Research Paper

Adoption and Uptake Pathways of the Recommended Practices among the Mushroom Farmers in Kegalle District, Sri Lanka

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Abstract

The study sought to describe the adoption and uptake pathways of the recommended practices among 60 mushroom farmers from Pitiyegama, Hewadiwela, and Walpola in Kegalle District, Sri Lanka. Data were gathered using an interview schedule and an innovation tree exercise, and analyzed using Statistical Package for the Social Science (SPSS) and manual method respectively. Descriptive statistics such as mean, frequency, percentage, and range were employed to analyze the quantitative data. Results showed that the adoption of mushroom technology in the Kegalle district started with the agriculture extension officers of the Department of Agriculture Sri Lanka introducing the recommended technology to the farmers through farm demonstrations, seminars, and workshops. The main source of information is the co-farmers. Knowledge about mushroom technology is strongly based on that of fellow farmers, relatives, and neighbors indicating the prevalence of a peer learning system. Extension service shows promise in strengthening the farmers' capability in facilitating the provision of needed support in information, problem-solving, and marketing. The typical tendency of farmers to engage in peer and collective learning suggests that any extension work should build up on the existing peer groups of farmers as a conduit for learning. The elements of trust and caring for fellow farmers as well as their shared lifeworld are strong points for farmers to influence each other to adopt or not-adopt certain technologies.

Keywords: Innovation tree exercise, Kegalle, Mushroom farmers, Technology adoption, Uptake pathways

Introduction

The demand for mushroom cultivation in Sri Lanka is raising rapidly (Thanuejah *et al*., 2013). Mushroom cultivation is a productive, profitable and lucrative business especially at small scale due to the huge demand for mushroom in local and international markets (Thilakarathna and Pathirana, 2017). Among tropical mushrooms, oyster mushroom is the most commonly cultivated in Sri Lanka. As the technologies for oyster mushroom cultivation are simple, it can be easily grown in small backyard farms (Thakur, 2014).

Government and nongovernment agencies have implemented mushroom cultivation programs along with business and technical advisory services to support small-scale farmers and local communities who are involved in mushroom cultivation in Sri Lanka (Marshall & Nair, 2009). The responsibility of the research and development activities of mushroom cultivation in Sri Lanka is under the portfolio of the Department of Agriculture (DOA) (Rajapakse, 2014). Thus, the Department of Agriculture has developed and disseminated a number of proven technologies for mushroom cultivation to farmers (Gamage and Ohga, 2018). In order to improve the productivity, research-proven technologies must be accepted and adopted by mushroom farmers. However, many mushroom farmers are not adequately aware of the recommended mushroom production technologies or reluctant to adopt such technologies due to uncertainty of the result. The studies indicate that the factors influencing technology adoption differ with the locations across the countries (Heisey and Mwangi, 1993).

According to Lai (2017), acceptance of these technologies depends on a number of factors such as availability of technologies, convenience, farmer needs and security. Lack of awareness on mushroom technologies including disease management among mushroom farmers is a major constraint (Thilakarathna and Pathirana, 2017). Knowledge on mushroom production technology is insufficient among mushroom farmers in Sri Lanka compared to other countries. Mushroom cultivation requires certain specific technical knowledge and skills including control of environmental conditions and pest and disease management (Gamage and Ohga, 2018)

The Ministry of Agriculture, Sri Lanka has implemented several livelihood development programs in recent times and introduced research-proven technologies to uplift farmer productivity (Rajapakse, 2014). The adoption of research driven technologies by farmers leads to support a developing country's economic sustainability. However, the decision to adopt technology is a behavioral response arising from a set of alternatives and constraints undergone by farmers.

Meanwhile, farmers can access technological information from various uptake pathways, which predominantly include extension agents, farmer field schools, and radio broadcasting programs in their localities. An uptake pathway will enable farmers to make timely decision

that will lead to adoption of recommended technologies and subsequent increased agricultural production (Torres *et al*., 2013)

The uptake pathway is the process that captures how the technology is introduced, disseminated, adopted and shared by the farmers with others (Torres *et al*., 2013; Navarro and Hautea, 2014 and Wang *et al*., 2015). According to Torres *et al*. (2013) and Wang *et al*. (2015), peer teaching is the preferred learning technique among farmers as farmer-to-farmer relationship facilitates the spread of firsthand information. Navarro and Hautea (2014) note that interpersonal and face-to-face encounter among farmers facilitates knowledge sharing which helps to disseminate of a technology especially when others are reported to have benefit from it.

This study thus was conducted in Kegalle district where many mushroom farmers are concentrated aiming to analyze the uptake pathways in the adoption of the recommended practices among the mushroom farmers. Rogers (1995) contend that the spread of recommended technology depends on many factors such as nature of innovation, state of adopted people, nature of communication channel, nature of social system and uptake pathways. Meanwhile, Bandura's Social Learning Theory suggests that individuals learn from one another through observation, imitation and modeling.

Increasing yield and income of mushroom farmers using a recommended mushroom production practices is the one of the targets of the mushroom development project of Department of Agriculture which was implemented in the Pitiyegama, Hewadiwela, and Walpita Villages of Kegalle District in 2014. This study was undertaken with objectives to find out the effect of interpersonal relationship with technical officers in government, private companies, and non-government organizations (NGOs); the effect of fellow farmers, relatives, neighbors, and friends; the accessibility of suppliers of inputs; the availability of loan providers; and market outlets with regard to the current production practices of mushroom farmers and the extent of farmers' adoption of recommended mushroom production practices.

Materials and Methods

The study was conducted in Pitiyegama, Hewadiwela, and Walpola villages of the Kegalle district in Sabaragamuwa Province, Sri Lanka. These villages provide a good setting for a research on uptake pathways in the adoption of the recommended practices among the mushroom farmers due to the presence of commercial mushroom cultivations. The Saemaul Global Foundation of South Korea and the Sabaragamuwa Provincial Council in Sri Lanka launched a joint program in these villages from 2014 to 2018 to popularize the mushroom cultivation in the Kegalle District. It was important either farmers having adequate experience on mushroom cultivation or exposed to the mushroom project activities so that the study could successfully conducted to enable them to trace and describe their adoption and uptake pathway.

Data were collected through a survey, focus group discussions, and key informant interviews.

Sixty farmers out of total 153 farmers engaged in mushroom cultivation in these three villages as per the records maintained by Instructors' offices were selected for the study using stratified random sampling method. Twenty-five respondents were selected from Pitiyegama Village where as 19 from Hewadiwela Village and 16 from Walpita Village. The samples from each village participated in a Focus Group Discussion (FGD) and innovation tree analysis.

The study employed a one-shot survey using a structured interview schedule to gather data from sample respondents. The interviewers were thoroughly briefed on the study and interview procedures before the data gathering was carried out.

The subject matter officer (mushroom cultivation), Agriculture Extension Officers, farm leaders and the Saemaul Korean mushroom project leaders chosen based on their role and level of involvement in the mushroom production were interviewed to obtain general information on the services provided to promote mushroom cultivation through agriculture extension.

An innovation tree exercise which was recognized as a Participatory Rural Appraisal (PRA) tool developed by the Van and Zakaria (2002) was carried out during focus group discussion. The innovation tree technique previously used by Torres *et al*. in 2012, Mayee and Choudhary in 2013 and Wang et al in 2015 was used to examine the adoption and uptake pathway of bio-tech crops. It was used to "help people visualize and analyze the way in which an innovation was spread over time among farmers" (Torres *et al*., 2012; Mayeel and Choundhary, 2013 and Wang *et al*., 2015).

The Statistical Package for the Social Science (SPSS) was used to analyze the quantitative data collected using the survey. Descriptive statistics such as mean, frequency, percentage and standard deviation were used to describe the variables in the study. The data generated from the qualitative methods, was analyzed using illustrations and flow charts.

The innovation tree analysis was used to analyze recommended technology adoption and uptake pathway that will generate the main actors in the process

Results and Discussion

Farmers' first source of information on mushroom

Farmers received their first information on mushroom production from their fellow farmers (co-farmers – 32%, cooperative members – 18%) with a strong tendency while 43% of farmers who participated in the innovation tree exercise emphasized the first source of information is received from the Department of Agriculture (Table 1). First source of information showed a very strong sense of peer system and shared lifeworld among farmers which was typical characteristics of farming communities in Sri Lanka.

Under the peer system, farmers considered their fellow farmers as co-beneficiaries of technology not as competitors. Farming as their livelihood is more of a community or a collective effort. Hence, they expected everyone to be sharing material and non-material resources like information to help others. In a way, information and knowledge had been regarded as social commodities which they shared with their peers.

Source of information on mushroom cultivation

Farmers received information on mushroom production from varied sources which are categorized mainly into interpersonal and media (Table 2). Thirty-seven percent of the farmers received information from fellow farmers who are also considered as their most frequent technology disseminators followed by magazines (24%), television (23%) and the Department of Agriculture (DoA) technicians (13%).

Table 1. Information on obtaining of the first source of information by farmers

Individual	Frequency (60)	Percentage
Extension officer DOA	26	43
Co-farmers	19	32
Member of cooperatives	11	18
Relatives	2	3
Extension officers –other	1	2
Other	1	2
Seed suppliers/ Traders	-	-

However, Torres *et al* (2013) reported different findings in which seed suppliers/ traders ranked as the topmost (56%) information source followed by the DoA technicians (34%) and then by their co-farmers (30%). It should be noted however that fellow farmers are also considered a major information source in Torres' studies regarding the uptake pathway and technology adoption.

Fellow-farmers served as the most significant influencers for the adoption of mushroom production technologies. This is attributed to the strong peer system and shared worldview among farmers. Unlike the professional occupations where competition is high, farmers usually have the strong tendency not to alienate their fellow farmers. However, farmers try to bring them in in the same circle from which they derive some benefits. They felt that benefits from mushroom production should be shared with all fellow farmers without keeping only among themselves.

Table 2. Sources of information on mushroom production

Sources of information	Frequency	Percentage
Interpersonal source		
Fellow farmers	57	37
Seed suppliers/ traders	1	1
Media sources		
Magazine	38	24
Television	37	24
Seed packet label	-	-

Huang and Wang (2014) stated that around 40% of farmers in Henan and Anhui province of China learned about Biotech cotton information from the seed technicians. However, the information on biotechnology acquired by farmers are shared later among farmers. Similarly, Torres *et al*., (2013) also cited those farmers learned information from the seed suppliers initially and then shared information among the fellow farmers.

People with whom the farmers shared their knowledge on mushroom cultivation

There was very strong tendency among farmers as shown in Table 3 to share their knowledge about mushroom production practices mostly with their co-farmers (54.09%) while 27.86% is sharing it with their relatives. This depicts a very strong sense of peer system and shared lifeworld among them which is typical characteristics of farming communities in the Sri Lanka.

Reason for effective extension delivery system

Forty-six percent of the respondents reported that the extension services were effective in assisting farmers at "problem solving". Farmers were aware that mushrooms were very susceptible to pests and diseases. Among all the problems they encountered in mushroom cultivation, dealing with pests and diseases was found to be the most critical. They believed that the agriculture extension officers are important source of information and mushroom cultivation would not be able to carry out without their assistance. Therefore, technically sound extension officers were considered effective to solve mushroom issues. Twenty-three percent of the farmers responded that continuous awareness programs were very effective in maintaining sustainable mushroom cultivation among small scale farmers. Eighteen percent of the farmers had continuous contact with extension officer for obtaining their services. As shown in Table 4, the extension agents who had the problem-solving ability, adequate capacity and knowledge to conduct awareness programs and better contacts with the mushroom farmers were considered as most effective.

Table 3. People with whom the farmers shared their knowledge on mushroom farming

Individual	Frequency (n=61)	Percentage
Co- farmers	33	54.09
Relatives	17	27.86
Technicians	1	1.6
No one	9	14.75
Other	1	1.6

Table 4. Reason for effective extension delivery system

Reasons	Frequency (n=53)	Percentage
Problem solving	46	46
Conducting awareness program	23	23
Continues contact with farmers for services	18	18
Visiting their premises	9	9
Facilitating market	4	4

**Multiple answers*

Uptake pathways

Innovation tree exercises were conducted in all 3 villages. Figure 1 shows the summary of the adoption of mushroom cultivation across the study areas. Findings from the FGDs explicitly showed that the mushroom cultivation was introduced to farmers by Agriculture instructors from the Department of Agriculture. These farmers were initial cooperators and their farms were used even for demonstration purposes. The Agriculture instructors conducted seminars on the crop and its benefits. It was evident that those who participated in the demonstration farm activities and seminars eventually adopted the technology and influenced other farmers within and outside their communities to adopt mushroom cultivation technologies.

Further, findings from the FGDs show that Seamaul project which also served as financier and subsidy suppliers had direct influence on the farmers' decision to adopt mushroom cultivation. Farmers relied on the project for capital and initial farm inputs. The Office of the Deputy Director of Agriculture plays a significant role in providing avenue for technical information during seminars. Further, the staff of the DD office monitored the mushroom pest and disease incidences in the area. Farmer cooperatives had indirect influence, mainly through a progressive member who persuaded other farmers to cultivate the mushroom.

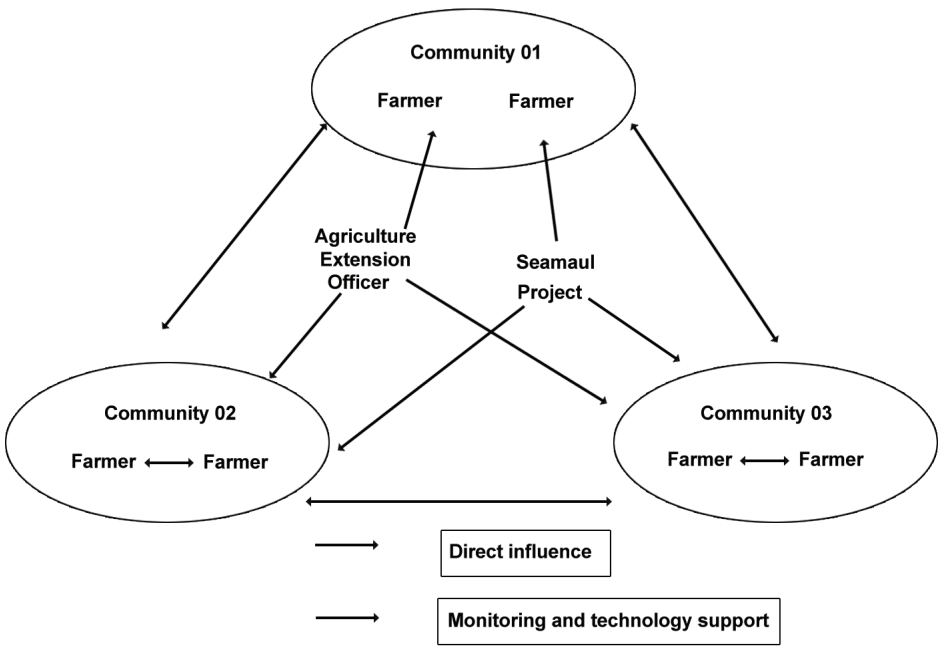

Figure 1. Overall pattern in the uptake pathway of mushroom technologies in three villages in Kegalle district

The innovation tree is a method that helps to visualize and analyze the way of innovations like mushroom production technologies spread over time among community members. FGD identified the different factors that influence the adoption, diffusion, and modification of an innovation.

Uptake pathway in walpola village

Mushroom cultivation in the Walpola village did not spread among farmers in the early years of its commercialization as fast as expected. Farmers were generally late adopters. Ms Niluka, for example, was the earliest adopter among the 16 participants in the innovation tree activity (Figure 2). She had learnt mushroom cultivation technologies from fellow farmers in another village in Kegalle district in 2007as farmers in other parts of the country had already been cultivating the mushroom. The succeeding adopters, namely Leela even started cultivating mushroom only in 2009. She learnt about mushroom cultivation from Niluka and started cultivation in 2009 when Niluka's mushroom cultivation became a successful venture. However, Leela passed her knowledge in 2017 to Karunawathi who also started cultivating oyster mushroom and relayed the technology to Krishari, her adjacent fellow farmer in 2017. Another farmer named Gunehami received information initially from members of the Seamaul cooperative who were not part of the FGD. Gunehami shared her knowledge on mushroom cultivation with a relative only.

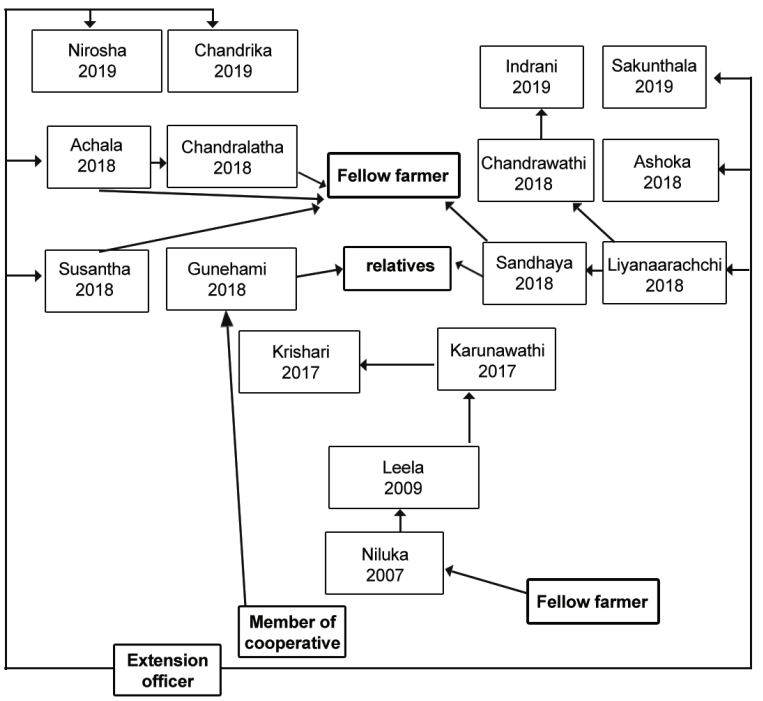

Figure 2. Uptake pathway of mushroom technology among farmers in Walpola

Extension officers of DoA had influence the decision of many other farmers in Walpola to adopt mushroom cultivation during 2018-2019. Accordingly, extension officers disseminated mushroom production technologies to Susantha, Ashoka, Liyaarachchi, Achala, Nirosha, Chandrika and Sakunthala (Figure 2). Achala, Liyanaarachchi and Chandrawathi shared their knowledge on mushroom cultivation technologies with fellow farmers in the FGD during 2018-2019. Majority of the farmers identified Achala, Chandralatha, Susantha, Gunehami and Sandhya in the Walpola village as those who shared their knowledge of mushroom technologies to fellow farmers who did not participate in the FGD. The Seamaul project gave subsidies and helped establish infrastructures for mushroom cultivation in the village.

Adopters relied on fellow farmers, agricultural extension officers and members in cooperatives for obtaining information on mushroom production technologies. Knowledge of recommended mushroom production practices was also often shared with fellow farmers, neighbors and family members usually after one season during which considerable knowledge is gained. Apart from the assured income, factors such as less recurrent expenses and reduced time and effort for pest management led the farmers to adopt mushroom cultivation.

It was found that some of the late adopters were aware of the mushroom technologies more than a year before until decided to adopt it. Their delayed adoption was due to lack of capital, unaffordable farm equipment (such as sterilizer), and lack of assurance for a good income. Some waited to witness the success of early adapters for them to take up the technology. In the area, about 30% of farmers in the village had not adopted the mushroom technology due to lack of capital.

The main problems identified in mushroom production were the following: (a) absence of support services from government, (b) lack of machinery, (c) infestation of mushroom by rats, mites and mushroom flies, (d) low market price for harvest and (e) environmental problem (or drought). Some farmers also had terminated growing mushroom for 1-2 years because of unbearable pest and disease incidents and subsequent crop failures in consecutive seasons led to debts.

The participants identified (a) pest and disease control; (b) machinery, such as sterilizer, media mixture; (c) equipment, such as misters and (d) training on proper cultivation as research needs to be taken up relevant institutions in priority basis.

Similar patterns of uptake pathway were observed in other two other villages.

Conclusion

Adoption of mushroom technology in the Kegalle district starts with agriculture extension officers of the Department of Agriculture Sri Lanka making farmers aware on recommended technologies. The main source of information is the co-farmers. Knowledge about mushroom technology is strongly based on the fellow farmers, relatives, and neighbors reflecting the prevalence of a peer learning system.

Extension services have helped bring out the innovators and early adopters among the farmers. However the technology adoption is mostly spreads through a peer learning system. Psychological and social factors also might be cause to influence the mindset of resource poor farmers for adoption of technologies. Therefore. it is also necessary to ensure provision of material inputs, as well as technical and policy assistance that would drive or motivate the farmers to adopt and sustain uptake of recommended mushroom production technologies. Farmers exhibit strong belief in experience and knowledge of themselves and are inspired by the success of their fellow farmers. Hence, farmer-to-farmer education must be promoted and sustained. People are more likely to follow the other's behaviors modeled (mushroom farm). More perceived commonalities between the observer and the model, the more likely the observer will learn from the model. Promotion of peer learning system for farmers (early adopters & early majority), strengthening of farmer organization can be recommended for technology dissemination programs in the extension service of the department of Agriculture.

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