

Factors affecting farmers' adoption of technologies in farming system: A case study in OMon district, Can Tho province, Mekong Delta.

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ABSTRACT

Farmers' changes of technology use are influenced by technical training, meeting, oral transmission, trust on technician and belief level on technology. Men usually use technologies for rice, fruit and fish production, and women use technology for pig, chicken production. Factors that trigger adoption of new technologies comprise of progressive, young and educated male farmers. Factors limited adoption of technology included conservative old men, and weak belief on ensure high yield of new technology. Though farmers have positive perception of technology, they faced problems in technology application due to lack of capital, lack the direction from the government and extension, lack compensation policy in ensure of yield.

INTRODUCTION

A farming system is the result of a complex interaction of a number of interdependent components – soil, water, crops, livestock, labor and other resource-within an environmental setting.

The total environment can be divided into two elements: technology and human. Technology determines the type and physical potential of livestock enterprises, and includes the physical and biological factors that can be modified through technology development. The human element is characterized by exogenous (community structures, external institution, etc.) and endogenous factors, which can be controlled by the farm household. At the center of this interaction is household member. The household ultimately decides on the farming systems on whether or not to adopt technologies and how to assign resources to support it (Norman, 1980, cited by Paris). The decision of use of technologies is dependent on how farmers perceive of technology. According to Price (1996), perception acts as filter through which new observations are interpreted. According to Van de Ban and Hawkin (1988), perception is the process by which we received information

or stimuli from our environment and transform it into psychological awareness. Decision making model of Norton and Mumford (1983, cited by Heong, et al. 1994) shows that, on the basis of perception of the problem, farmer assesses expected outcomes. The farmer's choice of action (decision) will depend on his evaluation of this and other outcomes, in term of his own personal perspectives. Allport, 1965 cited that perception involves to understanding, and awareness of a meaning or recognition of the objects. In this research, the objects are technologies. Koppel (1978), the predominant role of technology is facilitating major improvement in agriculture productivity. Therefore, it is important to know how farmers perceived of technologies for better understanding of their choice in decision of adoption or not. Technology is one of resources for agricultural production. According to Ingold (2002), definitions of technology differ widely, depending on whether the intent is to embrace the totality of human works, in all societies and during all epochs. Rogers (1983) reported that technology is a design for instrumental action that reduced the uncertainty in the cause and effect relationships involved in achieving a desired outcome. Technology comprises of

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two components, hardware and software. The hardware consists of physical tool that embodies technology. The software consists of information base for the tool. In Mumford's classification (1946), "technology-as-objects" encompasses the entire range of fabricated items intended for some use or other, including tools, utensils, utilities, apparatus and machines. Mitcham (1978), "technology-as-process", includes most importantly the activities we commonly denote as making and using. The key element here is that of skill defined as 'proficiency in the use of artefact'. Ingold (2002) distinguished technique from technology. Technique refers to skills, regarded as capability of particular human subjects, and technology means a corpus of generalized, objective knowledge, insofar as it is capable of practical application.

Technology can be reached farmers through technology transfer. Technology transfer refers to the general process of moving information and skills from information or knowledge 'generators' such as research laboratories and universities to clients such as farmers (Valera et al. 1987).

The outcome of new technology transfer is the farmers' adoption and bringing this into practice and further diffusion to other individuals in the community.

Regarding to adoption, farmers sometimes discover problems in putting recommendation into practice, the extent of adoption, adjustment or rejection depends on farmers' behavior (Valera et al. 1987). Mosher (1987, cited by Cruz, 1978) defined that adoption of an innovation is the process by which a particular farmer is exposed to, considers, and finally rejects or practices a particular innovation. The innovation decision model by Rogers (1983) shows the process through which an individual (or other decision making unit) passes from first knowledge of an innovation to forming an attitude towards the innovation, to a decision to adopt or reject, to implement of the new idea, and to confirmation of this decision.

Diffusion is the process by which an innovation is communicated through certain channels overtime among the members of a social system (Rogers, 1983). When new

ideas are invented, they are diffused and adopted or rejected. We use the concept of diffusion in our study in term of understanding how many farmers know and use of technology. Valera et al. (1987) reported that the community is composed of different groups of people, in general, diffusion of innovation will take place only within groups of people who are homogenous in terms of problems, aspirations and needs. According to Cruz (1987), time is an important factors in the process of diffusion. The system's social structure can have an important influence on the spread of new ideas. It can impede or facilitate the rate of diffusion and adoption of new ideas. The norms, social statuses, hierarchy, and so on of a social system influence the behavior of individual.

There are number of factors that influence the extent of adoption of technology such as characteristics or attributes of technology; the adopters or clientele, which is the object of change; the change agent (extension worker, professional, etc.); and the socio-economic, biological, and physical environment in which the technology take place Cruz (1987). Farmers have been seen as major constraint in development process (Cruz 1987). They are innovators or laggards. Socio-psychological trait of farmers is important. The age, education attainment, income, family size, tenure status, credit use, value system, and beliefs were positively related to adoption. The personal characteristics of extension worker such as credibility, have good relationship with farmers, intelligence, emphatic ability, sincerity, resourcefulness, ability to communicate with farmers, persuasiveness, and development orientation. The biophysical environment influences the adoption. The conditions of the farm include its location, availability of resources and other facilities such as roads, markets, transportation, pests, rainfall distribution, soil type, water, services, and electricity. For instance, farmers whose farms were irrigated were the earliest adopters of new rice varieties, while those without water were the late adopters. The innovation diffuses slowly if product price is low.

Rogers and Shoemaker (1974) identified important variables that determine the rate of adoption. One of these variables is the perceived characteristic of the innovation or technology. To be readily accepted or adopted, an innovation must possess five important attributes: relatively advantage, compatibility, complexity, trial ability, and observability. Some technologies are adopted more rapidly than others because the farmers perceived them to have different characteristics.

Farmers' use of technologies can be influenced by various socio-economic factors. Thus, this informal survey was conducted in Omon district, Cantho province to understand farmers' view of technology and factors affecting in apply and adoption of technology.

METHOD OF GATHERING INFORMATION

Focus group discussions mentioned by ASA (1997) were used to collect the qualitative data. Group discussion was conducted with knowledgeable farmers and leaders of hamlets in Thoi Thanh, Thoi Long and Thoi Lai villages (O Mon district, Cantho province, Mekong Delta) to draw upon the information on how farmer view of technology, their experience, belief, and adoption of technology. The additional contact with individual farmer for complimenting information was also conducted.

RESULTS

1. Farmers' definition of technology

Technology refers to how to cultivate a crop successfully. This success can be obtained by knowing how to apply fertilizer, control pests, and take care of plant for its healthy and good growing. Other group of farmers said that technology refers to what crop varieties and what kind of fertilizers that are suitable for the soil. Other definition from farmers is that technology is what introduced by scientists. This is knowledge. Technology is in cohesion with arts. This means that it is flexible depending on soil and habits of farmers.

They prefer the technology with low input but high benefit, and ensure high productivity

2. Farmers' perception of technology.

Farmer believed that technologies are good to farmers. Farmers believe on technologies because they give good efficiency in terms of high yield, less pest, and more benefit. Technology is important in agricultural production.

3. Farmers' learning of technology, training, adoption and diffusion.

Farmers did not to be trained for most of technologies related to agricultural production. Farmers were trained on technology of Integrated Pest Management (IPM), veterinary in pig raising, and fish production.

Farmers who attended in training had talks to other farmers about what they learned from the courses. It was called as private oral transmission. This kind of information diffusion usually occurred in coffee shop through gossips. Therefore, most of men got information from trained farmers. The level of practices the information from oral transmission is not known. The effectiveness depends on kind of technology and the place where it takes place. This kind of diffusion happened spontaneously, if there is intervention at this step, the effectiveness of technology diffusion must be higher.

Some production activities were not learned from formal classes. For mushroom cultivation, farmers have not learnt any technologies from extension technician yet. However, they have heard information about mushroom cultivation from radio and from oral transmission among farmers. Training for fruit production is negligible. Only some good eating quality mango varieties Cat Chu and Cat Hoa Loc were introduced to farmers and guide them how to plant. Farmers were taught how to use of flowering stimulators for mango and technology for fruit development. These technologies were adopted by only 1-2% farmers who have big orchards. The small orchard holders planting few mangos do not need to buy chemicals and hire labor to spray because they cannot use whole of chemical bottle at one time

Farmers expected to be trained on crop production, and plant protection for the upland

crops. For fruit tree, farmers are afraid of weather problems. Farmers want to be trained on treatment for flowering, technologies for increasing rate of sitting fruits. For rice, farmers want to have intensive course for pest management, rice production with using drum seeder and leaf color chart. Though these training courses for rice were already organized, farmers are still not yet all believed

Training is the most important factor for adoption of technology. Since 1994, farmers have been trained on Integrated Pest Management (IPM) in rice production from extension workers. So far, there have been 45% of farmers who attended IPM training in Thoi Thanh village. The adoption of this strategy was only 20%. The rest did not. However, IPM technology was used by most of farmers in Thoi Lai village by applying the simple rule of not spraying insecticide before 30 days after sowing.

For those farmers who adopted low seeding rate and less fertilizer through using leaf color chart to reduce nitrogen fertilizer in rice because they found that low seeding rate and less fertilizer application reduce rice disease infestation. Half of farmers adopted of row seeding. The rest are afraid of low yield from row seeding due to low seed rate in this technique. They are afraid of golden snail attacking the rice field with low seed rate, then there is nothing to compensate. Farmers easily adopt Jasmin rice variety because this is good quality rice and can be sold high price at harvest.

Training on aquaculture and husbandry: At the beginning, farmers practised fish cultivation based on their own experience. Later, training was organized by technicians from extension station. This technology was adopted easily by farmers. Provincial Agricultural Extension Center in co-ordination with Extension of the village guided farmers in aquaculture and husbandry. However, there are not many farmers having aquaculture because of the following reasons:

- There is not yet dikes constructed to prevent water during flood season, and
- They lack of capitals for constructing dikes to raise fish, buying fingerlings and

other materials. (At present they can access small loan only for rice cultivation)

So far there have been 3 times of training on aquaculture : (1) Training of raising carp, silver carp; (2) Training of raising Goby fish, (3) Training of raising Giant Fresh Water Prawn. Contents of the training includes:

- Pond preparation, sanitary.
- Selection fingerlings (same size fingerlings)
- Caring: feeding, rate of food of about 5% of releasing weight
- Density: fingerlings/ unit area.
- Veterinary
- Storage
- Harvesting

Pig raising is mostly at household level with very small extent (1-2 pigs per household). There is only guidance on medicine for pig raising through training or meeting. The new pig varieties were also introduced. Farmers like pig variety to shorten duration of rearing and fast increasing of weight.

Reasons for not adoption of technology:

- Farmers did not believe because it was new to them.
- They have not yet seen the demonstration fields.
- They worried of low yield
- Low education
- Old age farmers: did not believe new technology and only believe their own experience.
- Old behavior of cultivation practices embedded in farmers for long period: were not persuaded to use new technology. They only practised by their own practices such as using high rate of seeds in directly broadcasting and spraying pesticide for prevention of insect occurrence.
- Large land holding farmers: Farmers are feeling that it is not so sure about new technologies, particularly to those farmers have large land. They said if the yield loss due to new technologies in larger field, the amount of loss will be greater. According to Lazaro et al. (1993), farmers usually overestimate the yield loss caused by insects rather than the actual loss.

- Problem in applying technologies: not totally believe in technologies, and lack of capital. Labor is not difficult in application of technologies because farming is seen as their work for the food.

Reasons for adoption of technology:

- These farmers are progressive farmers. They believe on science and technology.
- Education: They went to school. They know how to read and write (most are men).
- Age group: They are young, less than 40 years old.
- Recognition of saving money and health from IMP strategy.
- Those farmers having stable in economy believe in technologies. Farmers who are old and conservatives do not.

4. Adaptation of technologies

The technologies can be used flexibly. For example, timing, quantity and kind of fertilizer for application can be modified according to climate or weather, the level of silt deposit after flooding period.

5. Reasons for changing in using of technologies

- Introduction from technicians, attend technical training

- Trust on technicians
- Observe demonstration fields, and believe that it is effective and then decide to change
- Test and recognize it is effective
- Oral transmission of new technologies among farmers through special occasion as dead anniversary, weeding, sitting in coffee shop
- Climate, weather.
- Change in soil fertility: silt deposition in flooding period

Farmers found that if a technology give them more benefit, more effective in income, they will change to use that technology. For example: change from normal rice to quality rice to sell higher price.

6. Ranking of technologies in terms of farmers' likeness

Farmers like IPM strategy for rice production very much followed by technology for pig raising, and the third likeness is fish cultivation. Though fish cultivation give higher benefit than big rearing as in the says by people that " If you want to be rich, you raise fish; if you want to be medium rich, you raise big; if you want to be poor, you rear ducks", rearing big is most popular at household level in the community than fish.

Table 1: Ranking of technology in term of farmers' likeness

Technologies	Likeness
IPM	1 st
Big raising	2 nd
Fish cultivation	3rd

7. Gender issue

Gender in training: Most of women do not access to technical training. They are busy with household chores and caring of children. They had no time to attend the training. They obtained low education and they were not invited. For example, in Thoi Thanh village, there is 30 % of women who attended IPM training in the last two years (a total of 25 participants, only 7-8 are women). In Thoi Lai village, the rate of women

participation in technical training was only 10%.

Gender use of technology: Most of technologies were used by men. IPM technology is mostly used by male farmers (70% of men and 30% of women). Row seeding (use of drum seeder) was used by men only.

Regarding to animal technologies, male farmers followed new technologies for animal raising meanwhile female farmers

followed traditional practices because their education was lower than men which limits them in adoption of new technologies. They

gradually change to new technologies from the traditional practices

Husband knows technologies more than wife. Wife usually practises in the field.

Table 2: Who did more

Activity	Who work
Rice production	Husband > Wife
Fish rearing	Husband > Wife
Chicken raising	Wife > Husband
Pig rearing	Wife > Husband
Planting pesticide-free vegetables	Wife > Husband
Mango, Sapota planting and caring	Husband > Wife

8. Farmers' wealth : Farmers' wealth may have influence on technology adoption. Farmers classify their wealth as rich, medium and poor.

Table 3: Classification of households based on household economy:

Criteria	Rich	Medium	Poor
Land area	2-3 ha	1-1.5 ha	0-0.4 ha
Income/capita	> 500 000 VND/month	500 000 VND/month	< 100 000 VND/month
House type	Permanent	Semi permanent	Temporary
Entertainment mean	Color television	Color television	Second hand color television
Equipment	Motorcycle Thresher Rotovator	Motorcycle Half of them having thresher	None
Other activities	Big trading	Small trading	Making bamboo trap for catching small prawn
Food	Delicious	Medium delicious	Lack of nutrient

CONCLUSION

Factors affecting in change of technology use include the access to the technical training, meeting, oral transmission, trust on technician and believe on technology introduced by scientist.

Technologies for rice, fruit and fish production are mostly used by men and for husbandry (pig, chicken) by women. More men than women access to technical training and meeting.

Factors that trigger adoption of new technologies comprise of progressive, young and educated farmers. However, not all

farmers adopted technologies introduced because it they are new to them. They were feeling hesitated in application of new technology because they do not believe that the new technology can ensure the high yield. These farmers are usually old age and work based on their own experience.

Though farmers perceived technology as good thing to them, they still faced problems in application of technologies. These comprise of lacking of capital, direction of the government and extension, lack ensure of yield by compensation policy.

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SUMMARY IN VIETNAMESE

Yếu tố ảnh hưởng đến sự tiếp nhận kỹ thuật của nông dân trong hệ thống canh tác ở Ô Môn, Cần Thơ

Sự thay đổi kỹ thuật trong canh tác của nông dân là do việc tham dự các lớp tập huấn, hội họp, sự truyền miệng từ nông dân này sang nông dân khác, mức độ tin tưởng vào cán bộ kỹ thuật và mức độ tin cậy vào hiệu quả kỹ thuật. Nam nông dân thường sử dụng các kỹ thuật phục vụ cho sản xuất lúa, cây ăn trái và cá. Trái lại, nữ nông dân thường sử dụng kỹ thuật về chăn nuôi nhiều hơn nam. Yếu tố thúc đẩy sự tiếp nhận kỹ thuật mới bao gồm sự cấp tiền, trẻ tuổi và trình độ văn hoá. Những nông dân trẻ tuổi, có tính tiến bộ và biết đọc biết viết tiếp nhận kỹ thuật mới nhanh hơn. Những nông dân lớn tuổi và bảo thủ không tin tưởng nhiều vào kỹ thuật mới. Phần lớn nông dân có nhận thức đúng đắn về kỹ thuật, nhưng việc áp dụng một kỹ thuật mới không dễ dàng đối với họ vì thiếu vốn, thiếu sự hướng dẫn của cán bộ khuyến nông, chưa có chính sách chung của địa phương, và không có chế độ đền bù rủi ro của kỹ thuật mới đưa ra.
