Farmers’ Adopting Decisions on Rice Technologies Diffused in the Cyber-Villages

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Abstract

The conventional modalities in technology transfer have been ameliorated using information communication technology (ICT) so that farmers’ access to up-to-date agricultural technologies could be as fast as the click of the mouse. We analyzed how technology transfer modalities in the cyber-villages assisted by the International Rice Research Institute (IRRI) contributed to adopting decision of rice farmers in Infanta, Quezon, Philippines. The study involved 76 rice farmers from three local government unit (LGU)- and three non-government organization (NGO)-managed barangays. The farmers were exposed to both ICT-based and conventional techno-transfer modalities. Some of the ICT-based technology transfer modalities were underutilized like the Pinoy Rice Knowledge Bank (RKB) and Nutrient Management for Rice (NMRice) mobile. Conforming to the theory of diffusion of innovation and influence, most farmers were early adopters because they wanted to see good results and to increase yield. Their adopting decisions were influenced by intermediaries whom they placed a high level of trust.

Keywords: technology transfer modalities, decision making, technology diffusion, adopting decision ties, social network analysis

Introduction

A number of technology transfer modalities have evolved in the past decades including farm demonstration, farmers training and other technology transfer and extension methods (Coldevin, 2003). With the advent of information and communication technology (ICT) and the goal to modernize agriculture, the conventional modalities need to be ameliorated so that farmers’ access to up-to-date agricultural technologies could be as fast as the click of the mouse. Cognizant of the rice farmers’ plight, the International Rice Research Institute (IRRI), an international research and development organization based at Los Banos, Laguna, Philippines, has designed in 2011 technology transfer modalities to strengthen farmers’ learning and to address the problem of food security worldwide (Lapitan et al., 2012). In the Philippines, IRRI is implementing the Cyber-Village Project which aims to enhance rice farmers’ productivity by improving their access to and application of rice and other related knowledge through the use of alternative models of technology transfer combined with relevant ICT. One of the pilot project sites is the municipality of Infanta, Quezon Province. The modalities were downloaded through the Cyber-Village Project. Under the Cyber-Village Project, IRRI provided technical experts, ICT infrastructure, and capability building services to the lead implementers – LGU of Infanta, Quezon through its Municipal Agriculturist’s Office (MAO) and the NGO, the Infanta Integrated Community Development Assistance, Inc. (ICDAI). The lead agencies facilitated in the diffusion of new rice technology from IRRI to the rice farmers in the villages.

In the process of technology diffusion, documentation and assessment of the decision making process among the rice farmers is important in the design of technology since it

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has direct bearing on its effectiveness (Reason, 1990; Monahan, 2000; Triantaphyllou, 2000). It will also inform the implementing agency on whether or not technologies will be adopted or used by the intended users. Also important to consider is the farmers’ perception of the characteristics of information products or services which translate directly to decisions on their use or non-use and positive or negative valuations of such (Sison, 1989). Since there is no documentation yet on the contribution of the new rice technology on the adopting decision of the farmers in the pilot cyber-villages of IRRI, a case study was conducted. Personal interviews and focus group discussions with the farmer-intermediaries and rice farmer-recipients of and Cyber-Village Project were conducted.

This paper analyzed how the new rice technology was diffused in the cyber-villages in Infanta, Quezon Province. It also looked into how the new technology contributed to the adopting decision behavior among the rice farmers assisted by IRRI. Specifically, it aimed to describe the technology transfer modalities used by IRRI for the rice farmers, find out the new rice production technology acquired by the farmers, and trace the adopting decision ties and behavior of the rice farmers.

Theoretical and Conceptual Framework

The study is anchored on the theory of diffusion of innovation and influence (Littlejohn & Foss, 2005) which posits that information flows from the mass media to certain opinion leaders in the community who pass information on by talking to peers. In the adoption of innovations, certain individuals will access it directly from media sources, whereas others will be many steps removed. In addition, people vary in their levels of resistance and the social support needed to adopt a new idea, practice or object. There are always individuals who will adopt an innovation early, before most others consider doing so. These early adopters will set the stage, and they usually have an influence on others. As more people adopt, a critical mass of adoption occurs that gives rise to a rapid increase in general adoption. A few people who may be very slow to adopt must see the innovation all around them before they will consider it. These are the late adopters and some may never adopt the new practice. In general, Rogers (1983) found that adoption approximates an S-curve over time and that higher-status individuals adopted an innovation relatively earlier. An individual is influenced to adopt an innovation who has already adopted the new idea.

The theory of the diffusion of innovation and influence also informs the present study since it deals with the farmers’ adoption of new rice production knowledge and technologies through the traditional and innovative media such as the Internet and cyber centers. The study tried to capture the interpersonal influence of the farmer-intermediaries to the rice farmers, how the new rice technology was diffused to the cyber-villages, how farmers perceived the technology’s relative advantage, and the farmers’ adopting decision and behavior.

Informed by the case study descriptive research design, the variables considered in this paper included the technology transfer modalities of IRRI, the new rice production knowledge and technologies acquired by the farmers, and adopting decision ties and behavior of the rice farmers within the pilot cyber-villages.

Methodology

Following the descriptive research design, the study sought to describe the technology transfer modalities and the farmers’ adopting decision behavior and networks. Guided by the case study as a form of descriptive research, the study tried to examine how technology transfer modalities contributed to adopting decision behavior and networks.
among the farmers who were actually involved in the Cyber-Village Project of IRRI.

Conducted from June to September 2012 in the municipality of Infanta, Quezon Province, the site was chosen since IRRI was implementing the Cyber-Village Project within the said town. Out of 36 barangays of Infanta, Quezon, six barangays were covered by the Cyber-Village Project of IRRI. The LGU-managed barangays included Binulasan, Guman, and Maypulot while the NGO-managed barangays included Abiawin, Alitas and Balobo.

Judgment sampling technique was used and respondents were selected following these criteria: 1) the respondent had been involved in any of the activities implemented by the NGO relative to the Cyber-Village Project of IRRI, and 2) the respondent was available and willing to participate during the time of the study. In selecting the rice farmer respondents, the intermediary (who happened to be the agricultural technicians designated by LGU and community worker designated by the NGO) were consulted. The respondents included 35 rice farmers from LGU-managed and 41 from NGO-managed cyber-villages. The farmer-respondents were tapped during the survey while the intermediaries were considered as key informants.

A pretested interview schedule was used to gather data on farmers’ newly acquired information or technology through the Cyber-Village Project, their time of adoption, and reasons for their adopting decision. In terms of adopting decision, farmers were categorized into: a) early adopters, those who immediately practiced the newly acquired information or technology; b) late adopters, those who adopted later; and c) non-adopters, those who did not adopt the technology.

During the sociometric survey, the farmers were asked: “before you decide to apply or adopt the new rice information or technology, who do you consult?” To analyze and generate adopting decision map, the UCINET 6 software was used for the social network analysis.

Results and Discussion

Technology Transfer Modalities

The technology transfer modality is also referred to as communication delivery system (CDS). In this study, the technology transfer modalities used by IRRI included the ICT-based CDS like Rice Knowledge Bank (RKB), nutrient management for rice (NMRice) mobile and internet; and conventional CDS such as Farmers’ Field School (FFS), print materials (brochure), training, seminar, and demonstration farm.

Rice knowledge bank (RKB)

The RKB comprised the two interfaces: the IRRI-RKB and the Pinoy RKB maintained by the Philippine Research Institute (PhilRice). As reported in [Aligam 2009], the RKB is an ICT-based repository of scientific research on rice and farming systems developed by IRRI. Together with the International Maize and Wheat Improvement Center (CIMMYT), the RKB aims to bridge the research-extension gap in rice production worldwide. Meanwhile, the Pinoy RKB could be accessed online through clicking the Philippine flag under the Country Knowledge Banks menu located at the IRRI RKB interface or by logging in to www.pinoyrkb.com (IRRI, 2012b). It was a one-stop source of information on rice and rice-based farming developed by the Philippine Rice Research Institute (PhilRice) and the Department of Agriculture, and translated into the major dialects of the Philippines. Occupying a larger space in the interface was the gallery for the PalayCheck System, a dynamic rice crop management system that presented the best key technology and management practices as key checks. By using the key checks, the user would learn from experiences while improving crop management practices. The user had to hover on images to view descriptions of the seven key checks. A good feature of the website was the different translations of the information.
into major vernaculars of the Philippines like Tagalog, Cebuano, Ilokano and Hiligaynon, providing ease of comprehension even for the less educated farmers in the countryside. IRRI’s RKB has also been helpful among the rice farmers in a local cooperative in Pampanga, Philippines (Guinto, 2009).

Nutrient management for rice (NMRice) mobile and internet

This was a web-based decision tool for providing field-specific guidelines on nutrient management for rice. As a quick way of getting nutrient recommendations for rice, rice farmers could access it using mobile phone or the internet with the assistance of the intermediaries. The nutrient recommendations were received by the rice farmers at their respective cellular phones.

The intermediaries of the Cyber-Village Project were provided a mobile tablet for easy access and service to the farmers right at the field. To get the nutrient recommendations, the farmer needed to be guided by the intermediary, following the instructions and entering relevant information that were asked for as inputs to this decision tool. When the needed information were provided, the nutrient recommendations will appear in the screen (if internet and android mobile phone was used) and a text message will be received by the farmer, indicating the desired amount and type of fertilizers to be applied during the specified growth stages of rice. The number of days after transplanting were indicated, and the expected yield was also calculated. Through the NMRice tool, the farmers were provided the necessary information on the appropriate time of nutrient application and the amount and type of fertilizer tailored to the conditions and environment of the rice farm. With the use of NMRice, as revealed in self-reports, the farmers’ yield have increased from 28 to 32 percent and their expenses reduced by about 4 to 14 percent.

Farmers Field School

The goal in FFS was to make farmers experts in their fields and eventually empower them to make their decisions. Its learning activities aimed to promote farmers’ ability to gather, analyze and interpret information, take action based on the information and evaluate the results in ways that would influence the next action by focusing on specific conditions and problems that farmers faced in the field (IRRI, 2012a). The FFS consisted of a group of cyber-village farmers who meet once every week during the rice cropping season (12-15 weeks). The FFS had a study field of 1,000 m² that was divided into IPM and farmer practice (FP) plots. Working in small groups of 5-6 persons, farmers observed plants and insects, assessed crop physiological conditions (e.g., height of the plant, number of leaves and tillers, length of roots) and recorded observations. Outside the field, each group reassembled and discussed, analyzed and interpreted its data. Prior to the implementation of the Cyber-Village Project, IRRI had assisted some research that explored expansion of the FFS even among the youth (Medrano, 2009).

Print materials

Print materials, in the form of brochures and posters, were designed, reproduced and distributed to the farmers. The brochure contained relevant information on the agronomic traits of the recommended rice varieties adoptable to various ecosystems. Aside from the agronomic traits of the rice varieties, instructions were provided for the farm demonstrations. Distribution of the brochure was done during the launching of the demonstration farms and trainings.

Training

In the Cyber-Village Project, trainings were conceptualized and carried out with specific objectives, usually related to knowledge and skills enhancement of the participants. Before
a particular training was implemented, the program of activities was laid out, resource persons were identified, logistics and facilities were prepared, and the participants were identified. Each training took two to three days, depending on the scope of the topic. In relation to the implementation of the Cyber-Village Project, the following trainings were implemented among the stakeholders of the project at Infanta, Quezon: Information-Communication Technology (ICT); Seed Health Management Training; and Training on Improved Rice Technologies from the Rice Knowledge Bank (RKB) and PalayCheck System. These were training sessions that introduced the farmers about the improved rice technologies that were integrated with the RKB and Palay Check System. The resource persons used the Tagalog version during the conduct of training sessions.

**Seminar**

In the Cyber-Village Project, seminars were conducted in the form of farmers' class or meeting. Farmers’ meetings were regularly scheduled for each of the barangays in the cyber-villages. Some cyber-villages had weekly meetings, while others had monthly schedules. The intermediary, usually, attended to and served as a resource person during seminars. The farmer-leader presided the meeting, and the proceedings of the meeting were recorded by the secretary. Seminar topics included in the Cyber-Village Project were follow-up concerns during the trainings, updates and activities implemented in the cyber-village.

**Demonstration farm**

A field demonstration was established by intermediaries – in collaboration with farmers – to validate and demonstrate new technologies. Field demonstrations were an effective way to raise farmer awareness about new options. In turn, farmers may then seek more information about a technology if they wish to try it. Demonstrations involved discussion (e.g., during field days, farmer to farmer talks, etc.) and visual components (i.e., the field plots). As reported in the Cyber-Village Accomplishment Report in Year 1 (Lapitan et al., 2012), the Project distributed seeds for participating farmers to test and multiply to see whether these varieties met the characteristic needs of the local environment of the site. Consequently, demonstration farms were established in the cyber-villages. The varieties tested were NSIC RC 222 (Tubigan 18), NSIC RC 214 (Tubigan 16), NSIC RC 194 (Submarino, NSIC RC 9 (Apo), NSIC RC 192 (Sahod Ulan 1), PSB RC 68 (Sacobia), NSIC RC 182 (Salinas 1), and NSIC RC 88. Farmers were given 1 kg of the varieties deemed suitable to the conditions or ecosystem of their area (based on knowledge about the province and reports by the municipal agriculturist on whether their rice farming areas were irrigated or rainfed, with or without saline intrusion, drought prone or not, etc.). Instructions on how to plant the variety (size of plot, spacing, fertilization) were explained to the participating farmers and intermediaries through the print materials and during the distribution of the seeds held on Project launching ceremonies.

**New Rice Production Information and Technology Acquired by Farmers**

To identify the specific rice information and technology acquired from the Cyber-Village Project, the rice farmer-respondents were asked about the time since they first got involved in the project. Among the LGU-managed cyber-villagers, they acquired the following: proper fertilizer application, proper water management, friendly insects, pests identification, proper application of pesticides, proper seeding, appropriate time of fertilizer application, rat control, seed characterization, field lot leveling, and synchronized planting. The NGO-managed
cyber-villagers revealed to have acquired the following: proper water management, seed selection, proper planting, appropriate time fertilizer application, seed purification, proper seeding, identification of friendly insects and pests, land preparation, and non-burning of rice husk.

A focus group discussion (FGD) with farmers showed that these information and practices were new to them. They claimed that they never applied such practices not until the Cyber-Village Project was introduced in their communities. For instance, as practiced before, they never determined the appropriate quantity or amount of fertilizer to be applied and the right time to apply it in their fields. They never identified the friendly insects and the pests; they applied high seeding and planting rates; and water was not properly managed.

Interestingly, a big proportion of the rice farmers from both camps perceived the new rice technology acquired from the Cyber-Village Project as very useful (86% and 93% of the LGU- and NGO-managed cyber-villagers, respectively). The main reasons of their perceived usefulness were the following: it increased yield, reduced the expenses, and added their new knowledge in rice farming. Moreover, the farmers found the new technology as understandable and they did not find it difficult to apply in their rice fields.

**Adopting Decision Behavior of Rice Farmers**

In terms of adopting decisions, a big proportion of the farmers from both LGU- and NGO-managed cyber-villages were early adopters because they wanted to see good results and increase their yield. Their primary considerations for adopting new rice technology were reduced expenses and increased yield. The intermediaries had influenced the rice farmers’ adoption decisions.

Almost all of the cyber-village farmers (97% from LGU- and 100% from NGO-managed cyber-villages) claimed to have adopted certain new rice technology (NRT) that they acquired through the Cyber-Village Project. Respondents have given reasons for adopting the technology. Foremost of these was their belief that NRT would reduce expenses and increase yield, indicating that the rice farmers in both camps would adopt a particular NRT if such would reduce their expenses and contribute to increased yield. For the LGU-managed farmers, they also stated that if the technology was easy to apply, easy to understand, has good eating quality, and has less water requirement, they would readily adopt such NRT. Meanwhile, for the NGO-managed cyber-villagers, a technology that was easy to understand and had less water requirement would be readily adopted by them.

As to the adoption mode, 22 of the LGU-managed cyber-villagers immediately adopted after learning about the new rice technology; they were classified as the early adopter. Some 13 farmers adopted the technology introduced to them some time later; they were called late adopter. Out of 41 farmers from the NGO-managed cyber-villages, 27 were the early adopter, 11 late adopter, and a few (3 farmers) were non-adopters because they never adopted some of the new technology. When asked about the reasons for immediate adoption, the primary reasons of the LGU-managed farmers were the following: they want to try it out, to increase their yield, and to prove the efficacy of the technology. Meanwhile, the NGO-managed farmers wanted to increase their yield, to try it out, and to reduce farm inputs. Those who adopted some time later reasoned out that they failed to adopt the technology immediately because they just learned about it lately. Others averred that they wanted to observe it first from other farmers. For the few farmers who never adopted, they claimed that the technology required much of work, and they do not want to harm the friendly insects in the field. When
queried about who were the influencers for them to adopt or not adopt a particular technology, most of the LGU-managed cyber-villagers identified the LGU technicians. A few of them identified IRRI personnel, NGO worker and co-farmer.

Meanwhile, the NGO-managed cyber-village farmers identified the NGO worker as their primary influencer. Aside from the NGO intermediary, the IRRI personnel, co-farmers, PhilRice staff, and LGU technicians were also considered as influencers. Again, it appears that the intermediaries (LGU technicians and NGO worker) have influenced the adoption decisions of the cyber-village farmers.

**Adapting decision ties**

Adapting decision ties focus on the pattern of interaction among stakeholders in terms of “who consults from whom for adoption decisions in the cyber-village” (out-degree) and “who is being consulted for adoption decision” (in-degree). Information on adoption decisions could provide us idea as to who influence whom in the cyber-villagers when it comes to adoption of new rice technology. The rice farmers were asked: “if you decide to adopt a new rice technology, from whom among the members of the cyber-village do you seek an opinion with?”

This network consisted of 88 active ties or links and 107 nodes or stakeholders (Figure 2). The most visible central points or hubs (having the most number of in-degree links) were LGU1, LGU2, LGU3 and NGO1. Result implies that the intermediaries of the Cyber-Village Project serve as the consultants when farmers decide to adopt or not a particular technology.

Interestingly, some potential farmer-consultants emerged in the network. The potential farmer-consultants included ALI4, BAL1, BAL4, ABI7, BIN6 and MAYP6 who are being consulted about adoption decisions. Result indicates the potential of some cyber-villagers for equipping to become farmer-consultants at the village level. Non-members were also sought for opinion by the cyber-village farmers, totaling 25. Aside from the LGU and NGO technicians, intermediaries from IRRI and PhilRice were also being consulted by the some farmers for their adoption decisions.

In general, it could be deduced that the network was intermediary-centered in terms of
Figure 2: Adopting decision ties in all barangays under the LGU-managed and NGO-managed cyber-villages.
seeking opinion for the farmers’ adoption decisions. This is supported by the earlier results indicating that the cyber-villagers placed a high level of trust among the intermediaries.

The apparent intermediary-centered adopting decision ties in the cyber-villages spells a need to bolster the network by conducting communicative skills enhancement among the farmers, and to empower the cyber-village farmers. Since IRRI could cease their assistance any time after the project’s implementation, the farmer intermediaries should be equipped and empowered since they are mostly trusted and depended upon by other farmers. The emerging farmer-consultants could be tapped to sustain the cyber-village activities even without the presence of IRRI.

Conclusion

The new rice technology flows from the technology source (IRRI) to the rice farmers through the trained intermediaries utilizing both ICT-based and mostly traditional systems of technology transfer modality. Conforming to the theory of diffusion of innovation and influence, a big proportion of the farmers were early adopters because they wanted to see good results and to increase their yield. The cyber-village farmers’ adoption decisions were influenced by the persons whom they placed a high level of trust.

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References


