

Farmers' Adoption of Tobacco Production Technology in Khounkham District, Khammouane Province, Lao People's Democratic Republic

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Abstract

The adoption of technology is an imperative factor for economic development. Successful introduction of technology for the developing countries requires thorough understanding of the priorities and concerns from the smallholder of farmers at the grassroots. Thus, the objectives of the study were to study: the farmers' adoption of tobacco production technology; factors affecting farmers' adoption of tobacco production technology; and problems and suggestions about tobacco production. Two-stage random sampling technique was used to determine the sample size and the questionnaire was created to collect data from a sample of 182 farmers. Statistical techniques were used descriptive statistics and multiple regression. The result of the research revealed that the farmer's adoptions on tobacco production technology were all at an average high level ($\bar{x} = 3.62$). The factors affecting farmers' adoption are three factors such as; participation in agricultural training, educational attainment, and the number of laborers in the households. The problems of the tobacco production found were; 1) Soil erosion due to slope areas 2) The costs and inputs for productions were high, particularly labor, fertilizers, and pesticides costs. 3) Tobacco yield was affected by natural disasters for example drought and flooding, and 4). The price of tobacco is quite low. Therefore, the farmers suggested to the concerned agencies to promote and develop tobacco production by the following recommendations; 1) Farmers are encouraged to prioritize education to equip them with necessary knowledge and skills. 2) Farmers should focus more on increasing labor-days for optimal to ensure close supervision of tobacco at all stages to minimize on-field losses. And; 3) Stakeholders should organize more useful seminars and intensive training programs on tobacco farming in order to provide farmers with skills and innovative knowledge to improve the traditional on-field tobacco management practices since most agriculturist depends on tobacco production.

Keywords: *technological adoption; tobacco production; tobacco farmer*

1. Introduction

Agriculture is an important sector in the Lao People's Democratic Republic (Lao PDR). Income from the agricultural sector accounted for 23.70 percent of gross domestic product (GDP), and it also creates a career of Lao people in the agricultural sector up to 80%. While the industry accounted for 29.10% and services 47.20% (Ministry of Planning and Investment, 2016). The country's major cash crops include rice, sugarcane, vegetables, and tobacco. It can be seen that tobacco is one of the important cash crops for the farmers, and the most popular tobacco species are Burley, Turkish or Oriental, and Virginia (Savith, 1977). The main area where tobacco is grown is in the central and southern regions, especially in central provinces such as Khammouane, Borikhamxay, and Savannakhet provinces. Because there are tobacco companies that have made contracts with many farmers in these areas to allow farmers to produce tobacco as raw materials for cigarette production. In addition, Tobacco was the third largest agricultural product that earn USD 50 million a year and was a substitute for rice in Laos. Farmers grow tobacco as a family business with contract farming. Tobacco farmers sell their products to cigarette manufacturing companies but keep a small amount of tobacco for household consumption. The characteristic of tobacco cultivation is mostly grown as a family that has a contracted with the company and some families have grown tobacco replacing-other crops, especially rice. The characteristics of almost all tobacco factories in Lao PDR are state-owned enterprises, which doubled cigarette production, up from 41 million tons in 2010 to 82 million tons in 2015. Tobacco production increased from 0.77 tons per hectare in 2005 to 3.6 tons per hectare in 2010. The production increased to more than 5 tons per hectare in 2012 and slightly increased between 2013 and 2014. However, there was a slight decrease in 2015 due to flooding in many areas of the country, which caused damage to many agricultural

products such as rice, sugar cane, soybeans, and tobacco (Baothammavong, 2007).

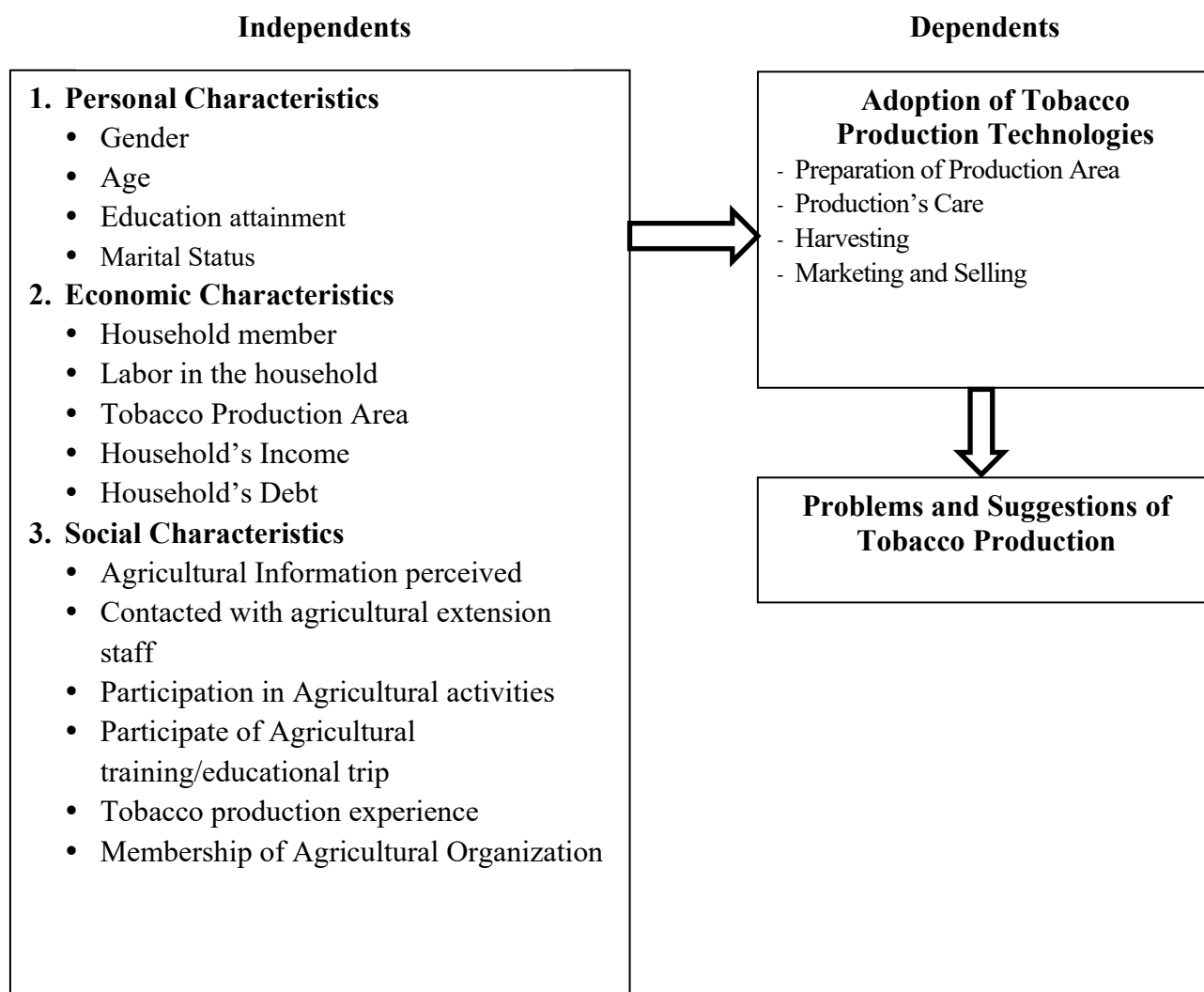
The tobacco produced is not only sold to the tobacco factory but also makes tobacco for household consumption (Phonepadith et al, 2016). Besides, tobacco is also an export product to generate income for the country as well. Since tobacco products are one of the important agricultural activities in Lao PDR, it also generates income for the Laotian farmers and creates jobs for the farmers as well. Each year, Lao PRD produces 28,000 tons of tobacco and 361 million cigarettes (Saysamone et al, 2018).

Tobacco production increases each year because the relevant authorities have encouraged farmers to use modern technology to get more benefits from tobacco production, starting from the preparation of planting areas to harvesting and selling products to obtain quality tobacco that meets the needs of the factory and allows tobacco production to progress to the industrial sector continuously. But there are still farmers that do not accept the modern technology used in production because they thought that there is no need of using modern technology to increase the production cost. Thus, this research aimed to study the adoption of tobacco production technology of the farmers and to know the factors affecting the adoption of technology for farmers and to know why some farmers do not adopt modern technology for production. The results obtained from this research are essential information in the planning of tobacco production extension policies and planning for the transfer of tobacco production technology to farmers in the target area and other areas throughout the country.

2. Materials and Methods

This study is quantitative research, to study farmers' adoption of Tobacco Production Technology of Farmers in Khounkham District, Khammouane Province, Lao People's Democratic Republic, the research process as the following

2.1 Conceptual Framework



2.2 Population and Sample Size

This study was carried out in Khoungkham district, Khammouane province where tobacco production is the third-largest proportion in the country. Two-stage random sampling technique was used to determine the sample size (Prachum Suwatthi, 1998: 115): 1) randomize the village sampling from 5 villages namely: Kang, Namnone, Phakhorm, Nakham; and Namngarm villages with a total 333 of tobacco producers. Then calculated sample size by Taro Yamane formulation (1973:727) at the 95% of confidence level and 0.05 error level, got total sample 182. 2) Randomly calculated the household sampling number in each village by using the proportional size method and randomized the household from a number of households and one respondent in each

household chosen as representative for conducting the interview.

2.3 Data Collection

Data collection was carried out through an interview survey based on a semi-structured discussion. A first draft of the interview was designed according to the research objectives. The interview schedule was carried out in the manner of pre-tested during pilot observation organized in the study area. The interview schedule was updated based on the pilot survey and later on, used for primary data collection from the farmers who are the producers of tobacco.

2.4 Data analysis

Various descriptive and inferential statistical techniques i.e. percentage, mean, standard deviation, regression analysis, etc. were applied for getting meaningful results by

using Statistical Packages for the Social Sciences (SPSS).

The adoption quotient for an individual farmer was calculated based on the adoption scores gained by the farmer for the adoption of tobacco production technology. A total of 4 requirements were used for the calculation of the adoption quotient. On the basis of the adoption quotient, farmers were classified into five categories as follows.

Average	Adoption level
1.00 – 1.80	Lowest
1.81 – 2.60	Low
2.61 – 3.40	Moderate
3.41 – 4.20	High
4.21 – 5.00	Highest

To analyze factors affecting farmers' adoption of tobacco production technology were used multiple regression analysis. (Multiple regression statistics)

3. Result

3.1 Farmers' personal backgrounds and social-economic characteristics

The study results showed that the majority of farmers, 65 percent, were male with an average age of 52 years, married, and finished primary education. The farmers had an average 6 of family members, 4 household workforces, and 0.40 hectares of tobacco production area, agricultural income earned 6,714,000 kips, the number of household debts was 3,376,520 kip. Farmers perceived information of farming of 7 times, contracted with an agricultural staff of an average of 2 times. Participated in agricultural tradition activities and participate in training/education trips on average of 3 times per year. The farmer has experienced tobacco production for 18 years on average and most members are of agricultural organizations in the community.

3.2 Famers' adoption of tobacco production technology in Khounkham District, Khammouane Province, Lao PDR

The farmers' adoption through tobacco production technology, all the average on a high level (3.62). Moreover, the accumulated average of adoption among 4 requirements was trended from low to highest levels, while the highest level had only one requirement that is the preparation of planting area (4.47); followed by high and low levels such as harvesting and processing (3.93); production's care (3.70); and marketing and selling (2.40) respectively (Table 1).

3.3 Factors affecting farmer's adoption of tobacco production technologies

The determination of factors affecting farmer adoption of tobacco production technology was the third objective of the study. Multiple regression analysis was applied to determine the specific contribution of each independent variable and the total variance explained by all variables on factors influencing the adoption of tobacco production technologies. There were fifteen independent variables entered in the model, out of which only three variables had significant influence at the 5% level on farmers of tobacco production technologies.

As shown in Table 2, the result revealed that the adjusted R^2 had a value of 0.226 indicating that 22.6% of the variation in the adoption of technologies was explained by the characteristics. Participating in Agricultural training/educational trips was found to have a positive influence on respondents' adoption of the selected tobacco production technology. The education level and the number of laborers in the household have a negative influence on the adoption of tobacco production technology.

3.4 Problems and Suggestions about Tobacco Production of the Farmers in Khounkham District, Khammouane Province, Lao PDR

The problems of the tobacco products found in this research 1) soil erosion due to area slope, 2) The costs and inputs for production were high, particularly labors, fertilizers, and pesticides. 3) Tobacco yield was affected by natural disasters such as drought and flooded

which directly and indirectly caused tobacco yield and affected the quality 4). Produces breakout of diseases and insects 5) Price of tobacco is still quite low.

Therefore, the farmers suggested to all concerned agencies and benefactors in order to promote and develop tobacco production 1) Farmers should be encouraged to prioritize education to equip them with necessary knowledge and skills since educational background positively influences tobacco production. 2) Farmers should focus more on increasing labor-days to optimal to ensure close supervision of tobacco at all stages to minimize on-field losses. 3) Stakeholders should organize training and seminars on tobacco farming more often to equip farmers with skills to improve on-field tobacco management practices. 4) Provide knowledge on tobacco production cost and marketing analysis and modern methods to prevent diseases and insect pests properly, and 5) States and national governments to help in provisions of the market and subsidized fertilizers to tobacco farmers

4. Discussion

The farmers' adoption through tobacco production technology, all the average on a high level. The farmer was adopted at a high level because technology has proved to be extremely useful in tobacco production. Presently, farmers are able to grow tobacco in areas where they were thought could not grow, but this is only possible through agricultural technology. Such technology boosts the resistance of the crops to pests and droughts. Through technology, farmers are in a position to electrify every process for efficiency and improved production.

The result from regression pointed out that participation in agricultural training and educational trips were significant at a 0.05 probability level. It was widely accepted that participating in the training will help a farmer to acquire knowledge relating to tobacco production. Accordingly, farmers who participated in training or educational trips were likely to adopt tobacco production technology. This result was similar to those from the study of Singh et. al. (2015) that farmers' participation in organic farming related to training as the

main determinants of adoption of organic farming among farmers which is similar to the research result of Kaya and Atsan (2013) that farmers participating in the training are more likely to engage in organic farming. This result confirmed the statement of Jierwiriypant et. al. (2012) that farmers who switch to organic farming to join organic agricultural networks will receive the training for organic rice farming

The regression coefficient of the education level of the farmer had a negative value of -0.076 and was statistically significant at $p < 0.05$ with the p-value of 0.009. The role of education in the development of agriculture hardly needs any emphasis. The role of education is immense in bringing about socio-economic transformation, which in turn affects the way in which a person utilizes his skills on agricultural land. Education is also able to erase the information gaps. Information gaps are the main communication barriers/hindrances which check the flow of development. Education is thought to create a favorable mental attitude for the acceptance of new practices, especially information-intensive and management-intensive practices. This contradicts findings was established by Ruggimbana (2008) who found that the coefficient of the level of education for the farmer had a positive sign and significant at $p < 0.05$ and attributed the same to the fact that educated farmers are more likely to understand and follow the advice and directive from the extension agents on the importance of using improved technologies and the use of inputs on recommended rates. It can be deduced from the result that education is independent of the other factors included in the regression model and in order to increase tobacco production by one unit, the education level should be decreased by -0.076.

The regression coefficient of labor for production in the household of the farmer had a negative value of -0.041 and was statistically significant at $p < 0.05$ with the p-value of 0.003. Farming practices are typically very labor-intensive and the majority of the labor is provided by household members. Agricultural household labor is; therefore, a key household asset and its accurate measurement are important. The estimation of

labor inputs on smallholder farms is complex and vulnerable to misreporting. Availability and amount of family labor play a vital role in determining the adoption and intensity of use of agricultural technologies. The existence of an active workforce in rural households usually encourages them to show interest in trying some agricultural technologies. Off course, the influence of labor availability on adoption depends on the characteristics of the technology to be adopted. When the new technologies in relative to the older ones are more attractive and labor-intensive, farmers with more labor would tend to adopt those technologies. Some new technologies are relatively labor-saving and others are labor using. For example, when technology is laborsaving like tractors, harvesters, pesticides, and the like, its impact will be negative. For those labor-using technologies, like improved varieties of seeds and fertilizer labor availability plays a significant role in adoption. Plenty of adoption studies found a positive impact of family labor on technology adoption such as Solomon et al (2012). The reviewer argues that higher family labors increase the probability to adopt agricultural new technologies. Most Ethiopian farmers have not used labor-saving technologies like tractors, harvesters in their production system. They depend on labor-using technologies and this agricultural new technology require human resource from sowing to the final harvesting of the crop; this result contradicts Davies M. (2017), who found the coefficient of labor used per hectare had a positive sign and significant at $p < 0.05$. This implies that in order to increase tobacco production by one unit, labor man-days should be decreased by -0.041.

5. Conclusion

The analysis developed in this research provides proves useful and provides evidence on an important issue concerning the adoption of technology in tobacco production. Results obtained from the estimated model show robust support to most hypothesized effects and are in agreement with

previous empirical results in the literature or in accordance with the adopted theory. The significant factors that increased the adoption of tobacco production technology include; participation in agricultural training/educational trips; education attainment; and the number of laborers in the household.

Based on the results some fundamental policy implications can be drawn from this study. The role of institutional factors is critical in facilitating the adoption of practices that are risk-reducing. Therefore, policymakers should promote research on the adoption of tobacco production technology for more products in the country. The government of Laos should take a proactive role to launch an advanced agricultural extension education program to guide the tobacco farmers in a better way. In conclusion, institutional services should be strengthened to provide managerial and technical skills on tobacco technology adoption, and on-time provision of financial services to enhance tobacco farmers' productivity.

It is also recommended that training sessions should be offered to farmers and builds their entrepreneurial skills, it is by so doing they will begin to consider their farming as a business and adopt technologies that would increase productivity. New technologies should be directed to the large scale of farmers since they are more likely to adopt than aged farmers and small-scale farmers.

Based on the results, the following recommenddations are proposed:

a) Farmers should have more opportunities to gain a higher level of education. They should learn new processes and agricultural technology methods;

b) The Ministry of Agriculture and Forestry should provide some support, especially training and marketing, to farmers. The farmers should have more knowledge on how to grow other agricultural products and replace tobacco products. Some main agricultural products (ie. rice, cassava, and soybean) should be subsidized in order to keep the prices higher than the cost of production. This could motivate farmers to produce other agricultural produce instead of tobacco.

c) Although tobacco farming is an important source of income for farmers, nonetheless, tobacco can also cause many diseases to the smoker such as cancer, heart disease, and stroke. Therefore, tobacco farming should be reduced in terms of the scale of production and the land area under cultivation.

6. Conflict of Interest

We certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

7. References

- Asfaw, S., Shiferaw, B., Simtowe, F., and Lipper, L. (2012). Impact of modern agricultural technologies on smallholder welfare: Evidence from Tanzania and Ethiopia. **Food Policy**. 37:3, 283-295 p.
- Davies, M. M. (2017). **Factors Influencing Tobacco Production Among Contracted Farmers in Kenya: A Case of Bungoma Country**.
- Fongvanh, B. (2017). **Interview by Saysamone Phoydouangsy**, 20 July 2017, Tax Department, Ministry of Finance, Vientiane Capital. 188 p.
- Jierwiriyapant, P., Liangphansakul, O.A., Chulaphun, W. and Pichaya-satrapongs T. (2012). Factors Affecting Organic Rice Production Adoption of Farmers in Northern Thailand. **CMU.J.Nat.Sci.Special Issue on Agricultural & Natural Resources**. 11(1), 327 – 333.
- Kaya, T.E. and Atsan, T. (2013) Factors Affecting Rural Women's Adoption of Organic Agriculture (TAR1 of Sample). **Food and Agriculture Organization of the United Nations**.
- Ministry of Planning and Investment (2016) **8th Five-Year National Socio-Economic Development Plan (2016-2020)**. Vientiane: Department of planning.
- Phoydouangsy, S., Wongpit, P., and Lassachack, X. (2018) **Livelihood in Tobacco Farming and Cigarette Consumption in Lao PDR**. Vientiane Capital.
- Rugimbana, F. (2008). **Assessment of the impact of contract farming on-farm productivity and returns a case study of tobacco in Uyuni district**. Sokoine university of agriculture. Morogoro, Tanzania.
- Singh, M., Maharjan, K.L. and Maskey, B. (2015). Factor Impacting Adoption of Organic Farming in Chiwan District of Nepal. **Asian Journal of Agriculture and Rural Development**. 5(1), 1 – 12.
- Xangsayarath, P., Douangvichith, D., Siengsounthone L., Phandouangsy K., Ly, T.H.T., Thanh, C. B. (2019) Tobacco use in Lao People's Democratic Republic: Results from the 2015 National Adult Tobacco Survey.
- Yamane, T. (1973) **Statistics: an introductory analysis**. Harper International. 886 p.

Table 1. Farmer's Adoption Level of Tobacco Production Technologies

(n=182)

Adoption of Tobacco Production Technologies	\bar{x}	S. D.	Adoption Level
Preparation of Production Area	4.47	.305	Highest
Production's Care	3.70	.285	High
Harvesting	3.93	.394	High
Marketing and Selling	2.40	.312	Low
Total	3.62	.159	High

Remark: Highest = 4.21- 5.00; High =3.41- 4.20; Moderate = 2.61-3.40; Low =1.81-2.60; Lowest =1.00 -1.80

Table 2. An Analysis of Factors Affecting Adoption of Tobacco Production Technology of Farmers in Khounkham District Kammouane Province, Lao People's Democratic Republic.

Independent variables	Dependent variables		
	Adoption of tobacco production technology		
	B	t	Sig.
1. Sex	-.021	-.807	.421
2. Age	-.002	-1.252	.212
3. Education attainment	-.076	-2.653	.009**
4. Status	.006	.232	.817
5. Number of Member in the household	.014	1.549	.123
6. Number of Labor in the household	-.041	-3.017	.003**
7. Tobacco Production Area	.009	.510	.611
8. Total Household's Income	1.721E-006	1.252	.212
9. Amount of Household's Debt	-1.274E-006	-1.735	.085
10. Agricultural Information perceived	-.002	-.351	.726
11. Contacted with agricultural extension staff	-.019	-1.249	.213
12. Participation in Agricultural activities	.014	.923	.358
13. Participate of Agricultural training/educational trip	.040	4.417	.000**
14. Tobacco production experience	-.002	-.887	.377
15. Membership of Agricultural Organization	.025	.683	.496
Constant	3.836	31.327	.000**
R² = 0.226 (22.6%) F = 3.231 P_ Value = 0.000**			

Remarks * statistically significant level at 0.05

** statistically significant level at 0.01