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Development of Rubber Farmer Groups Towards Good Agricultural Practices for Rubber in the form of Cup Lump Rubber in the Northern Region of Thailand

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Abstract: This research aims to develop a group of rubber farmers in northern Thailand to adopt Good Agricultural Practices (GAP) for cup-lump rubber and to explore approaches to developing GAP for cup-lump rubber. The study focused on rubber farmers in Phrao District, Chiang Mai Province, using a participatory action research methodology. The research involved two steps. 1) assessing the farmers' capacity to manage rubber plantations according to Good Agricultural Practices (GAP) principles; and 2) proposing recommendations for developing Good Agricultural Practices (GAP) for cup-lump rubber farmers. The study found that in 2022, farmers had an average rubber plantation area of 3.31 Ha, generating an average income of 235,549.33 baht per year from rubber plantations, while incurring average plantation management expenses of 4,621.46 baht per year. Most farmers sold their products as dry cup lumps to their cooperative members, and most had a high potential for Good Agricultural Practices (GAP) in rubber (average 4.13). The development of rubber farmer groups in northern Thailand toward Good Agricultural Practices (GAP) for rubber in the form of cup lumps should involve promoting member participation, particularly in farmer group management, and establishing clear standards for rubber trading. This should be coupled with the development of knowledge and skills in rubber plantation management through training with the Rubber Authority of Thailand. Furthermore, product quality should be improved, participatory inspection systems implemented, fair marketing and profit-sharing plans promoted, and sustainability planning implemented. However, to successfully develop farmer potential, farmers must begin by shaping their attitudes toward the benefits of Good Agricultural Practices (GAP) and promoting knowledge and understanding of proper Good Agricultural Practices (GAP).

Keywords: Farmer group development; good agricultural practices for rubber; upper northern region; Thailand

1. Introduction

Thailand is a major global exporter of agricultural and food products. However, agricultural and food products have historically been unsafe for consumers due to chemical residues, pesticides, and microbial contamination. This has resulted in the quality and safety of these products not meeting international standards and those of importing countries. Therefore, the Thai government promotes and encourages farmers to produce safe agricultural

products in accordance with quality management systems, particularly Good Agricultural Practices (GAP), which prevent or mitigate risks associated with agricultural and food products [1]. Rubber (*Hevea brasiliensis*) is an important economic crop for Thailand and the ASEAN region. To produce clean, high-quality, fresh latex and cup-lump rubber cost-effectively, rubber plantations require sound management from planting through post-harvest [2].

In 2005, the 1 million Rai Rubber Plantation Project, initiated by the government, aimed to expand rubber plantations across 36 provinces, comprising 48,000 Ha in 17 northern provinces and 112,768 Ha in 19 northeastern provinces. The project, costing a total of 1.4 billion baht, aims to alleviate poverty and ensure rubber production meets global demand, which is growing at an estimated 2.6 percent per year [3]. At that time, the Cabinet approved the project and assigned the Department of Agriculture to study and define appropriate rubber plantation areas, monitor and control them, and procure suitable rubber varieties for cultivation in the northern region. Chiang Mai Province is the pilot area for the 1 million Rai Rubber Plantation Project in northern Thailand, initially implemented in Phrao, Fang, and Chai Prakan districts. According to 2023 statistics, Chiang Mai Province had 1,422 rubber farmers and a total rubber plantation area of 16,963 rai. This comprised 1,146.40 Ha of land with title deeds, comprising 694 farmers with title deeds, and 1,083.36 Ha of land without title deeds, comprising 728 farmers without title deeds [4]. In Chiang Mai, rubber farmers produce cup lump rubber due to its simple production process, long shelf life, and lower production costs compared to other types of rubber, such as fresh latex and smoked rubber sheets [5]. A report on the rubber production situation in the Northern Region found that rubber farmers sell their products at low prices due to trade barriers and the need for certified rubber production standards. Currently, rubber buyers require rubber to be produced to two main standards: the Forest Stewardship Council (FSC) and Good Agricultural Practices (GAP), which have led buyers to pressure farmers to lower their prices. Resolving trade barriers requires developing farmers' rubber production potential, both in terms of yield and quality, to meet international consumer demand [6]. Furthermore, import requirements for rubber products from the United States and European Union member countries require traceability, regulated under the Food Safety Modernization Act. Imported products must meet safe production standards [7]. Furthermore, a weakness for Thai rubber farmers is their reliance on exports alone. Under international trade regulations, agricultural products from exporting countries must undergo inspections to ensure compliance with agricultural product standards. Farmers lack the knowledge and understanding to standardize their own agricultural products, resulting in prices they receive that do not align with market prices and mechanisms [8].

For this reason, this study aims to develop rubber farmer groups towards good agricultural practices for cup lump rubber in the northern region of Thailand. The objectives are to develop rubber farmer groups towards good agricultural practices for rubber in the form of cup lump rubber in the northern region of Thailand and to seek guidelines for developing rubber farmer groups towards good agricultural practices for rubber in the form of cup lump rubber, which will lead to solutions to the problem of rubber prices for farmers that do not comply with market prices and mechanisms.

2. Materials and Methods

This research on the development of rubber farmer groups towards good agricultural practices for cup-lump rubber in the northern region of Thailand collected data from June 2023 to December 2023. The research process was divided into two stages.

In the first stage, assessing the potential of rubber plantation management according to good agricultural practices (GAP) in the northern region of Thailand, the researcher selected Chiang Mai Province as the data collection area because it is the pilot area for the 1 million rai rubber plantation project. The researchers used a quantitative research process, including an interview form with an incongruence value, to determine reliability (IOC) equal to 0.768 and a reliability value (Cronbach alpha) equal to 0.872. The researchers also used a qualitative research process, including non-participant observation, to study data from rubber farmers in Chiang Mai province. The population in this research was rubber farmers in Chiang Mai province. Which are farmers who are registered with the Rubber Authority of Thailand, Chiang Mai Province, in the year 2022, a total of 7 groups, These include: Chai Prakan Rubber Plantation Fund Cooperative Limited,

Phrao Rubber Farmers Group, Mae Chaem Agricultural Cooperative Limited, Fang-Mae Ai Rubber Plantation Cooperative Limited, Muang Na Subdistrict Rubber Growers Group, Mae Chaem Rubber Plantation Assistance Fund Cooperative Limited, and Mae Taeng Rubber Cooperative Limited. totaling 553 people (data as of April 30, 2022), by setting the sample size that sets the acceptable error of estimation of the total population at 0.05 using the formula for calculating the sample size of Taro Yamane [9], which calculated a total of 233 samples and performed simple random sampling by drawing lots of farmers' names to collect data using a semi-structured interview consisting of closed-ended questions and open-ended questions. The interview content is divided into 3 parts.

Part 1: Questions about some basic personal characteristics of farmers, some economic and social conditions of farmers, and the management conditions of rubber plantations of farmers.

Part 2: Questions to assess farmers' potential in managing rubber plantations according to Good Agricultural Practices (GAP) standards, according to the Good Practices Manual for Rubber Plantations, Field Latex Collection and Good Agricultural Practices (GAP) Standard Cup Lump Production of the Rubber Authority of Thailand, and according to the agricultural product standard TASK 5910-2020, Good Agricultural Practices for Rubber and Cup Lump Production, National Bureau of Agricultural Commodity and Food Standards, Ministry of Agriculture and Cooperatives, in 12 areas: 1) Rubber plantation management 2) Use of agricultural hazardous substances 3) Farmer production factor management 4) Pre-tapping management 5) Post-tapping management 6) GAP rubber tapping techniques 7) Rubber tree management (making cut marks) 8) Rubber lump production process 9) Harvesting 10) Post-harvest management 11) Plantation personnel management 12) Data recording and verification By using the practice scale adapted from the Likert Scale, a score of 5 is assigned as immediately actionable, a score of 4 as immediately actionable, a score of 3 as possible but takes time, a score of 2 as possibly actionable, a score of 1 as unlikely to action, and a score of 0 as impossible to action. The potential of Good Agricultural Practices (GAP) for rubber was divided into levels to interpret the results from the average stratification this is a 6 point application Likert scale by average values are calculated as follows: 5.00 – 4.16 points means the highest level of potential; 4.15 – 3.33 points means a high level of potential; 3.32 – 2.50 points means a medium level of potential; 2.49 – 1.67 points means a low level of potential; 1.66 – 0.84 points means the lowest level of potential; 0.83 – 0.00 points means no potential.

Part 3: Questions about problems, needs, and suggestions regarding Good Agricultural Practices (GAP) for rubber were asked. In addition, the researcher used Non-Participant Observation to observe farmers' management of their rubber plantations. The collected data will be analyzed using descriptive statistics, including mean and standard deviation, to describe basic personal characteristics, socio-economic conditions, and rubber plantation management conditions of farmers. Stepwise Multiple Regression Analysis will be used to identify relationships between independent variables and the potential for Good Agricultural Practices (GAP) among rubber farmers. Second stage: seeking ways to develop rubber farmer groups towards good agricultural practices for rubber using participatory development theory by conducting focus group discussions (FGD), in-depth discussions with specific target groups (group committee representatives and 5 farmer members per group, 7 groups) to plan operations and decision-making on the development process of rubber farmer groups towards good agricultural practices for rubber. Data analysis was conducted using the principles of farmer group potential development according to the 2022 Farmer and Farmer Institution Development Manual of the Rubber Authority of Thailand in 6 areas: 1) Farmer group management, 2) Knowledge and skills in rubber plantation management, 3) Production and product quality, 4) Marketing and networks, 5) Farmer member participation, and 6) Farmer group sustainability.

3. Results

1. Assessment of the potential of rubber plantation management according to Good Agricultural Practices (GAP) of farmers.

1) Data on basic personal characteristics, socio-economic conditions, and rubber plantation management conditions showed that farmers had an average age of 53.72 years, completed lower secondary education, had an average education of 7.35 years, and had an average experience in rubber plantation of 14.53 years (52.40%). The majority of farmers (63.30%) operated rubber plantations as a secondary occupation. They

spent their free time during the day doing other agricultural activities, such as longan, mango, or other field crops. This may be because farmers viewed rubber plantations as just a hobby and a source of additional household income. The average household labor force was 3.21 people. Most farmers did not hold social positions. 68.40% of farmers had successors in the agricultural profession. 51.00% of farmers had access to other agricultural capital. 61.58% of farmers did not have land title deeds. According to a 2023 agricultural survey, farmers had an average rubber plantation area of 3.31 Ha, generating an average income of 235,549.33 baht from rubber production. They had an average plantation management expense of 4,621.46 baht per year and had an average debt of 66,450.46 baht. Regarding rubber sales, most farmers sell their rubber products as dry cup lumps to cooperatives or farmer groups of which they are members. Only two cooperatives sell them as wet cup lumps: the Fang-Mae Ai Rubber Cooperative Limited and the Mae Taeng Rubber Cooperative. Most farmers' rubber plantations lack title deeds (87.52%). Meanwhile, farmers possess an average of four types of plantation management technology: lawn mowers, sprayers, pruners, and walk-behind lawn mowers. Officials decided to plant rubber trees from the Rubber Plantation Welfare Organization. (Former Rubber Authority of Thailand) that encouraged rubber planting in the Million Rai Rubber Project. In 2023, farmers contacted agricultural extension officers an average of 6.37 times (Table 1).

Table 1. Basic personal characteristics, socio-economic conditions, and rubber plantation management

Independent variable	Mean	S.D.
Age of farmers (years)	53.72	11.66
Years of education (years)	7.35	4.67
Experience in rubber plantation (years)	14.52	1.91
Main occupation of farmers (1 = main occupation /0 = auxiliary occupation)	0.47	0.50
Type of labor used in the rubber garden (0 self-made / 1 employed labor)	0.41	0.49
Number of laborers in rubber plantation management (number of people)	3.21	1.28
Cost of rubber plantation in 2023 (Bath)	4,621.46	1,000.89
Income from rubber plantations in 2023 (Bath)	235,549.36	78,752.55
Debt related to rubber plantations of farmers (Bath)	66,450.64	84,052.62
Social Position (1 = Available / 0 = None)	0.07	0.26
Opportunities for farmers to obtain capital resources (0, none, none, none/none)	0.51	0.50
Inheritance of the rubber plantation occupation (1 = successor,0 = no successor)	0.68	0.46
Number of times to get information (times)	9.47	3.73
Training received (1 = trained/0 = not trained)	0.51	0.50
Number of times of coordination with agricultural extension officers (number of times)	6.37	3.47
Number of rubber plantation areas (rai) ≅ 3.31 Ha	20.60	5.83
Other agricultural activities in rubber plantations (1 = other activities/0 = no other activities)	0.51	0.50
Land title deed (1 Licensed/0Non-Licensed)	0.38	0.33
Receiving assistance from the Rubber Authority of Thailand (1 = received assistance/ 0 = did not receive assistance)	1.00	0.00
Number of technologies used for rubber plantation management	4.06	1.02

2) The potential for Good Agricultural Practices (GAP) for rubber farmers in Chiang Mai Province found that most farmers had a high potential for GAP (average 4.13**).** When considering each aspect, it was found that farmers had the highest potential for management of rubber plantation areas (average 4.16**)**, followed by farmers with the lowest potential for management of rubber trees (making cut marking lines), data recording and inspection (average 4.14**)**, and post-harvest management (average 4.09**) (**Table **2).**

Table 2. The potential for Good Agricultural Practices (GAP) for rubber farmers

variable	Mean	Std. Deviation	Interpretation
Management of rubber plantation areas	4.16	0.45	highest
use of agricultural hazardous substances	4.12	0.45	high
management of farmers' production factors	4.13	0.45	high
management before rubber tapping	4.11	0.45	high
management after rubber tapping	4.12	0.46	high
rubber tapping techniques according to GAP principles	4.13	0.44	high
management of rubber trees (making cuts, dividing lines)	4.14	0.45	high
rubber block production operations	4.13	0.45	high
harvesting products	4.13	0.47	high
post-harvest management	4.09	0.45	high
management of personnel working in rubber plantations	4.13	0.46	high
data recording and inspection	4.14	0.45	high
overview	**4.13**	**0.46**	**high**

Remarks: this is a 6 point application Likert scale by average values are calculated as follows: 5.00 – 4.16 points means the highest level of potential; 4.15 – 3.33 points means a high level of potential; 3.32 – 2.50 points means a medium level of potential; 2.49 – 1.67 points means a low level of potential; 1.66 – 0.84 points means the lowest level of potential; 0.83 – 0.00 points means no potential.

3) Factors Affecting Good Agricultural Practices (GAP) for Rubber Farmers: The Pearson Product-Moment Correlation Coefficient (PMC) found no multicollinearity among the independent variables. Therefore, the researchers conducted a stepwise multiple regression analysis and found that the Multiple Coefficient of Determination (R2) was 0.93, indicating that all independent variables could explain 93.30% of the dependent variable. Of the 21 independent variables, three were significantly positively correlated with the dependent variable at the 0.01 level**.** First, the farmers' years of education: this means that highly educated farmers have a greater potential to adhere to Good Agricultural Practices (GAP) standards. This may be because education level affects their ability to perceive, understand, and apply knowledge to rubber plantation management. Highly educated farmers tend to have greater access to academic information and modern agricultural technologies. They can learn the principles and requirements of GAP standards, including proper soil and fertilizer management, the safe and correct use of chemicals, pest and disease control, and the harvesting of quality produce in accordance with standards. Furthermore, highly educated farmers are more likely to participate in training, technology transfer, or agricultural extension activities provided by government and private-sector organizations, which help enhance their knowledge and skills in managing rubber plantations in accordance with GAP standards. Second, farmers who make rubber farming their primary occupation are more likely to comply with Good Agricultural Practices (GAP) standards than those with it as a secondary occupation. This may be because their primary occupation is the main source of household income, leading them to prioritize the serious, continuous management of their rubber plantations. These farmers typically dedicate most of their time, labor, and resources to caring for their rubber plantations, including soil and fertilizer management, pest and disease control, proper tapping techniques, and maintaining suitable environmental conditions in the plantation – all crucial components of GAP compliance. and their land title deeds. Rubber farmers in areas with land ownership documents, particularly those with land titles, have greater potential to comply with Good Agricultural Practice (GAP) standards than those in areas without such documentation. This may be attributed to the stability of land tenure as a fundamental factor influencing long-term investment decisions. When farmers are legally confident in their land ownership, they are more willing to invest in improving soil quality, organizing systematic rubber plantations, appropriately using production factors, and conserving natural resources—all key components of GAP

standards. In addition, one independent variable, farmers' access to capital, was significantly positively correlated with the dependent variable at the 0.05 level. Farmers with access to funding for rubber plantation management have greater potential to implement Good Agricultural Practices (GAP) standards than those without such funding. This may be because implementing these standards requires investment in several areas, including production inputs, plantation management, and the use of appropriate agricultural technologies. Farmers with funding can invest in quality rubber varieties, use fertilizers and pesticides correctly according to recommendations, improve planting conditions, such as soil and water management, maintain soil fertility, and implement systematic plantation management (Table 3**).**

Table 3. Factors Affecting Good Agricultural Practices (GAP) for Rubber Farmers

variable	B	Std. Error	Standardized Coefficients Beta	t	P - value	Collinearity Statistics	
						Tolerance	VIF
(Constant)	3.89	0.04		100.66	0.00		
Years of education (years)	0.03	0.01	0.42	7.01	0.00	1.00	1.00
The main occupation of farmers	0.22	0.04	0.32	5.26	0.00	0.946	1.05
Opportunities for farmers to obtain capital resources	0.09	0.04	0.13	2.18	0.03	0.99	1.00
Land title deed	1.00	0.02	0.96	56.82	0.00	1.00	1.00

a. Dependent Variable: **Good Agricultural Practices (GAP)**

SEest = ± 1.87, Durbin-Watson = 2.17, R = 0.96, R2 = 0.93, Adjusted R2 = 0.93, F = 3229.56, P- value = 0.00

4) Guidelines for developing rubber farmer groups towards good agricultural practices for rubber in the form of cup lump rubber.

According to the study Assessment of the potential of rubber plantation management according to Good Agricultural Practices (GAP) of farmers and Factors Affecting Good Agricultural Practices (GAP) for Rubber Farmers and data analysis using the principles of developing the potential of farmer groups according to the 2022 Farmer and Farmer Institution Development Manual of the Rubber Authority of Thailand, in 6 areas, consisting of 1) Farmer group management, 2) Knowledge and skills in rubber plantation management, 3) Production and product quality, 4) Marketing and networking, 5) Farmer member participation, and 6) Creating sustainability for farmer groups, the researcher has guidelines for developing rubber farmer groups towards good agricultural practices for rubber in the form of cup lump rubber.

1) Farmer group management

Farmer group management development should involve member participation in planning and setting rules for rubber trading. This may be stipulated in terms of trading regulations, such as: if rubber is to be sold to the group, it must be formic acid-treated rubber, or it must have a dry rubber content (DRC) greater than or equal to 80 percent. This is to establish clear standards for rubber purchasing by farmer groups.

2) Knowledge and skills in rubber plantation management

Developing farmers' knowledge and skills in rubber plantation management should involve group members in identifying the knowledge or skills they need to develop, and coordinating with relevant agencies to provide training and knowledge. For example, raising production standards and implementing GAP (Good Agricultural Practices) guidelines will help increase production efficiency, reduce costs, and minimize environmental impacts. Furthermore, group members' participation in exchanging experiences, planning rubber tapping, and developing new techniques will foster mutual learning and continuous development.

3) Production and product quality

In developing production and product quality, in addition to setting the rules for purchasing rubber from farmer groups, farmer group leaders should provide consultations, visit the area to offer advice on following good and appropriate agricultural principles, and encourage members to participate in jointly developing product quality standards and conducting participatory inspections.

4) Marketing and networking

Marketing and network development should involve joint market analysis to identify target groups and develop rubber sales channels for farmer groups. For example, group members should participate in a project to delay rubber sales. Farmers will collect rubber and wait to sell during periods of low rubber prices, then sell it during favorable times. Furthermore, they should set a median purchase price for their rubber products, allowing farmers to participate in rubber price determination. Profits from rubber sales by farmer groups should be used as dividends and benefits for group members. Lessons learned from joint marketing activities should inform future planning.

5) Farmer member participation

To foster farmer member participation, regular group meetings should be held to report on performance, listen to feedback, and propose joint solutions. A more diverse communication channel should be used, such as group Line, public address systems, or public relations materials. Furthermore, a transparent and accountable profit-sharing or dividend system should be established, along with incentives such as cooperation points or privileges for highly engaged members.

6) Farmer group sustainability

To build group sustainability, short- and long-term development plans should be established. Transparent accounting and financial management should be implemented. Group members should develop supplementary occupations, such as intercropping and agricultural tourism. Business matching should be established with buyers, factories, or other cooperatives to establish a network for rubber prices and facilitate negotiations with mediators. Group activities for the benefit of neighboring communities, such as tree planting and community service activities, should also be promoted.

Discussion

1) Personal characteristics, socio-economic status, and rubber plantation management. The study found that rubber farmers had an average of 14.53 years of experience in a rubber plantation. They cultivated rubber as a secondary occupation. Farmers spent their free time during the day engaging in other agricultural activities, such as longan, mango, or other field crops. This may be because farmers perceived rubber plantations as just a hobby and a career that generated additional household income, primarily through household labor. According to a 2023 agricultural survey, farmers had an average rubber plantation area of 20.69 rai. Most of this area lacked land title deeds that could be sold or converted into revolving funds. This may be because most farmers cultivated rubber in areas permitted by the Agricultural Land Reform Office, as the government allocated the land for agricultural purposes under the right to cultivate only. The right under Sor Por Kor. 4-01 is only the right to use the land, not the ownership of the land. Farmers earned an average income of 235,549.33 baht from rubber production. Farmers' rubber sales. Most farmers sell their products in the form of dry cup lumps to the cooperatives or farmer groups of which they are members. Only two cooperatives sell them as wet cup lumps: the Fang-Mae Ai Rubber Cooperative Limited.

2) The potential for Good Agricultural Practices (GAP) of rubber farmers in Chiang Mai Province found that most farmers had the highest potential for Good Agricultural Practices (GAP) (average 4.13). This may be because farmers have been promoted and trained to provide knowledge about rubber plantations in line with Good Agricultural Practices (GAP) to support trade policies from the Rubber Authority of Thailand.

3) Factors Affecting Good Agricultural Practices (GAP) for Rubber Farmers

(1) Years of education mean that farmers with higher education levels are more able to develop their potential to comply with Good Agricultural Practices (GAP) for rubber than farmers with lower education levels. This may be because farmers with higher education levels are better able to analyze and compare information and knowledge, make rational decisions, and keep up with new technological developments from

various sources such as the internet, newspapers, research, and social media. They can access information on the benefits of rubber plantation management according to Good Agricultural Practices (GAP). This will broaden their perspectives on managing rubber plantations to meet standards and improve their own productivity. This is consistent with [10], who explained that farmers with higher levels of education are better able to think, analyze, and distinguish in decision-making and to accept innovations effectively. [11] explained that farmers with higher education levels are more interested in learning more and applying it in their own fields, leading to a greater acceptance of appropriate Good Agricultural Practices. This is consistent with [12], who explained that education level is an important factor in enhancing understanding of modern technology. It helps farmers to accurately and comprehensively assess the benefits of innovation and also promotes an open attitude towards change. This is consistent with [13], which explains that when farmers have higher educational attainment, they tend to have easier access to information, making them more open to learning, even when the technology is complex.

(2) The main occupation of the farmers means that farmers who are solely engaged in rubber plantations have a higher potential to comply with Good Agricultural Practices (GAP) for rubber than farmers who cultivate rubber as a secondary occupation. This may be because farmers who cultivate rubber as their primary occupation are better prepared to manage their rubber plantations than those who cultivate it as a secondary occupation. They can devote time to learning, monitoring, and applying insights to increase resource efficiency continuously. This is consistent with the research of [14], which explains that primary farmers are often those who dare to invest in complex and expensive innovations because they see it as a necessary investment for the survival of their business.

(3) Licensed farmer land ownership means that licensed farmers will be more likely to comply with the Good Agricultural Practice Principles for Rubber (GAP) than non-licensed farmers, possibly due to the requirements of the Good Agricultural Practice Principles for Rubber (GAP) standard. The area used to cultivate rubber must comply with the requirements of the relevant laws, with proof of the right to use the land, and farmers who own the land are confident in long-term investments, such as land improvement, installation of irrigation systems, or the introduction of new technologies, etc., because they are confident that they will receive a return on those investments. Consistent with [15], it is explained that farmers with land rights will have more freedom to decide on land use, which crops to grow, and how to manage water resources, and are more likely to adopt and experiment with new technologies than farmers without land rights. And in line with [16], which explains that farmers who own land tend to embrace land development technology more than farmers who do not.

4) Farmer access to capital means that farmers with more access to capital channels will be more likely to comply with the Good Agricultural Practice Principles for Rubber (GAP) than farmers with less access to capital channels, perhaps because they have more access to capital channels. There is sufficient capital to pursue new agricultural knowledge and technologies for managing rubber plantations. In line with [17], farmers who have access to sources of capital or credit are more likely to adopt agricultural technologies, as access to credit helps reduce financial constraints. Enable farmers to invest in new production tools or methods, in line with [18], which explains that farmers who have access to capital sources are more likely to adopt technology. By accessing capital sources, they reduce financial constraints, enabling farmers to invest in technologies that improve production efficiency and reduce costs.

Conclusion

Development of Rubber Farmer Groups towards Good Agricultural Practices (GAP) for Rubber in the Northern Region of Thailand. The researchers assessed the potential of rubber plantations to support farmers in Chiang Mai Province in implementing Good Agricultural Practices (GAP) using quantitative research. They developed a guideline for building rubber farmer groups' capacity for Good Agricultural Practices for rubber using the Participatory Development Theory. The study found that most farmers had a high potential for Good Agricultural Practices (GAP) for rubber (average 4.13). When studying the factors affecting the potential for Good Agricultural Practices (GAP) for rubber farmers, it was found that 4 independent variables influenced the potential for Good Agricultural Practices (GAP) for rubber farmers: 1) farmers' years of education, 2)

farmers' main occupation, 3) farmers' land title deeds, and 4) farmers' access to capital. The researchers proposed six guidelines for developing rubber farmer groups towards good agricultural practices (GAP) for rubber: 1) farmer group management, 2) knowledge and skills in rubber plantation management, 3) production and product quality, 4) marketing and networking, 5) farmer member participation, and 6) group sustainability. To successfully develop farmer potential, the researcher must begin by adjusting farmers' attitudes to build confidence in good agricultural practices (GAP) for rubber. This should then be followed by enhancing farmers' knowledge and understanding of the practices, enabling them to recognize the importance of GAP standards.

Author Contribution

Author Contribution: Conceptualization S. Duangsingtham and P. Prapatigul; Formal analysis, S. Duangsingtham and P. Prapatigul; Investigation S. Duangsingtham and P. Prapatigul; Methodology, S. Duangsingtham, P. Prapatigul, S. Sreshthaputra and N. Phayakka; Supervision, P. Prapatigul; Validation S. Duangsingtham and P. Prapatigul; Writing- original draft S. Duangsingtham and P. Prapatigul ; writing-review and Editing S. Duangsingtham, P. Prapatigul, S. Sreshthaputra and N. Phayakka; All author read and agreed to the Published version of manuscript.

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