention is not limited to participants exposed to the extension program. Non-participants who have contact with the participants show adoption of the introduced intervention as well. Knowledge diffusion, in this case, was facilitated by the social interaction of farmers within their farming network.

Overall, social engagement among farmers facilitates information exchange, whether from formal or informal sources, via networking within the farming community. Although the study found a significant moderating effect of farmer’s social engagement on training, service access and knowledge-sharing, results must be taken cautiously. There is a high possibility of endogeneity that would likely cause bias in which the study does account. The reader is referred to the work of Manski [12], which provides a rigorous discussion on possible sources of endogeneity. On the other hand, this challenge is expected in a non-experimental study such as in social science research. Addressing this potential problem is beyond the objective of the study. This study aims to understand the potential relationship of the selected factors and the potential moderating effects of social engagement among farmers in their farming knowledge.

4. Conclusions
Several studies often use social network analysis in understanding the role of farmer’s social engagement within their farming community in knowledge diffusion. In this study, we contribute by investigating the potential moderating role of social engagement on the effects of training, service access and knowledge sharing on farming knowledge. The study results show that farmer’s social engagement moderated the effects of training and knowledge-sharing activities while statistically not significant on farmer’s access to social services.
As agriculture constitutes an important role, especially in the rural livelihood in Thailand, the study found that informal networks such as social ties within the farming community hold a potential role in promoting innovations. Introducing newly developed agricultural technologies should be complemented with the promotion of higher community involvement to promote interaction and social exchange. This would greatly facilitate the transfer of information and strengthen pre-existing knowledge shared by farmers within their farming network. The increased flow of information exchange driven by higher social engagement among farmers supports the foundation of a community-based approach in agricultural development.

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