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Apinya Ratanachai 2008: Information Sources, Communication Channels, and Adoption of Rubber Production Practices: A Case Study of Rubber Smallholders in Hat Yai District Songkhla Province. Doctor of Philosophy (Tropical Agriculture), Major Field: Tropical Agriculture, Interdisciplinary Graduate Program. Thesis Advisor: Associate Professor Jumnongruk Udomsade, Ph.D. 202 pages.

The objectives were to study information sources, communication channels, and adoption of rubber smallholders in Hat Yai district, Songkhla province about rubber production practices. The study was undertaken through an interview schedule. Data were analyzed and presented through percentage, mean, chi-square and Kendall's tau_b correlation.

Results reveal that the total average age of rubber smallholders was 51.88 years with elementary education. Majority of them were Buddhists and the average family member was 4.51 persons. The average rubber plantation size was 14.51 rais per household, average of labor was 2.26 persons per household, mean of years of experience in rubber production was 25.08 years and the average income per year was 193,993.80 baht. The important information sources were neighbor or friend, relatives, and Rubber Replanting Aid Fund official. The main communication channels for personal method were office visit and home and rubber plantation visit, the channels for group method were meeting, agricultural day festival, training course, and rubber smallholders receive information from television and village broadcasting tower in mass method. All rubber smallholders adopted rubber clone, planting, and weed or disease control. Almost smallholders adopted pruning and fertilizers while more than half of smallholders adopt tapping system. The characteristics which relate to information sources were age, education, credit, number of labor, size of plantation, income, and experience in production while communication channels were related to age, education, religion, credit, number of labor, size of plantation, income, experience in production, and member of organization. Neighbor or friend, merchant inside community and salesman were related to adoption of rubber practices while field trip and agricultural day festival were related to adoption of rubber practices. The important problems were unspreading of news, lack of rubber information, no time for information, lack of contact with officer, and lack of interest from officer.

Student's signature

Thesis Advisor's signature

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LIST OF ABBREVIATIONS

AEO	Agricultural Extension Official
Ag Co-op	Agricultural Co-operatives
BAAC	Bank for Agriculture and Agricultural Cooperatives
DOAE	Department of Agricultural Extension
EOPS	The extension official of private sector
GO	The government official
OAE	The office of agricultural extension
ORRAF	The Office of Rubber Replanting Aid Fund
PSU	Prince of Songkla University
RRAFO	The Rubber Replanting Aid Fund Official
RRI	Rubber Research Institute
RRIT	Rubber Research Institute of Thailand
RLSG	rubber latex seller group

CHAPTER I

INTRODUCTION

Problem Statement

Thailand is an agricultural country where most half of the total land area is utilized for agriculture, employing 46 percent of the total population (Department of Agricultural Extension, 2007). Parts of national income come from the agricultural products. Although the country has become a more industrialized society, huge number of people are still in the agricultural sector, and hence agriculture is important to the economy of the country. The government encourages the development of the farmers in term of the quality of life, agricultural product quality, production management, improved yields and the livelihood of the agricultural communities. It is undeniable that communication is an important factor at the present since it has effects on the farmers and their livelihood. They are keen in knowing and adopting new agricultural technology in a short time through person media from inside and outside community, group media and mass media. Information and technology are used as tools to help farmers overcome their financial problems. Communication being adopted are those that are related to farmers' livelihood, agricultural products, agricultural management system, and perception of the knowledge by the farmers. Communication helps in farmers' decision making in adopting new technologies for more efficient production (Kunsri, 1998).

Rubber is one of the major economic crops of Thailand, earning about 332 million baht in export in 2006, of which 83 million baht come from export of block rubber, 71 million baht from smoked rubber sheets and 44 million baht from rubber concentrated latex (Office of Agricultural Economic, 2007). The total rubber plantation area in Thailand, estimated by the Rubber Research Institute of Thailand, Ministry of Agriculture and Cooperatives, is about 12.62 million rais covering 49 provinces and 1 million households in southern, eastern and northeastern regions in

the country. A vast area of rubber plantation is in southern Thailand, about 10.68 million rais or 84.62 percent of total rubber planting area in the country (Rubber Research Institute of Thailand, 2007). In 2008, the rubber farmers of Thailand are about 1.15 million households or 19.80 percent of total farmer households. About 1 million households or 87 percent of rubber household live in the south of country (Anonymous, 2008). Majority of rubber farmers in Thailand, about 97 percent or more than 1 million farms, are smallholders with average holding size between 13-25 rais (Petcharat, 2004). Rubber smallholders in Thailand have faced many challenges such as increasing cost of rubber production, lack of opportunity to enhance rubber production; inaccessibility to research and development to fulfill the needs of rubber farmers, low quality of rubber products leading to low price and consequently low family income and lack of unity in management and problem solving regime (Weerana, 2003). These problems must be solved to increase rubber production through use of rubber varieties, culture practice, fertilizing, tapping, and sheet-making (Office of the Rubber Replanting Aid Fund, 1997). Farmers need to be assisted in obtaining information and adopting new production technologies by transferring technology for development through appropriate information sources and communication channels. Therefore media has a role in transferring information or technology to the farmers. Farmers can make decision based upon information on production technology from many sources through various channels whether they should adopt such technology. The government sector should employ suitable and useful media in transferring appropriate information.

Generally, the success one can achieve in transferring of information depends on one's knowledge and ability to make use of a variety of channels. A communicator can modify the channel by understanding the characteristics of audience such as their socio-economic status, education level and attitude toward information. A communicator must be selective in the approach to obtain satisfactory results. Various channels are not similar in their capacity to influence an audience; nor are they preferred or relied on to the same extent by an audience. Furthermore, a single channel is not suited to communicate all types of information. A prerequisite

to effective communication, therefore, is a thorough knowledge of channels, their nature and role in the communication process (Tucker and Nepier, 2002).

In the south of Thailand, Songkhla province plant the rubber tree more than other provinces. Total agricultural area of Songkhla province is about 3 million rai and 66.58 percent of total area or 70 percent of total agricultural area is rubber plantation at 1.6 million rai is planted to rubber (Reungchaiprakarn, 2007). The province's earnings from rubber product is more than 15 thousand million baht or 10 percent of the rubber export of Thailand, making Songkhla province as the important province for rubber production and transformation. The province also had the most investments in rubber industry than any other province in the country (Chaibangyang, 2005). There are five districts in Songkhla province with rubber tree plantings of more than 20 thousands rai: Sadao, Hat Yai, Nathawee, Sabayoy, and Tha pa. Most of rubber farmers in these districts are smallholders except Sadao with planting area per holding of more than 50 rai.

Other than perhaps favorable environmental factors, what makes farmers in these five districts stick to rubber production? Where do the farmers, especially the smallholders, obtain their information on production technology and what are their most preferred channels of communication? These are interesting questions which need to be answered by this research or study. The study on sources of information and selection of communication channels best suited to increase the efficiency of transferring knowledge, technology, or innovation will generate useful information to help concerned authorities to efficiently transfer technologies which could improve lives of the rubber smallholders and their families. Specifically the study has attempted to answer the following questions:

1. What are the socio-economic characteristics of rubber smallholders?
2. What are the information source and communication channels that transmit information on rubber production practices to rubber smallholders?

3. Are there the adoption of recommended in rubber production practices by rubber smallholders?

4. Are there significant relationships between the characteristics of rubber smallholders, the information source, and communication channel for acquiring information about rubber production practices?

5. Are there significant relationships between the information source, communication channel and adoption of rubber production practices of rubber smallholders?

6. What are the communication problems and /or obstacles in receiving rubber information from information source and communication channels of rubber smallholders?

Objectives of the Study

1. To describe socio-economic characteristics of rubber smallholders.

2. To identify the information source and communication channel where rubber smallholders receive information about rubber production.

3. To determine the adoption of recommended rubber production practices by rubber smallholders.

4. To ascertain the relationship between the characteristics of rubber smallholders, information source and communication channels for acquiring information about rubber production practices.

5. To ascertain the relationship between information source and communication channel with adoption of rubber production practices.

6. To find out communication problems and obstacles of rubber smallholders in receiving rubber information from information source and communication channels.

Expected Results

This study provides insights into information source and communication channel for agricultural development of rubber smallholders to both government and private sectors in Thailand. Findings of this study will lead to the dissemination of more information that could provide more alternatives to improve rubber smallholders' livelihood.

In addition, results of this study will present production methods of rubber production being adopted in study area, which will be useful when transferring appropriate rubber technologies to smallholders.

A study on information source, communication channel and adoption of rubber production practices by smallholders in Songkhla province has yet to be conducted. The results of this study could serve as a guide to the Department of Agricultural Extension (DOAE) and the Office of the Rubber Replanting Aid Fund (ORRAF) when formulating the communication framework and adoption strategy for agricultural extension. The information which will be received by the rubber smallholders from the sources and channels available in their local community will provide them with know how which would be useful in improving their production practices. Moreover, this study hopes to provide other researchers with greater insights into the operationalization of the concepts and theories on ideas of transferring information for the development of rubber plantation particularly for rubber smallholders.

Hypotheses

1. Sex, age, education, religion, labor, size of rubber plantation, income from rubber production, experience, membership of organization, and credit were related to information sources in rubber production practices.

2. Sex, age, education, religion, labor, size of rubber plantation, income from rubber production, experience, membership of organization, and credit were related to communication channels in rubber production practices.

3. Information sources were related to adoption rubber production practices.

4. Communication channels were related to adoption rubber production practices.

Scope of the Study

This study was mainly focused on the information about rubber production practices obtained from various information sources, communication channels, and recommended rubber practices adoption of rubber smallholders in Hat Yai district, Songkhla province. Findings of this study may not be applicable to other areas due to differences in socio-economic conditions and situational factors. Therefore, generalizations from this study should be carefully applied.

Definition of Terms

Characteristics of rubber smallholder refers to the socio-economic characteristics of rubber smallholders such as sex, age, education, religion, labor, size of rubber plantation, experience in rubber production, income of rubber production, membership to organization and credit.

Communication refers to a process of transmitting knowledge, skills, information related to rubber production practices from person to person or group which the receivers can understand, accept and use in their life.

Information refers to data about rubber production practices including rubber clone, planting, pruning, weed and disease control, fertilization, tapping, and sheet-making.

Information sources refer to source of information namely: agricultural extension worker, neighbor, friend, relatives, merchant, government official, salesman, teacher, local leader who communicates information to rubber smallholders.

Information source inside the community refers to the information sources who stay inside the community (village) of rubber smallholders.

Information source outside the community refers to the information sources who stay outside the community (village) of rubber smallholders.

Communication channels refer to the way which the message is transmitted by extension method such as personal methods, group methods and mass methods to rubber smallholders.

Personal method refers to method of transferring rubber information from information sources to individual rubber smallholders such as home and farm visit, office visit, personal letter, and phone conversation.

Group method refers to method of transferring rubber information from information sources to group of rubber smallholders such as demonstration, meeting, training course, field trip, agricultural day festival, exhibition, and video presentation.

Mass method refers to method of transferring rubber information from information sources to rubber smallholders such as printed material, radio, television, newspaper, village broadcasting tower, and campaigns.

Printed materials refer to the agricultural documents prepared by the government or private sector and given to rubber smallholders such as posters, leaflets, circular letters, pamphlets (booklets), brochures, folders, wall papers, magazines and journals, etc.

Adoption of practices refers to the utilization of recommended rubber production practices from ORRAF to actual use by rubber smallholders.

Rubber production practices refer to rubber smallholder's practices which recommended by ORRAF from rubber plantation to post-harvesting. Production process includes rubber clone, planting, pruning, weed and disease control, fertilization, tapping, and sheet-making.

Rubber smallholder refers to the person who has rubber plantation area size between 2-50 rais based on the classification of Rubber Research Institute of Thailand.

Income from rubber production refers to total income of rubber smallholders from product sales (rubber sheet and rubber latex).

Size of rubber plantation refers to the size of total rubber plantation of rubber smallholders. It includes the owners land and those rented from other persons.

Experience in rubber production refers to number of years in rubber production of rubber smallholders.

Labor refers to person who works in rubber production of the rubber smallholders. It includes family labor and hired labor (employee).

Family labor refers to person in family of rubber smallholders working in rubber production (planting, pruning, weed and disease control, fertilization, tapping, and sheet-making).

Hired labor refers to person who receives payment from rubber production. Payment includes money or rubber product which is produced by those labor.

Membership in organization refers to the rubber smallholders participation and being member of an organization or group.

Credit refers to the source of production capital of rubber smallholders.

CHAPTER II

REVIEW OF LITERATURE

Theoretical Concepts

Agricultural Extension

Mosher (1978) stated that as long as a subsistent farmer has his land and good health, he can carry on producing what his family needs with necessities he already has on his farms. On contrary, modern farmers depend much more than ever on many factors that can only be provided by external sources. If he needs seedstock, he has to purchase it. To secure fertilizers and pesticides, he needs merchants nearby from whom he purchases them. The farmers normally sell their products through middlemen, either individual merchants or cooperative dealers, or even governmental agencies. As some necessities are expensive and so he may need credit. For the objective of agricultural extension, it is defined that the major objective of an agricultural extension activity is to provide farmers up-to-date knowledge and skills in the lines of current interest and needs which are closely related to the increase in farm production and improve the livelihood of farmer families. An extension worker needs understand the function and relationship of these key elements. The agricultural scientists provide the extension worker with new knowledge pertaining to farming. The extension worker is responsible for carrying these messages in a manner that they are understood and meaningful to the end users.

Extension work is concerned with helping rural people learn new knowledge, skills, and attitudes. The only means employed for promoting effective learning is education. In promoting desirable changes among rural people, the educational approach is prioritized. Education is the process of arranging situations in which effective communication may take place between the learner and the message carrier.

Leagans (1963) cited that good communication, therefore, is the essence of good extension activities. Extension teaching is complex as the human elements involved differ in their interests, abilities, attitudes, appreciations, understandings, expectations, goals, and objectives.

Communication

Definition of Communication

Communication is defined as process in which people share information, ideas, and feelings. The process involves not only the spoken and written word, but also body language, personal mannerism and style, surroundings, and anything that carry further meaning to the message.

Communication is not only limited to verbal conversation. Since communication is a process that continues over a period, it also occurs before and after the time people actually talk to each other. It is the most important human survival skill. It is the way we stay within the world. Communication is our only way of knowing the world around us. When we receive stimuli and interpret them, we already communicate with the source of stimuli and ourselves (Chaiwirattana, 2001).

Leagans (1963) stated that communication is the process by which two or more people exchange ideas, facts, feeling, or impression in ways that each gains a common understanding of the meaning, intent, and use of messages. In fact, it is the act of getting a sender and a receiver tuned together for a particular message, or a series of messages.

Schramm (1971) mentioned that when we communicate, we try to establish a “commonness” with someone. That is, we are trying to share information, an ideas, or attitudes. In addition, he further stated that communication occurs when two

corresponding systems, join together through one or more non-corresponding systems, assuming identical status as a result of conversation.

Communication is defined as the exchange of information between a sender and a receiver and the inference of meaning (Dean and Goldhar, 1980). While Wood (2000) stated that communication is a systemic process in which individuals interact with and through symbols to create and interpret meaning.

Middleton (1980) said that communication enables individuals to share information and link with others as well as establishes linkage among groups and institution. Katz and Kahn (1978) is of opinion that communication needs to be viewed in relation to the social system in which it occurs and the specific function it performs.

Communication can be defined in different ways. There is no complete agreement on a single definition. However, all these definitions imply social interaction. Communication is a process of reciprocal influence. A communicator transmits a message to a receiver and observes its effect. The response made by the receiver as a result of transmission of the message in turn becomes a message to the other.

The basic purpose of communication is to attain interaction. It is usually a two-way process. The significance of communication in extension work lies in its ability to evoke desirable responses from an audience.

Communication in extension education is the process of transmitting knowledge, skills, attitudes, and descriptions of behavioral patterns related to farm technology in a manner that they are understood, accepted and used by rural people.

Communication Process

Lasswell (1971) described the answer for an act of communication for the following questions:

Who

What is said

In which channel

To whom

What effect.

He suggested that communication take places between the source (who), communicating certain messages or knowledge (what), through certain media or channels, to receivers (whom), with specific intention. For illustrative purpose, an agricultural extensioner disseminates information about a new agricultural practice using flipcharts and on-farm experience to a group of farmers, expecting the farmers to comprehend the message being communicated to them and would ultimately adopt and utilize the new practice in their farming career.

Gordon (1987) expressed that communication is a central organizational process. The exchange of information between different participants links the various subsystems of the organization. As a linking mechanism, communication is a central feature of the structure of groups and organizations; it builds and reinforces interdependence between various parts of the organization. The process of interpersonal communication, or the means by which senders and receivers exchange information is also included.

There are several models of the communication process developed by social psychologists, anthropologists, and rural sociologists. Presentation of these models may be helpful in clarifying the concept of communication and its key elements.

Communication, as an instrument of social interaction, allows us to divide labor, to know other people, predict their behavior, respond to their needs and get

them to respond to our actions. We communicate to survey the environment, to correlate response, to trade goods, to live better. . What we sometimes overlook is that we communicate to be, to live, to understand ourselves, to get on the record (Berlo, 1960).

Before communication can take place, a purpose expressed as a message to be conveyed, is needed. It passes the message from a sender and a receiver. The message is encoded and passed via some media to the receiver who retranslated the message delivered by the sender. The result is a transfer of meaning from one person to another.

The source disseminates a message by encoding a viewpoint. Four conditions have been described which affect the encoded message such as: skill, attitudes, knowledge, and the socio-cultural system.

The message contains the codes or group of symbols we use to transfer meaning, the content of the message itself, and the decision that the source makes in selecting and arranging both codes and content.

The channel is the medium through which the message travels. It is chosen by the source who determines which channel is formal and which one informal. Formal channels are established by the organization and transmit messages that relate to the professional activities of members. They traditionally follow the authority network within organization. Other forms of messages, such as personal or social, follow the informal channels in the organization.

The receiver is the target whom the message is directed. Before the message can be received, the symbols in it must be translated into a form that can be understood by the receiver. This is the decoding of the message. Encoding is limited by the receiver's skills, attitudes, knowledge, and socio-cultural system, restricting the clarity of the message to be transferred.

Elements of Communication

Communication is an ongoing process in which people share ideas and feelings. The elements of communication include senders, receivers, messages, channels, feedbacks, noise, and environmental settings. All communications are a form of transaction. Viewing communication as a transaction focused on the people who is communicating and the changes that takes place when they are communicating. It also implies that all participants are involved continuously and simultaneously. The communication ca be events of the past, present, and future, and the role the participants play would affect the communication (Chaiwirattana, 2001).

Berlo (1960) suggested that the communication process consists of different elements. The knowledge of their nature and role is essential for understanding the communication process. In the Rhetoric, Aristotle said that we had to look at three communication components; the speaker, speech, and the audience. He meant that each of these elements is necessary to communication and that we can organize our study of the process under the term headings :(1) person who speaks (2) the speech produced, and (3) persons who listen.

The elements in communication include (1) source, (2) transmitter, (3) signal,(4) a receiver, and (5) destination. If we translate the source into speaker, the signal into speech, and destination into the listener, we have the Aristotelian model, plus two further ingredients, a transmitter which sends out the message, and a receiver who catches the message for the destination (Berlo, 1960; cited Shannon and Weaver, 1949).

In addition, Berlo (1960) stated that communication which occurs between two persons, one who sends the message and who encodes it could be the same, known as “source”. Similarly, the person who decodes and receives the message could also be the same, receiver. Therefore, the composition of communication process in Berlo’s idea is composed of source, message, channel and receiver. This model, popularly known as the SMCR model, consists of four communication

elements – source, message, channel, and receiver. Within each of these elements are other variables that can influence the communication process. The SMCR model, with the variables of each element are represented in Figure 1.

S	M	C	R
Source	Message	Channel	Receiver
- Communication skill	- Structure	- Seeing	- Communication skill
- Attitude	- Element	- Hearing	- Attitude
- Knowledge	- Content	- Touching	- Knowledge
- Social System	- Treatment	- Smelling	- Social System
- Culture	- Code	- Tasting	- Culture

Figure 1 A model of the components in communication

Source: Berlo (1960)

The utility of this model is the knowledge transfer process that keeps the researcher mindful of the similarities and differences between the source and the receiver, the need to treat the message or knowledge rigorously, and the need to select a proper channel and media by which to carry the message to the receivers. Hussan (1993) noted that the SMCR model is popular among development communication professionals.

In analyzing a communication line, Chase (1956) identified similar elements as those in Shannon and Weaver model. He said the line begins with an information source prepared to send out something. The message must then be put upon a mechanism capable of encoding and sending it. The signal passes over a channel to a receiver mechanism. Here the message is decoded and forwarded to its destination for possible action. While passing from transmitter to receiver, the message may be distorted by outside forces, such as static, fading, snow in television, etc. – all of which interrupt the communication and known as “noise”.

Schramm (1971) said that communication always requires at least three elements – the source, message, and destination. A source may be an individual (speaking, writing, drawing, gesturing), or a communication organization like a newspaper, publishing house, television station, or motion picture studio. The message may be in the form of ink on paper, sound wave, impulses in electric current, a wave of hands, a flag in the air, or any other signal capable of being interpreted meaningfully. The destination may be an individual listener, watcher, reader; members of group such as a discussion group, a lecture audience, a football crowd, or a mob, or an individual member of the particular group called as mass audience, such as the reader of a newspaper or a viewer of television.

Fano (1963) identified the following seven elements in illustrating a model of communication process as follows:

1. Source: the device or person that generates the information to be transmitted.
2. Source encoder: the device used to transform the output from the source.
3. Channel encoder: the device used to transform the source into a single suitable form for transmission through the prescribed channel.
4. Channel: the physical means available for transmission.
5. Channel decoder: the device used to reproduce the encoded message.
6. Source decoder: the device used to reproduce the message.
7. User: the person or device that receives the information.

Discussing the key elements of communication, Leagans (1960) said that in extension educational programs, it is assumed that people will continue their ways of thinking and doing until they have new learning experiences that cause them to adopt new ways. It is also assumed that to accept new modes of thinking and acting specified by a program, people need a greater incentive to change than to continue their present pursuance.

In the context, the task of communication is to provide powerful incentive for change. Success in this task requires thorough understanding of the six key elements of communication: a skillful communicator sending a useful message through proper channels effectively treated to an appropriate audience who responds as desired.

He described each element in the following way:

The Communicator: A key factor influencing the effectiveness of communication is the person who originates and sends message. The credibility of the communicator as perceived by the audience is a powerful determinant in communication. Who is he? What are his motives? What does he know? What are his attitudes and skills? How does he act, write, and speak? Is his purpose to impart information that really helps? Questions like these often enter the minds of people brought in contact with a communicator. They add up to a challenge of his credibility, which prestige is a major factor for confidence, and determinant. When a communicator does not hold the confidence of his audience, communication does not take place.

Message or Content: Learning cannot go on in a vacuum. It requires content or subject matter. Communication must have a message to be conveyed to an audience.

A message is the information a communicator wishes his audience to receive, understand, accept, and act upon. Message may consist of statements of scientific facts about agriculture, sanitation or nutrition, description of actions being taken by individuals, groups, or committees; reasons why certain actions should be taken; or steps necessary in taking action. Potential messages range as wide as the contents of program.

Channel of communication: The sender and receiver of messages must be connected to each other. For the purpose, channels of communication are necessary. They are physical bridges between the sender and the receiver of messages.

A channel of communication may be anything used by a sender of messages to connect him with intended receivers. Radio, television, books, bulletins, letters, newspapers, organized tours, and personal contacts are common channels that make it possible for a communicator to transmit his message to his intended audience.

Proper selection and use of channels constitutes the third determinant of successful communication. Without proper use of channels, messages, no matter how important, will not get through to the intended audience. Regardless of effort, no communication can take place until and unless the audience receives the message. And many obstructions can enter channels from a wide range of sources.

Treatment of messages: Treatment has to do with the way a message is handled to get the information across to audiences. It is related to the technique, details of procedure, or manner of performance essential to presentation.

The purpose of good treatment is to make the message clear, understandable, and realistic to the audience. Designing treatment requires knowledge of subject matter, insight into the principles of human behavior, and skill in creating and using proper techniques of presentation. At this point the art of teaching comes into play. Great teachers are adequate in all ways, but superb in their ability to treat messages.

The Audience: The audiences are the intended respondents to message sending, and is assumed to be in a position to gain economically, socially, or in other ways by responding to the message in a particular way. Success in communication is dependent on what the audience does in response to messages received.

Audience may consist of one person or many. It may comprise of men, women, or both; of youth group, or their leaders. An audience group may be formed according to occupational groups such as farmers, engineers, educators, administrators, or special assignment groups, as extension officers. Many other categories may be used to delineate audiences, including geographical location, age, special interest, need, economic, social, and educational statuses. People comprise

those categories, but communicators must identify them. Otherwise, they do not know where their target is, or what it is like.

The importance of clearly identifying an audience cannot be overstressed. The more homogeneous audiences are, the greater the chance of successful communication; and the more a communicator knows about his audiences and its characteristics the more likely he is to make an impact.

Audience response: Some students of communication do not identify audience response as a separate element, but include it as an integral function of the audience. In applying the communication process to rural development, however, immediate response is so important to identification of this element is both appropriate and useful for clarity and special emphasis.

Audiences respond to messages with mental or physical action. Action should be viewed as a product, not a process; It should be dealt with as an end; not a means. Consequently, the five elements we have just analyzed – communicator, message, channel, treatment, and audience – are an organized scheme (means) for attaining desired action. Action that can be attributed to a given communicative act by an extension worker may be assumed as a result of the degree to which the first four of these elements have been effective. For example, if an intended audience has received a useful message, and has accepted it, will the audience act in response to the message? If so, what action will take place, by whom, to what extent, and with what consequence?

Six components in the communication process (1) the communication source (2) encoder (3) message (4) channel, (5) decoder; and (6) communication receiver.

All human communication have some sources, some persons or group of persons with a purpose. The purpose of the source has to be expressed in the form of message. The communication encoder is responsible for expressing the ideas of the source and putting them in a code, expressing the source's purpose in the form of

message. A channel is a medium, a carrier of messages. For communication to occur there must be someone at the other end of the channel. The person(s) at the other end can be called the communication receiver, the target of communication.

Information Sources

Farmers get information not only from internal sources such as village leaders and local officials but also from external ones such as extension agents. Extension systems use varied modes of information packages and means to convey these to their intended users. Generally, rural people have relied more on informal communication such as friends and relatives as well as the influence of the village leaders (Jamias, 1979).

Mosher (1978) mentioned that the modern farmers constantly need new information and skills. Improved varieties do him no good unless he knows about them and knows how to use them. He cannot apply the proper pesticide unless he can identify different diseases and infestations and knows what to do about each. He cannot make good decisions about when and to whom to sell his products unless he has independent knowledge about current prices in different market places. Moreover, since one of the features of modern agriculture is that it steadily increase productivity, modern farmers are dependent on research organizations. Not only must more productive techniques be constantly invented or developed but they must be tested near where each farmer lives to see what they will perform locally.

Lionberger (1968) explained that sources of information vary in relation to both the stage of adoption the farmer is in and to his relative position in the adoption cycle. At the awareness stage, mass media, e.g., newspapers, magazines, radio, television- are the most frequent sources of information about new ideas and practices.

At the interest stage, the mass media and other farmers are again rated high as information sources, but for somewhat different reasons than at the awareness stage.

Various agricultural agencies are likely to be important at this second stage too, particularly for early adopters and in connection with involving changes in techniques or operations.

At the evaluation stage, well-regarded farmers become the most useful sources. They are considered to have the requisite experience and are readily available for consultation. They are also likely to be sympathetic to the needs of the information seeker and to understand their problems.

At the trial stage, the “How do I apply it?” question arises at this stage, several sources are most frequently used. Salesmen and dealers commonly supply the answers to questions concerning commercial products. Other farmers continue to be important, particularly for questions closely related to existing farming operations. For more complex practices less closely related to existing operations, the county agent, vocational agricultural teacher, and other professionals or specialists are in demand.

At the adoption stage, when a farmer has decided in favor of continued use of new idea or practice, self-satisfaction and satisfaction of others to whom he often refers to are most important. For some people, research findings from government and industry help reinforce decisions made; for others the experiences of other successful farmers are most important.

Frequency of Contact with Information Source

Lionberger (1960) stated that the exposure to reliable sources of information creates a state of rationality which in turn predisposes an individual to the adoption of new practices. Similarly, Rogers (1969) mentioned that a general consequence of mass media exposure among peasants could lead to the development of modern attitudes, adoption of new ideas, greater political knowledge, and more empathy. In addition, Rogers and Shoemaker (1971) claimed that communication sources and channels could provide stimuli to the individual during the innovation decision

process. In this connection, Braid (1979) said that the communicator's role would be that of enabling people to express their aspirations through available media and assist them in attaining greater productivity.

Hossain *et al.* (1972) and Islam and Halim (1976) cited that there were some evidences showing that friends, relatives and neighboring farmers are the primary sources of information regarding modern varieties of seeds for farmers or adopters. Genio (1977) and Damag (1977) stressed that farmers who had more sources of information also obtain higher innovation scores than those who has less sources of farm innovation.

A number of studies demonstrated that extension contact is positively related to adoption of the technology. Hoque, *et al.* (1972) stated that effective extension services were implied to be an important adoption factor for rice growers in Bangladesh. Similarly, Canedo (1976) in his study found that the agent influenced the farmers mostly in persuasion and knowledge followed by the experienced farmers who influenced the rest mostly during the decision and confirmation stages. In the regard, he suggested the agent should possess certain degree of competence, sociability, trustworthiness and dynamism to work effectively with the farmers.

Mendoza (1984) found that frequency of contact with extension agents was significantly related to the use of recommended farm practices. Farmers normally learn either in a natural societal environment or in an extension education setting that is designed to enhance learning. When farmers learn in the natural setting, information is received mainly through friends, relatives, neighbors and fellow farmers. Although some self-education may occur, learning is largely by chance which is inefficient when compared to learning achieved under the supervision of a change agent. In extension education, the change agent arranges a developmental sequence of intellectual behavior that is structured around the material or practice to be learned. It includes all learning experiences resulting from supervised instruction and excludes activities and experiences occurring by chance (Opare, 1977).

Suwanarat (1987) indicated that the information sources which influenced the rubber replanters in applying knowledge and technology were the rubber replanting agents, agricultural extension agents, neighbors, the training projects organized by the Department of Agricultural Extension and printed materials. Furthermore, Uddin (1988) in his study found that the information from neighbor was significantly related to productivity.

In contrast, Bautista and Gomez (1980) stated that rubber farmers contacted personnel of processing plants only to sell their products and not to consult them about farming problems.

Communication Channels

Communication process cannot be completed without a channel through which the message moves. Rogers (1983 cited Sill, 1958) defined a communication channel as the means by which messages get from one individual to another. Rogers also highlighted that communication channels were mass media channels, all those means of transmitting message that involves mass media such as radio, television, newspapers, and so on, which enable a source of one or a few individuals to reach an audience of many, and interpersonal channels which are more effective in persuading an individual to adopt a new idea involves a face-to-face exchange between two or more individuals.

The communication channels used, according to Koehler, *et al.* (1981) should be on a consistent basis for definite types of communication. The channel could either be oral or written. A list of these channels is presented in Table 1.

Table 1 Communication channels used in transferring new technologies to farmers.

Oral	Written
Personal instructions	Letters, memos, reports
Lectures, conferences	House organ
House organ	Bulletin boards, posters
Committee meetings, bulletins	Handbooks and manuals
Interviews	Annual reports
Counseling	Pay inserts
Telephone, Public address system	Information racks
Movies, slides, television	Instructions and orders
Social affairs, union meetings	
Grapevine	
Gossips, rumours	
Speeches	
Training programs	
Intercom systems	

Source: Koehler *et al.* (1981)

Communication is the process by which participants create and share information with one another in order to reach a mutual understanding. The nature of the information exchange relationship between a pair of individuals determines the conditions under which a source will or will not transmit the innovation to the receiver, and the effect of the transfer.

Mass media channels are often the most rapid and efficient means to inform an audience of potential adopters about the existence of an innovation, that is, to create awareness-knowledge. Mass media channels are all the means of transmitting messages that involve a mass medium, such as radio, television, newspapers, and so on, which enable source of one or a few individuals to reach an audience.

Schramm (1979) wrote that regardless of how much of development activity is localized, the media will continue to be asked to inform, teach, and please, as they always have been asked. He also added that one of the most important functions of the mass media is to feed interpersonal channels.

On the other hand, interpersonal channels are more effective in persuading an individual to accept a new idea, especially if the interpersonal channel links two or more individuals who are similar in socioeconomic status, education, or other similarities. Interpersonal channels involve a face-to-face exchange between two or more individuals.

Adoption

Adoption of agricultural innovations may be conceptualized as a kind of behavior strongly affected by the individual's frame of reference, which consists of functionally interrelated external and internal factors operating at a given time.

Sherif (1956) explained that the external factors consisted of groups, associations, and institutional manifestations, which are stimulating situation for the individual. The internal factors were values, attitudes, and beliefs, which the individual holds. The internal factors necessarily result from the external because no individual existed in a situation devoid of social contacted and influenced which mold his system of values to accepted norms of the group in which he participated.

Roger and shoemaker (1971) agreed and added, more specifically in term of adoption proneness that the social system's norms on innovativeness serve as incentives or restrained on his adoption behavior. However, he also noted that the adoption or rejection of an innovation was a decision made by an individual. The adoption or rejection of innovations by individuals was the third part of the social change process which consisted of three sequential steps 1) invention, 2) diffusion, and 3) consequence. They defined the term "invention" as the process by which new ideas are created or developed, the term "diffusion" as the spread of a new idea from

its source of invention or creation to its ultimate users adopters. In the consequences could be expected to occur in two dimensions: adoption or rejection. Adoption was a decision to make full use of a new idea as the best course of action available. In contrast, the innovation decision could also take a negative turn; that was, the final decision could be rejection, a decision not to adopt an innovation.

Rogers (1983) defined the adoption process as the mental process through which an individual passes from first hearing about an innovation to final adoption. He likens the process to learning and other types of decision-making. The process by which innovation are adopted by individual was essentially a limited example of how any type of learning take place. In the adoption process, various stimuli about the innovation reach the individual from communication sources. Each ensuing communication about the innovation cumulates until the individual responds to these communications, and eventually adopts or rejects the innovation. Furthermore, he stated that information sources were important stimuli to the individual in the adoption process. The individual become aware of the innovation mainly impersonal and cosmopolite sources such as the mass media. Then the conclusion of the adoption process was either adoption or rejection of the idea. An innovation may be adopted at the conclusion of the adoption process and may be 1) used continuously, or 2) rejected at a later date, discontinuance. The innovation may be rejected at the end of the adoption process, but adopted at a later. It also possible the innovation will be continuously rejected.

The rubber production in Songkhla province

Songkhla province had the total agriculture area about 3 million rais or 66.58 percent of total area of Songkhla. In 2005, the total rubber plantation area was about 2 million rais in 14 districts of Songkhla such as Sabayoy, Na mom, Krasaesin, Chana, Rattaphum, Bangklum, Khlong hoy kong, Muang, Nathawee, Hat Yai, Ranot, Khun neang, Sadao, and Tha pa of which 1.47 million rais yieded rubber products (Office of Songkhla Agriculture, 2006). The subsidized area was about 185 thousand rai and the rubber holders were 1.85 thousand persons (ORRAF Songkhla region 1,

2006). The majority of rubber holders in Songkhla province were smallholders except in Sadao district. Almost rubber plantations in Sadao were large holdings of more than 50 rais (Office of Songkhla Agriculture, 2006). Most rubber farms have been employing foreign labor such as Burmese, Lao, or Cambodian (Office of Agricultural Economic region 9, 2005).

Office of the Rubber Replanting Aid Fund (ORRAF)

The Office of the Rubber Replanting Aid Fund (ORRAF) is a statutory state enterprise of the Ministry of Agriculture and Cooperatives. It was established in 1960 to carry out the special policy of the state as the promotional occupation and non-profit organization.

The mission of the ORRAF was to work with rubber holders on rubber production, rubber processing and rubber marketing with speedy service. The ORRAF assisted the rubber holders get rid of the low yielding rubber and replant with high yielding rubber clones or perennial trees that were economic crops by grant payment. After approval for the aid, the officials of the ORRAF educate owners of rubber plantation directly in areas of production, processing and marketing. The ORRAF has given grant in aid to the rubber holders in term of supplies needed for replanting such as fertilizers, rubber seedling, weed killers, etc. and the grant is transferred to the account of recipients through a bank for wages in maintenance of rubber trees as specified by the ORRAF.

The objectives of the ORRAF were:

1. To encourage rubber holders to replant with good rubber clone, or perennial trees, and promoted rubber holders that had never planted rubber trees to start cultivation. The grant will be paid in the following ways:

- 1) Replanting with high yielding rubber clones is paid at the amount of 9,000 baht per rai over the period of five a half years.

- 2) Replanting with perennial crops is paid at the amount 9,000 baht per rai over the period of four a half years.

3) For new rubber planting areas, which rubber holders that had never planted rubber trees before, the kinds were distributed or giving directly to the rubber holders at amount of 4,600 baht per rai over the period of five and a half years. It is noted that the compensation for new rubber planting area was lower than the replanting grant due to the replanting aid is collected from the rubber exporters while the new planting aid is provided by the government.

2. To develop the product, quality which was acceptable to the market by using recommended technology.

3. To develop the system and the market mechanism for the rubber holders to receive fare price.

4. To establish strong high-bargaining-power rubber holders organizations.

The roles, duty, and responsibilities of ORRAF were:

1. To assist the rubber holders replant the low old yielding rubber and rubber trees which are more than 25 years of age, or rubber trees that are deteriorated, damaged or giving little yield with high yielding rubber clones or economic perennial crops.

2. To assist the rubber holders who had no previous rubber holdings and they are required to plant rubber trees in the promoted areas as specified by the Department of Agriculture. The grant for each rubber holders were from 2 rais and up but not exceeding 15 rai.

3. To carry on the activities concerning technology transfer, demonstrate and supervise the farmers participating to the project.

4. To be wholly responsible for the overall rubber cultivation process from planting, processing, and marketing as well as other assigned tasks by the Ministry of Agriculture and Cooperatives or the Cabinet.

The funds used in expenditure of replanting come from 4 sources:

1. Aid fund (CESS) collected from rubber exporters at the rate specified by the minister of the Ministry of Agriculture and Cooperatives and approved by the Cabinet (rubber price 30 baht per kilogram or under, exporters pay 0.90 baht per kilogram, price more than 30 to 35 baht per kilogram, exporters pay 1.20 baht per kilogram, and

price more than 35 kilogram, exporters pay 1.40 baht per kilogram), which at present in 2006 collected at 1.40 baht per kilogram. Pursuant to the Rubber Replanting Aid Fund Act, CESS is divided into 3 parts:

1) not less than 85 percent to be turned to rubber holders applied for replanting aid in the form of technical and production aid.

2) no more than 5 percent to be given to the Department of Agriculture for research, experimentation and development on businesses that may be beneficial to rubber holders.

3) the rest no more than 15 percent to be used as expenses for management of the ORRAF. If any year the budget was not enough, the government may set up and appropriation as necessary.

2. Interest – the interest from CESS may be used for the expenses of the ORRAF management if ever necessary while the rest to be added to the aid for replanting rubber holders.

3. Government subsidies – it was in the form of loans from the government or a governmental budget to aid replanting and new planting rubber holders (had no previous the rubber holdings), to pay for the ORRAF management and other assignments by the government.

4. The joint fund for aid for rubber holders- used to aid crop substitution, i.e, reduced coffee and pepper growing areas or other perennial trees as assigned by the government (Office of Rubber Replanting Aid Fund, n.d.).

Rubber production practices

The appropriate rubber planting practices brings about higher yields of latex over a longer period of harvesting. The farmers use their experiences in rubber cultivation especially land preparation, rubber clones, planting, pruning, weed and disease control, fertilizing, and latex harvesting.

The rubber plantation area is set by the Rubber Research Institute (RRI). There were 2 types of area for planting: 1) the old planting area and 2) the new planting area. The old planting included 14 provinces in the south such as

Chumphon, Ranong, Surat Thani, Krabi, Phangnga, Phuket, Nakhon Si Thammarat, Trang, Phatthalung, Satun, Yala, Pattani, Narathiwat, and Songkhla and 3 provinces in the east of Thailand such as Rayong, Chanthaburi, Trat and a part of Prachuap Khiri Khan (Bangsaphan and Bangsaphannoy district). The new planting area consisted of 19 provinces in the northeast such as Kalasin, Nakhon Phanom, Mukdahan, Loei, Sakon Nakhon, Nong Khai, Udon Thani, Nong Bua Lam Phu, Nakhon Ratchasima, Buri Rum, Maha Sarakham, Yasothon, Roi Et, Si Sa ket, Surin, Ubon Ratchathani, and Amnat Charoen and 2 provinces in the east of country such as Chon Buri and Chachoengsao.

Rubber Clone

Rubber is a perennial crop that can be tapped for six to seven and a half years. The rubber planters should select suitable clone for their plantation areas.

In 2003, RRI suggested rubber clones which gave high yield, good growth, resistant to diseases, and suited to the rubber cultivation area. These was:

Rubber Clone 1 Recommended to rubber holders, it can be planted in an unlimited area of plantation. It consisted of eight clones, such as RRI 251, Songkhla 36, BPM 24, PB 255, PB 260, PR 255, RRIC 110, and RRIM 600.

Rubber Clone 2 Rubber holders can plant this clone to a maximum of 30 percent of their area, each rubber clone had to be planted to more than 7 rais and rubber holders can plant only one variety in an area. There were 6 clones for this group such as RRIT 250, RRIT 226, BPM 1, PB 235, RRIC 100, and RRIC 101.

Rubber Clone 3 This clone can be planted to about 20 percent of the area in order for the rubber holders to get to assistance from ORRAF, with each clone planted more than 7 rais and rubber holders can plant only one clone in the area. There are 9 clones in this group such as PR 302, PR 305, RRIC 121, RRIT 163, RRIT 209, RRIT 214, RRIT 218, RRIT 225, and Hiken 2.

Planting

Rubber planting starts in early rainy season. The suitable tree spacing for the rubber plantation in the old planting area was 2.5x8 m or 3x7 m, with about 76-80 rubber trees per rai. In the new plantation area, the spaces between trees were 2.5x8 m or 3x6 m or 3x7 m, for planting density of 76-91 trees per rai. The number of tree per rai depends on soil fertility and slope of area. The spacing in sloping area could be 3x8 m, with 67 rubber trees per rai. The rubber holders need to dig the holes for planting of seedlings. The hole size was 50x50x50 cm (Rubber Research Institute of Thailand, 2006).

Pruning

Rubber tree branches should be pruned for proper maintenance of the plantation. A rubber tree should have straight trunk and smooth surface. It did not prune in summer. The rubber holders should to start pruning when the trees are 1 year. The branch which is pruned should lower than 2 meters. The trees are pruned in order to maintain well aerated and healthy planting areas. Reasons for pruning are

1. At the seedling stage, pruning help straighten the stem when it grows and the tapping can be done with ease.
2. Pruning protects the fully mature trees from damage caused by strong winds that result in tree collapsing.
3. Pruning helps remove the remains of rubber trees after the storms. This facilitates the activities such as fertilizing, weed and disease control, and tapping.

Weed and disease control

The rubber holders remove or kill weeds in rubber plantation by many methods such as hoeing, ploughing, and used of chemicals.

Presently, weeds in rubber plantations are controlled using herbicides or chemical sprays. There are many types of chemical herbicides used for weed control in rubber plantations.

Chemicals which are commonly used in rubber plantations are:

1. Paraquat 400 ml of paraquat mixed with 50 liters of water per rai for both narrow-leaf and broad-leaf weeds.
2. Gaifoset 200 ml of Gaifoset mixed with 50 liters of water per rai for narrow-leaf weeds.
3. Salfoset 200 ml. of Salfoset mixed with 50 liters of water per rai for narrow- leaf weeds.
4. Gaifoset and Daikamba 400 ml of the mixture in 50 liters of water per rai for both narrow- and broad-leaf weeds.

ORRAF recommended chemical and rate for using in weed controlling in rubber plantation are shown in Table 2.

Table 2 Chemicals used for weed control in rubber plantation.

Type of weed	Name of chemical	Commercial name	Rate (milliliter / rai)
General weed	(mixed 50 liters of water per rai)		
	1. Paraquat	1. Grammoczone	400
	2. Gaifoset	2. Round up	200
	3. Salfoset	3. Touch down	200
Cogon grass	(mixed 100 liters of water per rai)		
	1. Gaifoset	1. Round up	750-1,000
	2. Immasaper	2. Ash salt	600-800
	3. Salposet	3. Touch down	750-1,000

Source: ORRAF Songkhla Region 1(2003)

For rubber disease, the source of rubber disease was fungi and unsuitable environment. Rubber tree has a lot of important diseases such as Phytophthora leaf fall and pod rot, Powdery mildew, Pink disease, Black stripe, White root disease, Corynespora leaf spot. Furthermore, rubber trees were damaged from termites and grub of cockchafers.

Fertilizing

Application of fertilizers in rubber plantation is done twice during the harvesting period: before and after tapping of latex.

Before tapping: Fertilizers are used at this stage to enhance the growth of trees which can be harvested after 6 years of planting. There are two formulae for this period. One is 20-8-20 formula for old plantation and 20-10-12 for new ones.

Rubber planters must choose the suitable method of fertilization in their rubber plantations. Fertilizers application is done in three ways:

1. Sowing: This method is used in plateau area.
2. Row: Used for sloping or contoured area.
3. Hole: For highly sloping area.

After tapping: When rubber trees are tapped, rubber planters apply fertilizers annually. To achieve high quality of rubber product, fertilizer formula 30-5-18 is suitable for the tapped rubber trees and the application rate is 500 grams per time per tree and put it twice a year in the end of April to May and August to September. However rubber planters may use organic and chemical fertilizers together in dry area. Since chemical fertilizers enhance the growth of trees. Organic fertilizers can be prepared from agricultural wastes such as straw, chip of branch, leaves, or animal manure. By this way, planters could save the cost of rubber production.

Rate and method of fertilization A kilogram of chemical fertilizer is applied to rubber tree once a year. Fertilizing can be practiced twice a year. The first time is during the early rainy season while the second is toward the end of rainy season. In plain areas, fertilizers are sown about 50 – 60 cm from the tree. In the sloping area, fertilizer is applied in 4 holes dug around the base of the rubber tree. In contoured area, fertilizers are sown along the stand of rubber trees. For dry area, rubber planters apply organic fertilizer 2-3 kg or more per tree annually.

Tapping

Rubber trees can be tapped for the first time when it is about seven and a half years old, with diameter of at least 50 cm. More than 70 percent of the total number of rubber trees in the plantation can be tapped at the same time. Rubber holders have to tap 150 centimeters from the ground and the angle of tapping was 30-35 degree from left to right of trees. The ideal tapping procedure is that maximum latex is produced at the least bark lost. In this way, the rubber tree could be tapped for a long time, until they are 25-30 years old.

There are 4 periods of rubber tapping and the tapping systems.

Rubber tree is 7 and a half to 10 years old During period of rapid tree growth, rubber planters should not over-harvest. Suitable tapping regimes are as follows:

1. Tap at half the tree height at 2 -day interval.
2. Tap at half tree height on alternating days with no compensation for the loss.
3. Use chemical to increase rubber latex and tap on half tree height at 2-day interval.

Rubber trees of more than 10 years old Rubber trees are more sturdy than period 1 (7 – 10 years). Suitable tapping systems are:

1. Tap at half tree height at 2 -day interval and compensate for the loss,

2. Tap at half tree height at 1-day interval, and compensate for the loss in some area where rubber trees are tapped less than 200 days per year, and
3. Use chemical to increase latex production and tap at half tree height once in three days.

When the new bark on rubber tree develops: There are 3 systems of tapping for this period. They are:

1. Tap at half tree height, one day skip every two days and compensate for the loss,
2. Tap at half tree height on alternating day and compensate for the loss, and
3. Tap at half tree height, one day every skip three days or use chemical fertilizers to increase latex quantity and tap at half tree height, one day -skip two days.

Old bark of some clone is applied with chemical to increase latex production. Rubber planters should not use chemicals on old bark of rubber trees for a long time because they can be damaged resulting in latex loss of latex (ORRAF Songkhla Region 1, 2003).

Related Research

Information source and communication channel

Colis (1982) studied the contribution of education and extension to production and income of lowland rice farmers and found that traditional strategies of extension such as a combination of meetings with extension officers, farm and home visits, and farm classes and demonstrations resulted in the increase in rice production and net farm earnings.

Pua (1984) studies participatory training of farmers in the Limana Cabusao Pump Irrigation System. Result showed that the traditional strategy of an informal training program designed for farmers was effective. The training program aimed at strengthening the farmers' irrigation cooperatives by enhancing their understanding

the use of the pump irrigation system as the means to address their farms' water-related problems. Yet, farmers had negative attitude towards the proposed turnover of the water system to them because they did not feel ready to take over the operation and management of the system.

Allen (1985) studied determinants of information source selection by farm families in two North Florida Counties. Results showed that a greater proportion of farm wives used interpersonal information sources, such as family, friends, and neighbors, whereas a greater proportion of farm husbands used interpersonal extension, research-based personal information sources. A difference in information usage was also found to exist between small- and large-scale farm operators. Large-scale farm operators used interpersonal extension/research-based personnel more than do the small-scale farm operators. A greater proportion of crop producers used the interpersonal extension, research-based source more often than other sources while livestock producers used mass media source most often.

Escalada (1985) reported that learning strategies based on farmer's needs and use of media to aid the learning situation was effective in terms of learning scores obtained by the farmers. This approach used staggered farmers' classes on rice production supplemented by dramatized radio tapes and discussions, informal talks between subject matters, specialists, farmers and periodic farm visits.

Samonte (1987) mentioned about technology transfer methods and demonstrated that technology generation and transfer has a linear flow from the extension agent to the farmers. Small-scale farmers have been technologically overlooked, by-passed and understudied in terms of adoption, utilization and dissemination of transferred technologies. While technology has been functional to better-off farmers, it has been non-functional or even dysfunctional for small farmers. Further, small farmers are at the bottom of the socio-economic scale which makes access to farm innovations and services meager. Thus, small farmers' technology should be simple, available, inexpensive and effective to immediately meet their subsistence needs and progress to improve their incomes and levels of living. Thus,

technology transfer should start and end in the small farmers' farms, in order for them to have the capacity for and mastery of the technology, instead of technology being the instrument to perpetuate their poverty. In short, technology should be an enabling tool and not a disabling device.

Rajabuthra (1991) conducted communication behavior concerning home economics activities of the farm women group leaders in Chaiyaphum province. Result showed that in terms of knowledge, farm women group leaders received the home economics information from television and radio at the average of 5.2 and 3.8 times per week, respectively and from home economic agents, agricultural extension agents and other agency personnel at the average of 3.3, 2.6 and 2.1 times yearly, respectively.

Somin (1993) studied agricultural information exposures of farmers from village broadcasting towers in Nakhon Nayok province. Results revealed that age, education level, membership of farmer groups were not significantly related to the agricultural information utilization. However significant differences were found in the relationship between incomes and the agricultural information utilization of the farmers.

Gongpat (1994) conducted a study on media factors affecting grape growers performance in using agro-pesticide in Damnoen Saduak district, Ratchaburi province. Results indicated that grape growers were exposed to three types of media namely: agro-pesticide sellers (human media), television (mass media) and posters (special media). The exposures to each type of media were rated at low level. In addition, the research also reported that differences in age, education level, income, membership in agricultural institutes, personal media and special media exposure did not affect performance in using agro-pesticides. But differences in area for grape growing and mass media exposure significantly affected the performance.

Padmanuja (1996) studied information acquisition by hill tribe farmers through media in Ban Huay Nam Dang, Kued Chang subdistrict, Maetang district, Chiangmai province. She presented that farmers required agricultural marketing information in preference to governmental information. The most understood media by the farmers are village headmen, neighbors, meeting and radio. The least understood media is non-governmental persons. The media with the highest level of suitability were village headman, neighbors, broadcasting stations, meeting, radio, and television. The media with the lowest level of suitability were non-governmental persons and meeting, village headman, and neighbors.

Likitruengsilp (2002) found that the agricultural information exposure of staffs under Pastoral Training Center of Bangkok Archdiocese in Sampran district, Nakhonpathom province is mainly based on the agricultural information perception from outside: television, friends, relatives, newspapers, and radio. The main subjects or topics discussed were mainly on vegetable, cut-flower, preserved food, and gardening, respectively. The agricultural information sources from inside were colleagues, television, exhibition board, and meeting, respectively. The relationship among variables shows that the educational level, work experiences, and income was significantly related to the printed media except for the age which was significantly related to the human media such as friends, relatives, and colleagues including local area network.

Tucker and Napier (2002) showed that the preferred sources and channels of soil and water conservation among farmers in three mid-western US watersheds for conservation information across the three watershed areas included a mix of agencies and agribusiness organization: farm service agency, agri-chemical dealer, and Natural Resources Conservation Service. Farm magazines were the most important communication media for accessing agricultural information in the three watershed areas.

Adoption

Karnjanarungsie (1977) conducted research on some factors affecting the adoption of new improved varieties of rice among farmers in Makok sub-district, Pasang district, Lamphun province. Results showed that most of farmers were informed of new improved varieties by neighbors, local leaders, and the agricultural extension officers. The most commonly used channel was radio.

Kompor (1977) studied differences between adopters and non-adopters of farm innovation: a case study of rural reconstruction project at Po-ngam village in central Thailand. He found that the communication channels, mass media and interpersonal channels were related to types of adoption. Adopters who have greater exposure to mass media and interpersonal communication adopted innovations more readily than the ones who have lesser exposure to mass media and interpersonal channels of communication.

Brohmsubha (1984) studied farmers' adoption of cropping systems in Sukhothai Groundwater Project ; Zone 2: Srinakorn district, Sukhothai province. He reported that mass media which the farmers received most of agricultural information was radio. The source of agricultural information, the farmers in the project received most agricultural information from agricultural and cooperatives extension workers.

Arayangkura (1985) studied farmers' adoption of new technology in broadcasting of pregerminated wet rice seeds in Bung Kham Phroi sub-district, Lam Luk Ka district, Pathumthanee province. The result showed that information source for most of the farmers was from their experiences about technological knowledge. For communication channel, most of farmers gained the technological knowledge by their own experiences and from the radio.

Maiprom (1996) studied adoption of coffee production technology by growers in Phato district, Chumphon province. This study found that respondents contacted agricultural officers at an average of one time a year. Their annual coffee production information access averaged once a year through television; seven times through radio; four times from publications; ten times from agricultural equipment dealers; fifteen times from neighbors and successful coffee growers. Their attendance in a training course in coffee production was once a year on the average and most of them were members of the Coffee Growers Cooperatives. This study also found that the size of plantation, land holding, crop yield, income, coffee-growing experience, contact with agricultural officers, information access, training, and farmer groups were not significantly correlated with the respondents level of adoption of coffee production technology.

Tekanate (1996) studied some factors affecting the farmers' adoption of the asparagus production technology in Tamaka district, Kanchanaburi province. The results showed that there were significant relationships between ages, incomes, farm labors, cultivation area and farmers exposures with the farmer's adoption of the production technology at 0.05 significant level.

Panna (1999) presented the results of farmers' adoption in using neem extract for insect control in Suphanburi province. The results showed that the farmers received agricultural information through interpersonal communication. In addition, he found that the relationship between age and income of farmers to adoption level of neem extract uses were not statistically significant at .05 level, but were significantly related to the education level, farm sizes, and experience in using neem extract at .05 level .

Geetha *et al.* (2001) studied socio-economic determinants of farmer-oriented technology packages for sericulture. The authors reported that factors like land size and mulberry production under irrigation and education were not interrelated. In addition, other socioeconomic variables like family type, sizes, occupation status,

experience in sericulture, extension support, yield, and income had positive significant correlation with the level of adoption.

Igbokwe (2001) conducted a study on adoption of rice production techniques among wetland farmers in southern Nigeria. The study designed to determine wetland rice production techniques adopted by the farmers in Enugu State, Nigeria, and the factors influencing the intensity of adoption. Results showed that intensity of adoption was influenced by level of education, farming experience, primary occupation and tenure. Because some of the farmers were part-time and non-residents in the farm locations, it was recommended that rescheduling of extension visits in the farms during weekends when many of them can be located in the farms can improve extension contact. Mass methods of extension especially radio should depend upon farmers' awareness.

Elwell (2002) reported that the obstacles to adoption of soil and water conservation practices in Central Africa are focused on the reasons for low adoption of conservation technologies by the small-holding sectors. The smallholder farming is characterized by subsistent farmers living predominantly in the semiarid regions of Central Africa. Although the reasons for poor uptake of conservation technologies are many and varied, the following shortcomings are considered to be major obstacles to the success of conservation programs: lack of government support, incorrect mode of technology development and transfer, farmer perceptions and socioeconomic constraints, and inappropriate forms of aid.

Lohapasai (2001) studied farmer's adoption of recommended practices in raising tiger shrimp in Pattani province. The results showed that the source of farm information were magazines, journals and the shrimp farmers' association. The relationship between economic, social, psychological and communication factors and farmers' adoption of recommendations was observed. Income, use of labor and quality of shrimp were positively correlated with the farmer's adoption. The economic characteristics of farmers had an influence on their adoption behavior. In

addition, the farmers who had a higher economic status have greater farm production than others who did not adopt the recommended practices.

Ike and Onuegbu (2007) presented the results of adoption of aquaculture technology by fish farmers in Imo state of Nigeria. The results showed that the level of adoption of the technology was low. Less than half of the respondents adopted the technology. After the construction of the ponds, which were usually not to specifications, the farmers found it difficult to adopt the other recommendations, (e.g., pond maintenance, feeding, harvesting, and fish preservation). It was discovered that the farmers did not have adequate funds to maintain their small ponds and to purchase the necessary feed and other necessities for aquaculture. To increase the level of adoption of aquaculture technologies in Nigeria, it was necessary to change its perception from subsistence to commercial and sustainable farming practice; to assist the farmers with credit facilities and to provide closer monitoring of the process by extension agents.

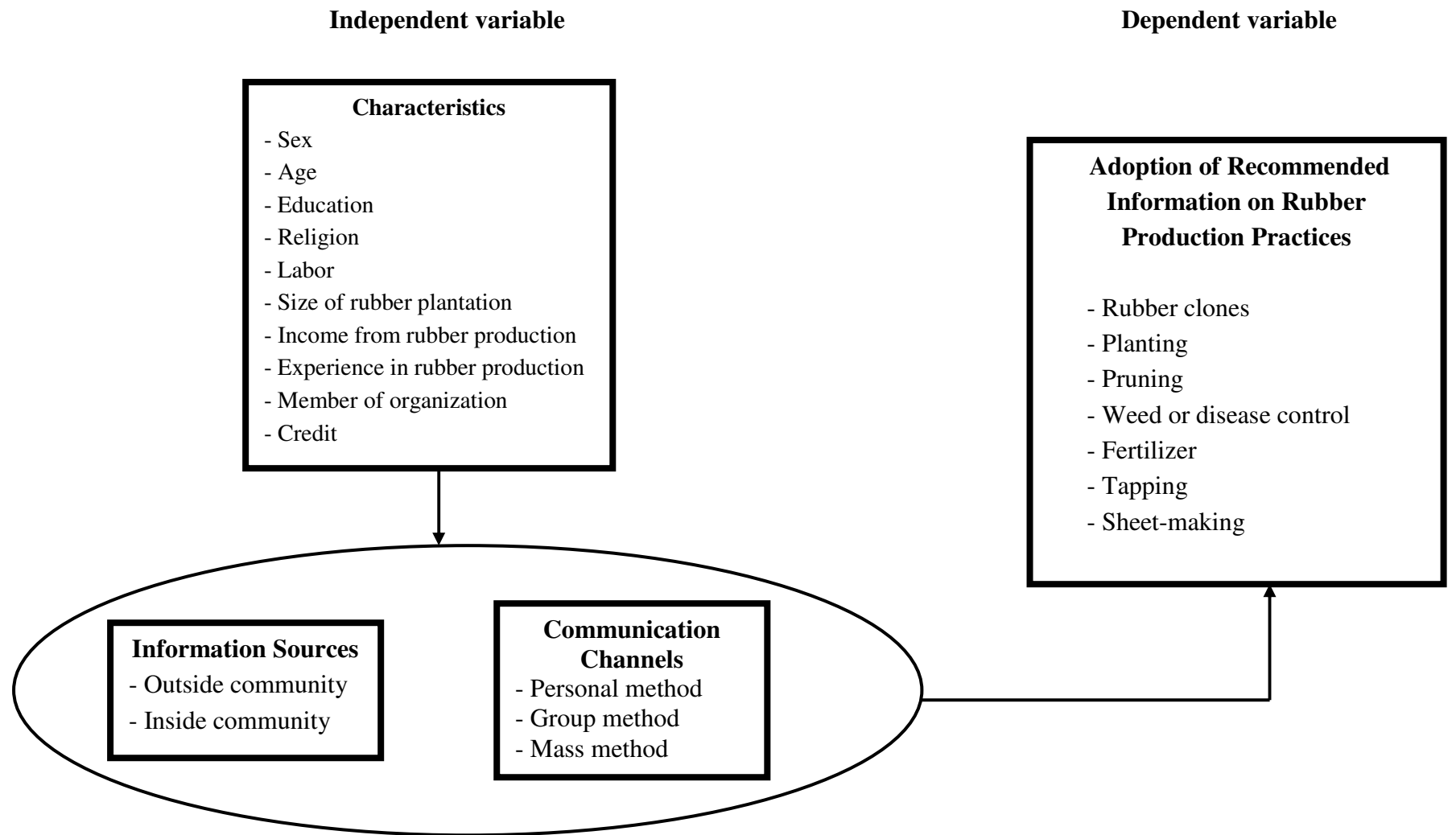


Figure 2 Conceptual framework showing the relationship among variable

CHAPTER III

METHODOLOGY

Data Collection Procedures

Location of the Study

The study was conducted in 7 sub-districts from 12 sub-districts of Hat Yai district, Songkhla province (Figure 3). These were Kho Hong, Chalung, Thung Yai, Thung Tam Sao, Tha Kham, Nam Noy, and Pha Tong. The rest of the sub-districts were not suitable for the study; most area of Khu Tao and Khlong Hae had rice field and fishery, majority of the people in Hat Yai were engaged in business, rubber plantations in Ban Pru were mostly large plantation because it had above 50 rais, and Khun Lung sub-district full of fruit orchards. The study covered a total area of 532,998 rais and 62.3 percent of this area was for agricultural activities. Rubber plantation in Hat Yai was about 90.8 percent of total area for agriculture. Hat Yai district was the second largest rubber planting area in Songkhla province, marginally less than Sadao district but the rubber plantation in Sadao was more of the large plantation types with the area of each rubber plantation was more than 50 rais (Songkhla Provincial Agricultural Office, 2002).

Selection of the study site was based on following reasons:

1. Rubber production is the major occupation for Hat Yai residents.
2. Most of the rubber planters are smallholders.
3. Hat Yai is the center of rubber industry, education, private and government organizations, business and commercial firms.
4. A large number of organizations are located in Hat Yai district with many of them are involved in rubber production. These are marketing and industries such as the Office of Rubber Replanting Aid Fund (ORRAF), central rubber market, Prince

of Songkla University (PSU), Songkhla Provincial Agricultural Office, Rubber Research Institute, and rubber product factories.

5. Chalung Industrial Estate is located in Hat Yai district.

In addition, there were also some problems and obstacles regarding farming and marketing practices in this rubber producing communities. The problems included fertilization practice, disease problems during rainy season and high humidity, improper maintenance of rubber tree, low quality rubber sheet and the need for improvement of sheet-making process in order to gain higher price, and preference of the vast majority of farmers to sell latex instead of rubber sheet (Hat Yai District Agricultural Office, 2002).

Population and Sampling Regimes

Population of the study included smallholding rubber planters with land area of 2-50 rais, living in Hat Yai district, Songkhla province and specifically being assisted by the Office of the Rubber Replanting Aid Fund (ORRAF) Songkhla Region 1 in terms of rubber production techniques between 1995 - 2004. ORRAF Songkhla Region 1 reported that the total rubber holders were 1,279 households subsidized by ORRAF Songkhla Region 1 in that time.

The sample size of 128 households is 10 percent of the total 1,279 households in 7 sub-districts (Department of Agricultural Extension, 1985). They have been assisted by the ORRAF Songkhla Region 1. The rubber smallholder had been engaged in rubber production for a long time for one crop about 25-30 years and then the number of sampling at 10 percent could show the data about rubber production. Samples from each sub-district and village were determined by proportional sampling. Names of rubber smallholders in each of the selected area were arranged in alphabetical order and about ten percent of them were selected as rubber smallholders using simple random sampling technique (Table 3).



Figure 3 Map of Hat Yai district, Songkhla province

Table 3 Sample size of rubber smallholders per sub-district.

Sub-district	Population	Sample size (persons)
Kho Hong	29	3
Chalung	281	28
Thung Tam Sao	350	35
Thung Yai	75	8
Tha Kham	184	18
Nam Noy	67	7
Pha Tong	293	29
Total	1,279	128

In addition, the study used focus group and observation for adoption of recommended rubber production practices and the actual practice in rubber production of smallholders. The rubber smallholders who have received assistance from ORRAF Songkhla Region 1 in rubber production practices more than 1 cropping season were selected for the focus group method. They were purposively selected from all sub-districts but nobody was subsidized from ORRAF Songkhla Region 1 for more than 1 cropping season in Kho Hong sub-district (Table 4). Thus, sample size or number of rubber smallholders was 20 smallholders from 6 sub-districts.

Table 4 Sample size of rubber smallholders for focus group method.

Sub-district	Sample size
Chalung	3
Thung Tam Sao	6
Thung Yai	2
Tha Kam	5
Nam Noy	1
Pha Tong	3
Total	20

Research Tool

The structured interview schedule was used as research instrument in gathering data of smallholders. It involved the characteristics of rubber smallholder, information source and communication channel about rubber production practices, adoption recommended rubber production practices, and communication problems. The interview schedule was prepared first in English and later translated to Thai, and then the reversed process was done after the data were collected. The instrument consisted of close-end and open-end questions which were divided into 4 parts:

Part I: Characteristics of rubber smallholders: sex, age, education, religion, labor, size of rubber plantation, experience in rubber plantation, income from rubber product, membership of organization, credit, and household facilities.

Part II: Information sources and communication channels which transmit information on rubber production practices: methods, frequency, topic of rubber information, etc.

Part III: Adoption of recommended rubber production practices of rubber smallholders.

Part IV: Problems and obstacles related to information sources and communication channels which the rubber smallholders have encountered.

The structured interview schedule was pre-tested at Na Mom district in February 2005, with 20 rubber smallholders. The instrument was revised and utilized in subsequent data collection.

In addition 20 rubber smallholders for focus group were interviewed in-depth about actually rubber production practices: rubber clones, planting, pruning, weed and disease control, fertilization, tapping, sheet-making process, and also the product for sale and observation by the researcher. The data were collected by semi-structured

interview with smallholders who have been rubber smallholders assisted by ORRAF Songkhla Region 1 for more than one cropping season.

Data Analysis

Data Collection and Data Analysis

Data were collected from April to July 2005 using structured interview schedule, in-depth interviewed through focus group method and observation was used for data collection at the same time.

The researcher employed the following statistical tool:

1. Descriptive statistic percentage, frequency, mean, and range were used to describe the socio-economic characteristics of rubber smallholders and extent of the adoption recommended rubber production practices.

2. Chi-square and Kendall's tau_b correlation were used to analyze the relationships between socio-economic characteristics, information source, communication channel, and adoption recommended rubber production practices of rubber smallholders.

Measurement of variable

Data were evaluated using the indicators listed below:

Age referred to age of rubber smallholders in 2005. This is categorized into 25-40 = 1, 41-55 = 2 and above 55 = 3

Education level: The levels of formal education (in school) the smallholders had. This was categorized as follows:

Illiterate or uneducated = 0

Pratomsuksa 4 = 1

Pratomsuksa 6 = 2

Mutthayomsuksa 3 = 3
 Mutthayomsuksa 6 = 4
 Diploma or certificate = 5
 Bachelor degree = 6, and
 Above bachelor degree = 7

Household members or number of residents in a household referred to the total number of persons living in a family in 2004. It is categorized into 1-4 = 1, 5-8 = 2, and above 8 = 3.

Size of rubber plantation referred to total area of land in rai planted with rubber trees in 2004. This was categorized as follows:

1-15 = 1
 16 – 30 = 2
 31- 45 = 3
 Above 45 = 4

Labor use referred to the types and number of labors or workers engaged in rubber production in 2004. Types of labor used were classified into family labor and non-family labor (hired labor). Family labor was categorized into 0 = 0, 1-2 = 1, and 3-5 = 2. Hired labor was categorized into 0 = 0, 1-2 = 1, and 3-4 = 2 and total number of labor was categorized into 1-2 = 1, 3-4 = 2, and above 4 = 3.

Experience in rubber production referred to the number of years in rubber production of rubber smallholders. This was categorized as follows:

1-8 = 1
 9-17 = 2
 18-26= 3
 27-35= 4
 36-44= 5
 Above 44 = 6

Income from rubber production referred to the approximate total annual income earned from rubber production by rubber smallholders from January to December, 2004. This was categorized as follows:

Lower than 100,000 = 1

100,000-199,999 = 2

200,000-299,999 = 3

300,000-399,999 = 4

400,000-499,999 = 5

Higher than 499,999 = 6

Membership of organization referred to the affiliation of the rubber smallholders with organizations in or outside of their community or village in 2004 such as group of rubber latex seller, customer group of Bank for Agriculture and Agricultural Co-operatives, Agricultural Co-operatives, etc. It was categorized into non-member = 0 and member = 1.

Credit referred to rubber smallholders' money or investment in rubber production from loan in 2004. It was dichotomized into without loan or credit independency = 0 and with loan or credit dependency = 1.

Household facilities referred to the facility in house of rubber smallholders such as television, refrigerator, motorcycle, radio, mobile-telephone, telephone, car, pick-up car, and computer. It was categorized into no = 0 and yes = 1.

The frequency of contact with the person who was the information source referred to the number of contact between the rubber smallholders and the person who was the information source inside and outside community in 2004. The frequency of contact was measured using a seven-scale scoring as follows:

Never = 0

Everyday = 1

1-2 times / week = 2

3-4 times / week = 3

Every month = 4

Once in 2-3 months = 5

Once a year = 6

The frequency of receiving rubber information from personal method referred to the number of contact between the rubber smallholders and the information source through personal method in 2004. The frequency of contact was measured using a seven-scale scoring as follows:

1-2 times / year = 1

3 times / year = 2

The frequency of receiving rubber information from group method referred to the number of contact between the rubber smallholders and the information source through group method in 2004. The frequency of contact was measured using a seven-scale scoring as follows:

1-2 times / year = 1

3-4 times / year = 2

Above 4 times / year = 3

The frequency of receiving rubber information from mass method referred to the number of contact between the rubber smallholders and the information source through mass method in 2004. The frequency of contact was measured using a eight-scale scoring as follows:

1-2 times / week = 1

3-4 times / week = 2

Everyday = 3

Once a month = 4

Once a 2-3 months = 5

Above 3 months / time = 6

Once a year = 7

CHAPTER IV

RESULTS AND DISCUSSION

Results

Results of this study are presented into 5 parts:

Part I Socio-economic characteristics of rubber smallholders.

Part II Information source and communication channel where rubber smallholders received the information about rubber production.

Part III Adoption of recommended information on production practices of rubber smallholders.

Part IV Relationship between the characteristics of rubber smallholders, information source and communication channel for acquiring information about rubber production practices and relationship between information source and communication channel with adoption rubber production practices.

Part V Communication problems and obstacles encountered by rubber smallholders.

Part I Socio-economic Characteristics of Rubber Smallholders

The socio-economic characteristics determined and analyzed in this study included sex, age, education, religion, labor, size of rubber plantation, experience in rubber production, income from rubber production, membership in organization, credit, and household facilities (Table 5).

Sex: More than half of the rubber smallholders at 58.59 percent were men and 41.41 percent women.

Age: The rubber smallholders' ages ranged from 27 to 85 years with a mean of 51.88 years. Majority of the rubber smallholders or more than 80.00 percent were above 40 years old.

Education: The rubber smallholders included in the study had low educational attainment. More than half of the rubber smallholders at 64.85 percent had elementary education, while 22.66 percent were educated at secondary school level.

Religion: Majority of rubber smallholders at 80.47 percent were Buddhists and the rest were Muslim.

Member of Household: The mean number of residents in a household of rubber smallholders was 4.51 persons per household. The number was at the minimum of 1 person and the maximum was 10 persons per household. Around half of rubber smallholders at 51.57 percent had residents in household below the mean and the rest with the residents more above the average.

Size of Rubber Plantation: The average rubber plantation size was recorded 14.51 rais per household. The lowest and highest sizes were 2 and 50 rais per household. More than half of the rubber smallholders at 66.41 percent had the size of rubber plantation 15 rais or below.

Table 5 Socio-economic characteristics of rubber smallholders

(n = 128)		
Socio-economic Characteristics	Number	Percent
Sex		
Men	75	58.59
Women	53	41.41
Age (year)		
25-40	23	17.97
41-55	61	47.66
Above 55	44	34.37
Mean = 51.88 Min = 27 Max = 85		
Education		
Uneducated	6	4.69
Pratomsuksa 4	71	55.47
Pratomsuksa 6	12	9.38
Mutthayomsuksa 3	14	10.94
Mutthayomsuksa 6	15	11.72
Diploma or certificate	6	4.69
Bachelors degree	4	3.11
Religion		
Buddhism	103	80.47
Islamic	25	19.53
Number of residents in a household (person / household)		
1-4	72	56.25
5-8	53	41.41
Above 8	3	2.34
Mean = 4.51 Min = 1 Max = 10		

Table 5 (Continued)

(n = 128)		
Socio-economic Characteristics	Number	Percent
Size of Rubber Plantation (rai / household)		
1-15	86	67.19
16-30	29	22.65
31-45	11	8.60
Above 45	2	1.56
Mean = 14.51 Min = 2 Max = 50		

Labor in Rubber production: The major source of labor was family labor. Most of rubber smallholders at 74.22 percent relied only on family labor. The average number of labor was 1.72 persons per household, with the highest of 5 and the lowest of 1. There were only 10.94 percent who used only hired labor in their production. The largest number of employed labor was 4 persons and the lowest was 1 person. The average number of hired labor was 0.53 persons per household. The average of total labor (family labor and hired labor) was 2.26 persons. About 60 percent of rubber smallholders used 2 persons in production because plantation sizes were relatively small (Table 6).

Table 6 Labor in rubber production

Labor in Rubber production	Number	Percent
(n = 128)		
Family Labor (person / household)		
0	14	10.94
1-2	101	78.91
3-5	13	10.16
Mean = 1.72 Min = 1 Max = 5		
Hired Labor (person / household)		
0	95	74.22
1-2	25	19.53
3-4	8	6.25
Mean = 0.53 Min = 1 Max = 4		

Experience in Rubber Production: the average of years of experience by rubber smallholders in rubber production was 25.08 years. The shortest rubber production experience was 1 year and the longest was 58 years. There was equal number of rubber smallholders who had experience of 18-26 and 27-35 years at 28.13 percent. There were about 53.13 percent of rubber smallholders who had the experience of 26 years or below (Table 7).

Table 7 Experiences in rubber production

Experience in Rubber production	Number	Percent
(n = 128)		
1-8	10	7.81
9-17	22	17.19
18-26	36	28.13
27-35	36	28.13
36-44	13	10.16
Above 44	11	8.59
Mean = 25.43 Min = 1 Max = 58		

Income from Rubber Production: Almost half of rubber smallholders at 45.31 percent had an income of less than 100,000 baht per year and a half of rubber smallholders had income between 100,000-499,999 baht per year. Only 4.69 percent of rubber smallholders earned income from rubber production about 500,000 baht and over per year. The average income of rubber smallholder was 193,993.80 baht per year, with the lowest and highest income of 18,000.00 and 2,700,000.00 baht per year (Table 8).

Table 8 Income from rubber production

(n = 128)		
Income from Rubber production	Number	Percent
Lower than 100,000	58	45.31
100,000-199,999	35	27.34
200,000-299,999	18	14.06
300,000-399,999	7	5.47
400,000-499,999	4	3.13
Higher than 499,999	6	4.69
Mean = 193,993.80 Min = 18,000 Max = 2,700,000		

Membership of Organization: Most of the rubber smallholders at 71.88 percent were member of organizations such as group of rubber latex seller, Agricultural Co-operatives (Ag Co-op) and Bank for Agriculture and Agricultural Co-operatives (BAAC). There were 28.12 percent of rubber smallholders who were not member of any organization. They had many reasons for this situation such as unnecessary, dislike, no time, and uninformed (Table 9).

Table 9 Membership in organization of rubber smallholders

(n = 128)		
Membership in Organization	Number	Percent
Member	92	71.88
Non-member	36	28.12
Organizations*		
Group of rubber latex seller	42	32.81
Ag Co-op	39	30.47
BAAC	36	28.13
Savings group	18	14.06
Village fund	4	3.13
Farm woman group	3	2.34
Islam Co-operatives	1	0.78
Reason for Non-membership*		
Unnecessary	10	7.81
Dislike	6	4.69
No time	5	3.91
Uninformed	4	3.13

* Multiple responses

Credit for Rubber Smallholder: More than half of rubber smallholders at 60.16 percent had never used loans in their rubber production. Around 57.03 percent of rubber smallholders did not use credit because they had their own capital for production, 3.13 percent of them indicated that it was unnecessary for them. Around one- third of all used credit from the financial institutions. The main financing institutions were the Bank for Agriculture and Agricultural Cooperatives (BAAC) and the Rubber Replanting Aid Fund (RRAF) while other sources were used by a few rubber smallholders. The loan was used in the major activity such as fertilizing, weed and disease control and rubber clone (Table 10).

Table 10 Credit for rubber smallholders

	(n = 128)	
Credit for Rubber Smallholder	Number	Percent
Credit dependency	51	39.84
Credit independency	77	60.16
Source of Credit*		
BAAC	20	15.63
RRAF	15	11.72
Ag Co-op or Co-operatives	9	7.03
Savings group	5	3.91
Village fund	3	2.34
Relatives	3	2.34
Islamic Co-operatives	1	0.78
Merchant	1	0.78
Activity that requires*		
Land preparing	6	4.69
Rubber clone	15	11.72
Planting	7	5.47
Fertilizers	28	21.88
Weed and disease control	18	14.06
Tapping	2	1.56
Reason for Credit Independency		
Own capital	73	57.03
Unnecessary	4	3.13

* Multiple responses

Household Facilities for Rubber Smallholder

Television was the most common item which was owned by almost all rubber smallholders at 97.66 percent and 67.97 percent were with radio in the households. The most common way of communication by rubber smallholders was their mobile-telephone and fixed telephone which were used by 59.38 and 50.00 percent of the rubber smallholders, respectively. Majority of rubber smallholders at 96.09 percent used motorcycle and 35.16 percent used pick-up car (Table 11).

Table 11 Household facilities in rubber smallholders accommodation

(n = 128)		
Household Facilities	Number	Percent
Household Facilities *		
Television	125	97.66
Refrigerator	125	97.66
Motorcycle	123	96.09
Radio	87	67.97
Mobile-telephone	76	59.38
Telephone	64	50.00
Pick-up car	45	35.16
Computer	19	14.84
Car	9	7.03

* Multiple responses

Part II Information Sources and Communication Channels

Information Sources

Rubber smallholders reported ten information sources for rubber production career from which they obtained rubber information. Table 12 presents frequency and percent distributions of the rubber smallholders citing various information sources, through which they generally received information. It was noted that a rubber smallholders obtained rubber information entirely from personal or human source.

Information sources were divided into two types inside and outside the community. Of the ten information sources mentioned, neighbors or friends as a source were cited by most rubber smallholders. The second most frequently used source of information was the Rubber Replanting Aid Fund officials (RRAFO), followed by relatives, the agricultural extension officials (AEO), merchant inside community, local leader, merchant outside community, the extension official of private sector (EOPS), government officials (GO), and salesmen.

Information source inside the community: Almost all rubber smallholders received information from neighbors or friends at 75.78 percent. Half of rubber smallholders at 55.47 percent received rubber production information from their relatives. Around 17.19 percent of rubber smallholders got information from merchant inside their community. Around 10.16 percent of rubber smallholders received rubber production information from their local leaders.

Information source outside the community: RRAFO was the main source from outside the community and there were 72.66 percent of rubber smallholders who received information from this source. The next source was the AEO and there were almost 20 percent of rubber smallholders who mentioned about this source of information. Other sources such as the merchant outside community, EOPS, GO, and salesmen seldom contacted rubber smallholders (Table 12).

Table 12 Frequency and percent distribution of information sources

Information Source	Number	Percent (n= 128)
Inside the community*		
Neighbor or friend	97	75.78
Relatives	71	55.47
Merchant	22	17.19
Local leader	13	10.16
Outside the community*		
Rubber Replanting Aid Fund official	93	72.66
Agricultural extension official	23	17.97
Merchant	11	8.59
Extension official of private sector	4	3.13
Government official	3	2.34
Salesmen	1	0.78

* Multiple responses

Information source inside the community

Information source inside the community in this study included various information sources living inside the community or village of rubber smallholders such as neighbors or friends, relatives, merchant, and local leaders. The results of the frequency of communication of rubber smallholders with source inside the community are shown in Table 13.

Neighbor: 50.78 percent of rubber smallholders contacted their neighbors everyday. They lived in the same village or community and met everyday when they sold the product, where they transmitted information about rubber production.

Relatives: About 31.25 percent of rubber smallholders contacted the relatives everyday because their accommodations were in close proximity. They could visit others and then the information was from one to others.

Merchant: Around 14.84 percent of rubber smallholders contacted with the merchant inside community. Most of this source sold fertilizers and bought rubber products from the rubber smallholders who could contact with him / her everyday.

Local leader: Rubber smallholders contacted transferred their leader everyday at 2.34 percent while rubber smallholders who seldom contacted this source were of almost equal number.

Topic of information inside the community source

For the topic of rubber information, the rubber smallholders received much information from source inside the community. Marketing information was transferred to the target in preference to other topics, followed by fertilizers, weed and disease control, and rubber clone (Table 14).

Neighbor: The most common rubber information from this source was marketing, followed by fertilizers, weed or disease control, rubber clone, tapping, planting, and sheet-making.

Merchant: The main rubber information from this source was marketing. The next topic was fertilizers, rubber clone, weed and disease control, planting, pruning, tapping, and sheet-making.

Relatives: The important information from relatives was marketing and there were 48.44 percent of rubber smallholders who received information from their relatives. The next topic was fertilizer and weed and disease control.

Table 13 Frequency and percent of rubber smallholders who receive information from source inside community

(n = 128)

Frequency	Information source from inside community							
	Neighbor or friend		Relative		Local leader		Merchant	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Everyday	65	50.78	40	31.25	3	2.34	19	14.84
1-2 times / week	10	7.81	8	6.25	2	1.56	2	1.56
3-4 times / week	9	7.03	4	3.13	1	0.78	0	0
Every month	4	3.13	5	3.91	2	1.56	0	0
Once in 2-3 months	7	5.47	10	7.81	4	3.13	1	0.78
Once a year	1	0.78	4	3.13	1	0.78	0	0

Table 14 Frequency and percent of rubber smallholders who received information on each topic of rubber production

(n = 128)

Topic of information*	Information source from inside community							
	Neighbor or friend		Relative		Local leader		Merchant	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Rubber clone	16	12.50	12	9.38	6	4.69	7	5.47
Planting	7	5.47	9	7.03	6	4.69	5	3.91
Pruning	5	3.91	4	3.13	5	3.91	5	3.91
Fertilizer	31	24.22	26	20.31	9	7.03	8	6.25
Weed and disease control	22	17.19	23	17.97	9	7.03	6	4.69
Tapping	11	8.59	5	3.91	4	3.13	5	3.91
Sheet-making	7	5.47	6	4.69	4	3.13	4	3.13
Marketing	79	61.72	62	48.44	9	7.03	19	14.84

* Multiple responses

Local leader: The rubber smallholders about 7.03 percent who received information from this source about fertilizer, weed and disease control, and marketing. The next most frequent information was rubber clone, planting, pruning, tapping, and sheet-making.

Information source outside the community

Information source outside the community in this study referred to various information sources living outside the community or village of rubber smallholders namely: the Rubber Replanting Aid Fund Official (RRAFO), followed by the merchant, the agricultural extension official (AEO), the extension official of private sector (EOPS), the government official (GO), and salesmen (Table 15).

The Rubber Replanting Aid Fund Official (RRAFO): The rubber smallholders about 42.19 percent seldom contacted RRAFO such as once in 2-3 month or once a year.

The agricultural extension official (AEO): The frequency of meeting was different varying from once a month, 2-3 months, or once a year. However, there were a few rubber smallholders who contacted AEO because the responsibility of AEO was more other crops concerned with than rubber.

Merchant: Almost 10 percent pf rubber smallholders received rubber information from merchant outside the community. Rubber smallholders seldom contacted with this source because the merchant lived far from the community of rubber smallholders. They could exchange rubber information when rubber smallholders had to buy the goods such as fertilizer or chemical for weed from them.

The extension official of private sector (EOPS): There were a few rubber smallholders who received information from EOPS with low frequency of contact.

The government official (GO): There were only 3 rubber smallholders who received information from this source. It was a small number and the frequency was uncertain.

Salesman: The last source from outside the community for rubber smallholders was salesmen. There was only one rubber smallholder who received information once a year from this source. Other rubber smallholders had never contacted with salesman and then he was not an important information source for rubber smallholders.

Topic of information from outside the community source

The Rubber Replanting Aid Fund Official (RRAFO): Fertilizers were the main subject or topic of information responded to the rubber smallholders more than other topics. Weed and disease control was shown as the second topic by RRAFO to them. Other topics were planting, rubber clone, marketing, pruning, tapping, and sheet-making (Table 16).

The agricultural extension official (AEO): Fertilizers were the most frequently required information from AEO. Topic of rubber clone and planting both were the next topic frequently inquire by 10.16 percent of rubber smallholders from AEO 9.38 percent received topic of weed and disease control from AEO.

The extension official of private sector (EOPS): Only 2 topics of fertilizers and marketing were transferred to the rubber smallholders by this source. The frequency of contact was less than RRAFO and AEO indicating this information source to be least important.

The government officer (GO): There were four topics provided by the government officer such as the rubber clone, fertilizers, weed and disease control, and marketing.

Table 15 Frequency and percent of rubber smallholders who received information from source outside the community

(n =128)

Frequency	Information source from inside the community											
	RRAFO		AEO		EOPS		GO		Merchant		Salesman	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
1-2 times / week	9	7.03	-	-	-	-	1	0.78	1	0.78	-	-
3-4 times / week	1	0.78	-	-	2	1.56	-	-	2	1.56	-	-
Once a month	24	18.75	9	7.03	-	-	1	0.78	2	1.56	-	-
Once in 2-3 months	32	25.00	6	4.69	2	1.56	1	0.78	4	3.13	-	-
Once a year	27	21.09	8	6.25	-	-	-	-	2	1.56	1	0.78

Table 16 Frequency and percent of rubber smallholders who received information on each topic of rubber production

(n = 128)

Topic of information*	Information source from inside community											
	RRAFO		AEO		EOPS		GO		Merchant		Salesman	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Rubber clone	34	26.56	13	10.16	-	-	2	1.56	2	1.56	-	-
Planting	36	28.13	13	10.16	-	-	-	-	1	0.78	-	-
Pruning	24	18.75	8	6.25	-	-	-	-	-	-	-	-
Fertilizer	57	44.53	19	14.84	2	1.56	2	1.56	6	4.69	1	0.78
Weed and disease control	41	32.03	12	9.38	-	-	2	1.56	4	3.13	1	0.78
Tapping	21	16.41	7	5.47	-	-	-	-	-	-	-	-
Sheet-making	20	15.63	7	5.47	-	-	-	-	-	-	-	-
Marketing	25	19.53	6	4.69	4	3.13	1	0.78	6	4.69	-	-

* Multiple responses

Merchant: The merchant gave the rubber information about fertilizer, marketing, and weed and disease control more than other topics. The rubber smallholders did not get rubber information about pruning, tapping, and sheet-making from this source.

Salesman: The information from salesman was at the lowest frequency when compared with other sources from outside the community. There were two topics which rubber smallholders did not get information from salesman, i.e. fertilizers, and weed and disease control.

Communication Channels

The percent distribution of the rubber smallholders, who obtained rubber production information from the various communication channels is shown below. It was reported for the three methods of channels, i.e., personal method, group method, and mass method.

Rubber smallholders received rubber production information through mass method more than others. The major mass media was television and broadcasting tower. Meeting was an important channel of group method and office visiting was the main channel for personal method (Table 17).

Table 17 Frequency and percent distribution of rubber smallholders who received rubber information from communication channels

	(n = 128)	
Communication channels*	Number	Percent
Personal method		
Office visit	62	48.44
Home and rubber plantation visit	41	32.03
Phone conversation	6	4.69

Table 17 (Continued)

	(n = 128)	
Communication channels*	Number	Percent
Group method		
Meeting	75	58.59
Agricultural day festival	41	32.03
Training course	33	25.78
Demonstration	9	7.03
Field trip	8	6.25
Exhibition	5	3.91
Mass method		
Television	122	95.31
Broadcasting tower	94	73.44
Printed material	59	46.09
Radio	57	44.53
Newspaper	53	41.41

* Multiple responses

Personal method

The personal method in the study included the method of transfer of rubber production information from information sources to individual smallholder namely; office visit, home and rubber plantation visit, and phone conversation (Table 18).

Office visit: The RRAFO was the agency which was contacted by rubber smallholders through this method. The frequency of contact for one-third of rubber smallholders was 3 times per year.

Home and rubber plantation visit: The officials who most commonly visited the rubber smallholders were the RRAFO. The frequencies of visit were between 1-3 times per year.

Phone conversation: The rubber smallholders seldom contacted with the information source by phone. The frequency of this method was a few times per year. However, the RRAFO was the main source for this channel.

Table 18 Frequency and information source of personal method

(n = 128)

Frequency and information source	Personal method					
	Office visit		Home and rubber plantation visit		Phone conversation	
	Number	Percent	Number	Percent	Number	Percent
Frequency						
1-2 times / year	23	17.97	20	15.63	3	2.34
3 times / year	39	30.47	21	16.41	3	2.34
Information source						
RRAFO	55	42.97	36	28.13	4	3.13
AEO	5	3.91	2	1.56	1	0.78
Merchant in community	2	1.56	-	-	-	-
Relatives	-	-	3	2.34	1	0.78

Topic of information from personal method

Office visit: Most common topic of rubber information was fertilizing at 42.19 percent, 25.78 percent contact for weed and disease control. The least was tapping practice at 6.25 percent.

Home and rubber plantation visit: Fertilizing was the major topic of rubber production exchanged between 27.34 percent of rubber smallholders during home or

rubber plantation visit. Other topics were weed and disease control at 21.09 percent and planting at 20.31 percent.

Phone conversation: Around 3.91 percent of rubber smallholders who used this method received information on fertilizing more than other information. Others were planting at 3.13 percent, weed and disease control and marketing at 2.34 percent (Table 19).

Table 19 Topic of information received by rubber smallholders through personal method

(n = 128)

Topic of information*	Personal method					
	Office visit		Farm and home visit		Phone conversation	
	Number	Percent	Number	Percent	Number	Percent
Rubber clone	30	23.44	24	18.75	1	0.78
Planting	30	23.44	26	20.31	4	3.13
Pruning	12	9.38	24	18.75	1	0.78
Fertilizer	54	42.19	35	27.34	5	3.91
Weed and disease control	33	25.78	27	21.09	3	2.34
Tapping	8	6.25	14	10.94	2	1.56
Sheet-making	9	7.03	13	10.16	1	0.78
Marketing	15	11.72	19	14.84	3	2.34

* Multiple responses

Group method

The group method in the study referred to the method of transferring rubber production information from information sources to group of smallholder namely; meeting, agricultural day festival, training course, demonstration, field trip, exhibition, and video presentation (Table 20).

Meeting: RRAF transferred information to rubber smallholders in preference of other organizations at 47.66 percent about 1-2 times per year. The next was the Rubber latex seller group (RLSG), Office of Agricultural Extension (OAE), Rubber

Research Institute of Thailand (RRIT), Agricultural Co-operative (Ag Co-op), and local leaders.

Agricultural day festival: About one third of all rubber smallholders at 32.03 percent used to go the Agricultural Day Festival. This activity was held by Prince of Songkla University (PSU) in preference to other organizations but the frequency of this activity was only once a year.

Training course: ORRAF arranged training course for rubber smallholders more than other organization at 25.00 percent of group method activities. The average of frequency was 1-2 times per year.

Other method: The other methods for group contact were demonstration, field trip, and exhibition. The most rubber smallholders received rubber information through these methods about 1-2 times per year. The important source was ORRAF.

Table 20 Frequency and information source of group method

(n=128)

Frequency and information source	Group method											
	Demonstration		Meeting		Field trip		Agricultural day festival		Training course		Exhibition	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Frequency												
1-2 times / year	7	5.47	61	47.66	8	6.25	41	32.03	32	25.00	4	3.13
3-4 times / year	-	-	7	5.47	-	-	-	-	2	1.56	-	-
Above 4 times / year	-	-	7	5.47	-	-	-	-	2	1.56	-	-
Information source*												
ORRAF	7	5.47	64	50.00	5	3.91	1	0.78	32	25.00	2	1.56
Rubber latex seller group	-	-	5	3.91	-	-	-	-	1	0.78	-	-
OAE	-	-	4	3.13	-	-	-	-	2	1.56	-	-
RRIT	4	3.13	4	3.13	3	2.34	-	-	5	3.91	-	-
DAE	-	-	-	-	-	-	1	0.78	-	-	-	-
PSU	-	-	-	-	-	-	41	32.03	-	-	2	1.56
Ag. Co-op	-	-	2	1.56	1	0.78	-	-	-	-	-	-
Local leader	-	-	1	0.78	-	-	-	-	2	1.56	-	-
Company	-	-	-	-	-	-	-	-	1	0.78	-	-

* Multiple responses

Topic of information from group method

Meeting: The most information received from meeting was fertilizing. There was about 44.53 percent of rubber smallholders who participated in the meeting received this information topic. The next was weed and disease control, planting, rubber clone, marketing, tapping, pruning and sheet-making.

Agricultural day festival: The rubber smallholders who attended the agricultural day festival received information on rubber clone at 19.53 percent, fertilizing at 15.63 percent. They received rubber information in both weed and disease control and tapping at 7.81 percent

Training course: The most common information from training course was fertilizing and there were about 18.75 percent of rubber smallholders who participated in training received this information. It was followed by planting, weed and disease control, rubber clone, tapping, marketing, pruning, and sheet-making (Table 21).

Table 21 Topic of information given rubber smallholders by group method

(n = 128)

Topic of information*	Group method											
	Demonstration		Meeting		Field trip		Agricultural day festival		Training course		Exhibition	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Rubber clone	6	4.69	33	25.78	3	2.34	25	19.53	13	10.16	2	1.56
Planting	5	3.91	42	32.81	5	3.91	8	6.25	18	14.06	2	1.56
Pruning	3	2.34	15	11.72	4	3.13	6	4.69	5	3.91	2	1.56
Fertilizer	8	6.25	57	44.53	2	1.56	20	15.63	24	18.75	2	1.56
Weed and disease control	5	3.91	43	33.59	3	2.34	10	7.81	15	11.72	3	2.34
Tapping	4	3.13	18	14.06	1	0.78	10	7.81	12	9.38	2	1.56
Sheet-making	4	3.13	13	10.16	3	2.34	8	6.25	5	3.91	2	1.56
Marketing	2	1.56	23	17.97	3	2.34	5	3.91	9	7.03	2	1.56

* Multiple responses

Mass method

Mass method in the study referred to the method of transferring rubber production information from information sources to mass of rubber smallholder such as television, radio, newspaper, agricultural printed material, and broadcast tower (Table 22).

Television: Around 89.06 percent of the rubber smallholders watched television everyday and the rest watched irregularly.

Radio: The rubber smallholders who listened to radio broadcast about 27.34 percent everyday. There were around 5.47 percent of rubber smallholders who listened to it about 1-2 times per week.

Newspaper: There were equal rubber smallholders who read newspaper around 1-2 times per week and 3-4 times per week at 15.63 percent. Only 9.38 percent of the rubber smallholders read newspaper everyday.

Printed Material: The rubber smallholders about 17.19 percent received information from agricultural printed material once a month while 15.63 percent seldom receive it (more than 3 months per time). The rubber smallholders who received information about once in 2-3 months was 10.16 percent and 4.69 percent received information through this channel once a year.

Broadcasting tower: There were 94 persons who received the information from broadcasting tower in their community and about 43.75 percent could hear information 1-2 times per week. Around 17.97 percent listened to broadcasting tower 3-4 times per week while 10.16 percent listened to it everyday. There were 20.32 percent seldom listened to it and only 6.25 percent used to hear only once in a year.

Table 22 Frequency and percent of rubber smallholders who received information from mass method

(n = 128)

Frequency	Mass method									
	Television		Radio		Newspaper		Printed material		Broadcasting tower	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
1-2 times / week	2	1.56	7	5.47	20	15.63	-	-	56	43.75
3-4 times / week	5	3.91	12	9.38	20	15.63	-	-	23	17.97
Everyday	114	89.06	35	27.34	12	9.38	-	-	13	10.16
Once a month	-	-	-	-	-	-	22	17.19	12	9.38
Once in 2-3 months	-	-	-	-	-	-	13	10.16	13	10.16
Above 3 months / time	-	-	-	-	-	-	20	15.63	1	0.78
Once a year	-	-	-	-	-	-	6	4.69	8	6.25

Topic of information from mass method

Television: There was about 46.09 percent of television watching rubber smallholders received marketing and the price of rubber product information. The other topics included fertilizing at 18.75 percent, pruning at 7.81 percent, planting and weed or disease control was equal at 7.03 percent. The rest of the topic accessed to the rubber smallholder in a small numbers.

Radio: The rubber smallholders received rubber information from radio in the same manner as television. They received information about the price of rubber product more than other information. About 33.59 percent of those who listened radio programe received marketing information and to other information about rubber production a few times.

Newspaper: Around 14.06 percent of rubber smallholders who read newspaper received information about marketing. Other information included fertilizing at 7.03 percent, planting and weed or disease control both at 5.47 percent. Other topics were received by a few rubber smallholders.

Printed Material: The rubber smallholders who received the printed material as the information source that contains information in fertilizing and planting more than other topics from this channel were at 28.91 percent. The second most frequent topic of information provided was weed and disease control at 17.19 percent, followed by pruning, rubber clone, tapping, and sheet-making at 12.50 percent, 10.94 percent and 8.60 percent, respectively.

Broadcasting Tower: About 24.43 percent of rubber smallholders received market information more than other topics from broadcasting tower. The information on fertilizers was the next at 18.75 percent, followed by planting at 10.94 percent, weed and disease control 9.38 percent, and rubber clone at 4.69 percent. The least in number was pruning at 2.34 percent and they did not receive the information about tapping and sheet-making from broadcasting tower (Table 23).

Table 23 Topic of information sent to rubber smallholders through mass method

(n = 128)

Topic of information*	Mass method									
	Television		Radio		Newspaper		Printed material		Broadcasting tower	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Rubber clone	4	3.13	2	1.56	1	0.78	14	10.94	6	4.69
Planting	9	7.03	3	2.34	7	5.47	37	28.91	14	10.94
Pruning	10	7.81	2	1.56	2	1.56	16	12.50	3	2.34
Fertilizer	24	18.75	3	2.34	9	7.03	37	28.91	24	18.75
Weed and disease control	9	7.03	3	2.34	7	5.47	22	17.19	12	9.38
Tapping	3	2.34	-	-	-	-	11	8.60	-	-
Sheet-making	5	3.91	-	-	-	-	11	8.60	-	-
Marketing	59	46.09	43	33.59	18	14.06	3	2.34	30	24.43

* Multiple responses

The Effective Method for Transferring Information

Rubber smallholders indicated that the most effective method of transferring information was by officials transferring rubber information to representatives of group, later representatives passing on information to others as reported by most rubber smallholders at 77.34 percent. The second was the printed materials which were handed out to rubber smallholders, followed by 35.16 percent joining the field trip and 31.25 percent required community meeting where media were used (Table 24).

Table 24 Frequency and percent distribution of rubber smallholders opinion about the effective method for transferring rubber production information

(n = 128)

Effective method of transferring*	Total number	Percent
Official transfer to group representatives who transfer to others	99	77.34
Hand out the printed materials	65	50.78
Field trip	45	35.16
Community meeting and use media	40	31.25
Face to face by officer	36	28.13
Produce radio or TV program by organization	24	18.75
Newspaper	4	3.13
Inform through village broadcasting tower	2	1.56
Use poster for transferring in community	1	0.78

* Multiple responses

Part III Adoption of Recommended Production Practices by Rubber Smallholders

Rubber production practices include rubber clone, planting, pruning, weed or disease control, fertilizers, tapping, and sheet-making.

The degree of adoption of all recommended production practices by rubber smallholders is shown in Table 26, revealing that none of the rubber smallholders adopted all rubber practices. Only 3 to 7 topics were adopted by all of rubber smallholders such as rubber clone, planting, and weed or disease control. For the adoption of the remaining practices 4 to 7 topics differed among rubber smallholders about pruning, fertilizers, tapping, and sheet-making (Table 25).

Rubber Clone

All of rubber smallholders seek information about rubber clone, studied about the suitable clone before planting and used of the recommended rubber clone.

Planting

All of rubber smallholders planted rubber seedling in the early rainy season. The size of hole was 50 x 50 x 50 centimeter and the space between trees was 3 x 7 meter (for the plain area) or 3 x 8 meter (for the sloping area).

Pruning

Rubber smallholders at 85.16 percent started pruning when the tree was 1 year old and stopped pruning when the tree was 3 years old at 51.56 percent while the rubber smallholders at 48.44 percent stopped it at 4-5 years old.

Weed or disease control

All rubber smallholders adopted the recommended weed or disease control. They removed the weed in their plantation for protection against rubber disease, as weed was the source of some diseases.

Fertilizers

Before tapping, there were 93.75 percent of rubber smallholders who used the 20-8-20 formula of fertilizers for their rubber trees. The rest used other formula for the trees. Almost rubber smallholders at 92.19 percent applied fertilizers at interval of 3 months. After tapping, 50.78 percent of rubber smallholders applied the 15-15-15 formula for their trees and the rest at 28.91 percent used other formula. There were 46.88 percent who applied fertilizers twice a year for their rubber plantation.

Tapping

Around 71.09 percent of rubber smallholders started to tap the rubber tree when it was 7 years old. Only 8.59 percent of rubber smallholders began to tap at less than or more than 7 years old. There were 75.00 percent who started to tap the trees at 150 centimeter from the ground. The rubber smallholders at 26.56 percent tapped the tree at 1 or 2 days and stopped for 1 day.

Sheet-making

For the rubber product, majority of rubber smallholders at 81.25 percent sold the rubber latex. Only 18.75 percent sold their product as rubber sheets.

Table 25 Distribution of adoption of recommended rubber practices by rubber smallholders

Rubber practice	(n = 128)			
	Adoption		Non-adoption	
	Number	Percent	Number	Percent
Rubber Clone				
1. Seek information about clone	128	100.00	0	0.00
2. Study about the suitable rubber clone for the area	128	100.00	0	0.00
3. Use the recommended clone	128	100.00	0	0.00

Table 25 (Continued)

Rubber practice	(n = 128)			
	Adoption		Non-adoption	
	Number	Percent	Number	Percent
Planting				
4. Planted in the early rainy season	128	100.00	0	0.00
5. Size of hole was 50 x 50 x 50 cm.	128	100.00	0	0.00
6. Distance of rubber tree was 3 x 7 m or 3 x 8 m	128	100.00	0	0.00
Pruning				
7. Start pruning the rubber tree when the tree was 1 year old	109	85.16	19	14.84
8. Stop the pruning when the tree was 3 years old	66	51.56	62	48.44
Weed or disease control				
9. Eradication of weed or disease in the plantation	128	100.00	0	0.00
Fertilizers				
10. Before tapping; apply the 20-8-20 formula fertilizers	120	93.75	8	6.25
11. Apply fertilizers every 3 months	118	92.19	10	7.81
12. After tapping; use the 15-15-15 formula*	65	50.78	37	28.91
13. Put twice a year after tapping*	60	46.88	42	32.81
Tapping*				
14. Started tapping at 7 years old	91	71.09	11	8.59
15. Tree height was 150 centimeter from the ground	96	75.00	6	4.69
16. Tapping 1day and 1 or 2 days interval	34	26.56	68	53.13

Table 25 (Continued)

Rubber practice	(n = 128)			
	Adoption		Non-adoption	
	Number	Percent	Number	Percent
Sheet-making				
17. Making sheet as the rubber product	24	18.75	104	81.25

* 25 rubber smallholders had not begun the tapping of the rubber tree at the time of data collection.

Part IV Hypotheses Testing

For the study of socio-economic characteristics, information source and communication channel of rubber smallholders were proceeded on the following hypotheses:

1. Socio-economic characteristics of rubber smallholders: sex, age, education, religion, labor, size of rubber plantation, income from rubber production, experience in rubber production, member of organization, and credit were related to information sources for rubber production practices.

The result of testing hypothesis between characteristics of rubber smallholders (sex, religion, and credit) and information sources (inside and outside community) by chi-square found that there was not different in receiving rubber production practices from information sources of rubber smallholders with different characteristics. The x^2 from analysis was less than the standard value, thus the hypothesis was rejected indicating that there was no relationship between sex, religion, and credit with all information sources inside and outside the community. The relationships between some characteristics of rubber smallholders: sex religion, and credit with information sources inside community are shown in Table 26. The relationship between those characteristics and information sources outside the community are shown in Table 27 and 28.

Table 26 Relationship between characteristics of rubber smallholders and information sources inside community.

Information sources inside community		Frequency of communication			Total	X ²	df	Sig.
		Never	Seldom	Often				
Relations								
<u>Sex</u>	Men	33 (44.00)	10 (13.33)	32 (42.67)	75	0.061	2	0.788
	Women	24 (45.28)	9 (16.98)	20 (37.74)	53			
<u>Religion</u>	Buddhism	43 (41.75)	16 (15.53)	44 (42.72)	103	0.114	2	0.437
	Islamic	14 (56.00)	3 (12.00)	8 (32.00)	25			
<u>Credit</u>	Dependency	22 (43.14)	7 (13.72)	22 (43.14)	51	0.043	2	0.887
	Independency	35 (45.46)	12 (15.58)	30 (38.96)	77			
Neighbors or friends								
<u>Sex</u>	Men	19 (25.33)	7 (9.33)	49 (65.34)	75	0.009	2	0.995
	Women	13 (24.53)	5 (9.43)	35 (66.04)	53			
<u>Religion</u>	Buddhism	23 (22.33)	10 (9.71)	70 (67.96)	103	0.125	2	0.367
	Islamic	9 (36.00)	2 (8.00)	14 (56.00)	25			
<u>Credit</u>	Dependency	9 (17.65)	7 (13.72)	35 (68.63)	51	0.169	2	0.16
	Independency	23 (29.87)	5 (6.49)	49 (63.64)	77			

Table 26 (Continued)

Information sources inside community		Frequency of communication			Total	X ²	df	Sig.
		Never	Seldom	Often				
Merchants								
<u>Sex</u>	Men	62 (82.67)	1 (1.33)	12 (16.00)	75	0.075	2	0.696
	Women	44 (83.02)	0 (0)	9 (16.98)	53			
<u>Religion</u>	Buddhism	86 (83.50)	1 (0.97)	16 (15.53)	103	0.064	2	0.772
	Islamic	20 (80.00)	0 (0)	5 (20.00)	25			
<u>Credit</u>	Dependency	41 (80.39)	1 (1.96)	9 (17.65)	51	0.114	2	0.438
	Independency	65 (84.42)	0 (0)	12 (15.58)	77			
Local leader								
<u>Sex</u>	Men	66 (88.00)	6 (8.00)	3 (4.00)	75	0.136	2	0.305
	Women	49 (92.45)	1 (1.89)	3 (5.66)	53			
<u>Religion</u>	Buddhism	93 (90.30)	5 (4.85)	5 (4.85)	103	0.056	2	0.816
	Islamic	22 (88.00)	2 (8.00)	1 (4.00)	25			
<u>Credit</u>	Dependency	45 (88.24)	3 (5.88)	3 (5.88)	51	0.049	2	0.857
	Independency	70 (90.91)	4 (5.19)	3 (3.90)	77			

* Significance level 0.05

** Significance level 0.01

Table 27 Relationship between characteristics of rubber smallholders and information sources outside community.

Information sources outside community	Frequency of communication			Total	X ²	df	Sig.	
	Never	Seldom	Often					
Merchants								
<u>Sex</u>	Men	69 (92.00)	5 (6.67)	1 (1.33)	75	0.081	2	0.655
	Women	48 (90.57)	3 (5.66)	2 (3.77)	53			
<u>Religion</u>	Buddhism	96 (93.20)	5 (4.86)	2 (1.94)	103	0.131	2	0.334
	Islamic	21 (84.00)	3 (12.00)	1 (4.00)	25			
<u>Credit</u>	Dependency	45 (88.24)	3 (5.88)	3 (5.88)	51	0.190	2	0.098
	Independency	72 (93.51)	5 (6.49)	0 (0)	77			
Rubber Replanting Aid Fund Officials								
<u>Sex</u>	Men	21 (28.00)	45 (60.00)	9 (12.00)	75	0.193	2	0.093
	Women	14 (26.41)	38 (71.70)	1 (1.89)	53			
<u>Religion</u>	Buddhism	29 (28.16)	65 (63.11)	9 (8.74)	103	0.086	2	0.622
	Islamic	6 (24.00)	18 (72.00)	1 (4.00)	25			
<u>Credit</u>	Dependency	11 (21.57)	38 (74.51)	2 (3.92)	51	0.175	2	0.142
	Independency	24 (31.17)	45 (58.44)	8 (10.39)	77			

Table 27 (Continued)

Information sources outside community	Frequency of communication			Total	X ²	df	Sig.	
	Never	Seldom	Often					
Government Officials								
<u>Sex</u>	Men	74 (98.67)	1 (1.33)	0 (0)	75	0.108	2	0.474
	Women	51 (96.22)	1 (1.89)	1 (1.89)	53			
<u>Religion</u>	Buddhism	100 (97.09)	2 (1.94)	1 (0.97)	103	0.076	2	0.689
	Islamic	25 (100.00)	0 (0)	0 (0)	25			
<u>Credit</u>	Dependency	51 (100.00)	0 (0)	0 (0)	51	0.126	2	0.362
	Independency	74 (96.10)	2 (2.60)	1 (1.30)	77			
Private sector employee								
<u>Sex</u>	Men	72 (96.00)	2 (2.67)	1 (1.33)	75	0.108	2	0.475
	Women	52 (98.11)	0 (0)	1 (1.89)	53			
<u>Religion</u>	Buddhism	99 (96.12)	2 (1.94)	2 (1.94)	103	0.088	2	0.606
	Islamic	25 (100.00)	0 (0)	0 (0)	25			
<u>Credit</u>	Dependency	50 (98.04)	1 (1.96)	0 (0)	51	0.105	2	0.491
	Independency	74 (96.10)	1 (1.30)	2 (2.60)	77			

* Significance level 0.05

** Significance level 0.01

Table 28 Relationship between characteristics of rubber smallholders and some information sources outside community.

Some information sources outside community		Frequency of communication		Total	X ²	df	Sig.
		Never	Seldom				
Agricultural Extension Officials							
<u>Sex</u>	Men	63 (84.00)	12 (16.00)	75	0.061	1	0.490
	Women	42 (79.25)	11 (20.75)	53			
<u>Religion</u>	Buddhism	82 (79.61)	21 (20.39)	103	0.128	1	0.148
	Islamic	23 (92.00)	2 (8.00)	25			
<u>Credit</u>	Dependency	40 (78.43)	11 (21.57)	51	0.076	1	0.388
	Independency	65 (84.42)	12 (15.58)	77			
Salesmen							
<u>Sex</u>	Men	75 (100.00)	0 (0)	75	0.106	1	0.232
	Women	52 (98.11)	1 (1.89)	53			
<u>Religion</u>	Buddhism	102 (99.03)	1 (0.97)	103	0.044	1	0.621
	Islamic	25 (100.00)	0 (0)	25			
<u>Credit</u>	Dependency	50 (98.00)	1 (2.00)	51	0.109	1	0.217
	Independency	77 (100.00)	0 (0)	77			

* Significance level 0.05

** Significance level 0.01

The result of testing hypothesis between characteristics of rubber smallholders: age, education, labor, size of rubber plantation, income from rubber production, experience in rubber production, and member of organization with information sources (inside and outside community) by Kendall's tau b correlation found that hypothesis was accepted in some characteristics of rubber smallholders and information sources.

The correlation analysis indicated that most of the relationships between characteristics of rubber smallholders with information sources inside the community were not statistically significant except size of rubber plantation with the relatives, neighbors and friends. Also there were significant relationships between experience in rubber production and the local leaders as the source of information.

Number of labor and size of rubber plantation were positively related with the merchant at 0.01 level but the annual income of rubber smallholders was positively correlated with the merchant and the agricultural extension officials at the 0.05 significance level.

Age was negatively correlated with the RRAFO and the EOPS at the 0.05 significance level.

Education was negatively correlated with the GO at the 0.05 significance level but was positively correlated with the EOPS at 0.01 significance level.

Experience in rubber production of rubber smallholders was positively correlated with the GO at the 0.05 significance level it was negatively correlated with the EOPS at the 0.01 significance level (Table 29).

Table 29 Relationship between characteristics of rubber smallholders and information sources

Variable	Age	Education	Number of labor	Size of rubber plantation	Income per year	Experience in rubber production	Member of organization
1. Inside the community							
- Relatives	-0.043	0.030	0.034	0.144*	0.082	-0.104	0.057
- Neighbor or friends	-0.086	0.077	0.060	0.157*	0.079	-0.122	0.050
- Merchants	-0.030	-0.097	0.115	0.093	-0.057	-0.050	0.038
- Local leaders	-0.111	0.017	0.100	0.085	0.107	-0.161*	0.131
2. Outside the community							
- Merchants	0.022	-0.047	0.194**	0.173**	0.136*	0.045	-0.039
- Agricultural extension Official	-0.029	-0.034	0.021	0.059	0.143*	-0.019	0.035
- Rubber Replanting Aid Fund Official	-0.121*	0.107	0.102	0.069	-0.083	-0.019	0.087
- Official of government	0.056	-0.143*	0.065	-0.064	-0.023	0.145*	-0.077
- Official of private sector	-0.137*	0.197**	-0.103	-0.041	-0.072	-0.226**	-0.064
- Salesman	0.048	-0.055	0.101	0.066	0.025	0.098	0.001

* Significance level 0.05

** Significance level 0.01

2. Characteristics of rubber smallholder: sex, age, education, religion, labor, size of rubber plantation, income from rubber production, experience in rubber production, member of organization, and credit were related to communication channel in rubber production practices.

In personal method of information transfer, there was no relationship between religion with all the personal methods, except for sex having relationship with phone conversation at 0.05. Only credit had relationship with visit at home or rubber plantation at 0.01 level. This meant that rubber smallholders who had different credit line had the difference on receiving rubber information from communication channel. The hypothesis was accepted for this variable (Table 30).

Table 30 Relationship between characteristics of rubber smallholders and personal method

Personal method		Frequency of communication			Total	X ²	df	Sig.
		Never	1-2 times per year	above 2 times per year				
Visit at office								
<u>Sex</u>	Men	37 (49.33)	14 (18.67)	24 (32.00)	75	0.053	2	0.834
	Women	29 (54.72)	9 (16.98)	15 (28.30)	53			
<u>Religion</u>	Buddhism	55 (53.40)	18 (17.47)	30 (29.13)	103	0.075	2	0.695
	Islamic	11 (44.00)	5 (20.00)	9 (36.00)	25			
<u>Credit</u>	Dependency	28 (54.90)	10 (19.61)	13 (25.49)	51	0.088	2	0.607
	Independency	38 (49.35)	13 (16.88)	26 (33.77)	77			

Table 30 (Continued)

Personal method		Frequency of communication			Total	X ²	df	Sig.
		Never	1-2 times per year	above 2 times per year				
Phone conversation								
<u>Sex</u>	Men	72 (96.00)	0 (0)	3 (4.00)	75	8.507	2	0.041*
	Women	50 (94.34)	3 (5.66)	0 (0)	53			
<u>Religion</u>	Buddhism	97 (94.18)	3 (2.91)	3 (2.91)	103	0.109	2	0.466
	Islamic	25 (100.00)	0 (0)	0 (0)	25			
<u>Credit</u>	Dependency	50 (98.04)	0 (0)	1 (1.96)	51	0.128	2	0.349
	Independency	72 (93.50)	3 (3.90)	2 (2.60)	77			
Visit at home or rubber plantation								
<u>Sex</u>	Men	48 (64.00)	14 (18.67)	13 (17.33)	75	0.111	2	0.452
	Women	39 (73.59)	6 (11.32)	8 (15.09)	53			
<u>Religion</u>	Buddhism	74 (71.85)	16 (15.53)	13 (12.62)	103	0.212	2	0.056
	Islamic	13 (52.00)	4 (16.00)	8 (32.00)	25			
<u>Credit</u>	Dependency	27 (52.94)	14 (27.45)	10 19.61	51	10.857	2	0.004**
	Independency	60 (77.92)	6 (7.79)	11 (14.29)	77			

* Significance level 0.05

** Significance level 0.01

In the group method, there was no relationship between the demographic characteristics of rubber smallholders and demonstration, meeting, training course, field trip, exhibition, and agricultural day festival. However, credit had relationship with field trip at 0.05 level of significance. Hypothesis was accepted between testing credit and field trip because X^2 from analysis was less than the standard value. This meant that rubber smallholders who had different credit standing had differences in receiving rubber information from field trip (Tables 31, 32, and 33).

Table 31 Relationship between characteristics of rubber smallholders and group method

Group method		Frequency of communication		Total	X^2	df	Sig
		Never	1-2 times per year				
Demonstration							
<u>Sex</u>	Men	71 (94.67)	4 (5.33)	75	0.006	1	0.936
	Women	50 (94.34)	3 (5.66)	53			
<u>Religion</u>	Buddhism	97 (94.17)	6 (5.83)	103	0.130	1	0.719
	Islamic	24 (96.00)	1 (4.00)	25			
<u>Credit</u>	Dependency	49 (96.08)	2 (3.92)	51	0.393	1	0.531
	Independency	72 (93.51)	5 (6.49)	77			

Table 31 (Continued)

Group method		Frequency of communication		Total	X ²	df	Sig
		Never	1-2 times per year				
Field trip							
<u>Sex</u>	Men	69 (92.00)	6 (8.00)	75	0.947	1	0.331
	Women	51 (96.23)	2 (3.77)	53			
<u>Religion</u>	Buddhism	97 (94.17)	6 (5.83)	103	0.162	1	0.687
	Islamic	23 (92.00)	2 (8.00)	25			
<u>Credit</u>	Dependency	45 (88.24)	6 (11.76)	51	4.400	1	0.036*
	Independency	75 (97.40)	2 (2.60)	77			
Exhibition							
<u>Sex</u>	Men	72 (96.00)	3 (4.00)	75	0.458	1	0.499
	Women	52 (98.11)	1 (1.89)	53			
<u>Religion</u>	Buddhism	99 (96.12)	4 (3.88)	103	1.002	1	0.317
	Islamic	25 (100.00)	0 (0)	25			
<u>Credit</u>	Dependency	50 (98.04)	1 (1.96)	51	0.380	1	0.538
	Independency	74 (96.10)	3 (3.90)	77			
Agricultural day festival							
<u>Sex</u>	Men	55 (73.33)	20 (26.67)	75	2.394	1	0.122
	Women	32 (60.38)	21 (39.52)	53			
<u>Religion</u>	Buddhism	69 (66.09)	34 (33.01)	103	0.232	1	0.630
	Islamic	18 (72.00)	7 (28.00)	25			
<u>Credit</u>	Dependency	33 (64.71)	18 (35.29)	51	0.415	1	0.520
	Independency	54 (70.13)	23 (29.87)	77			

* Significance level 0.05

** Significance level 0.01

Table 32 Relationship between characteristics of rubber smallholders and training course

Training course	Frequency of communication			Total	X ²	df	Sig.	
	Never	1-2 times per year	above 2 times per year					
<u>Sex</u>	Men	53 (70.67)	18 (24.00)	4 (5.33)	75	0.151	2	0.230
	Women	39 (73.58)	14 (26.42)	0 (0)				
<u>Religion</u>	Buddhism	71 (68.93)	29 (28.16)	3 (2.91)	103	0.148	2	0.245
	Islamic	21 (84.00)	3 (12.00)	1 (4.00)				
<u>Credit</u>	Dependency	37 (72.55)	13 (25.49)	1 (1.96)	51	0.055	2	0.826
	Independency	55 (71.43)	19 (24.68)	3 (3.89)				

* Significance level 0.05

** Significance level 0.01

Table 33 Relationship between characteristics of rubber smallholders and meeting

Meeting	Frequency of communication				Total	X ²	df	Sig.	
	Never	1-2 times per week	3-6 times per week	above 6 times per week					
<u>Sex</u>	Men	28 (37.33)	42 (56.00)	3 (4.00)	2 (2.67)	75	0.168	3	0.308
	Women	26 (49.06)	21 (39.62)	3 (5.66)	3 (5.66)	53			
<u>Religion</u>	Buddhism	42 (40.78)	52 (50.49)	6 (5.83)	3 (2.90)	103	0.158	3	0.360
	Islamic	12 (48.00)	11 (44.00)	0 (0)	2 (8.00)	25			
<u>Credit</u>	Dependency	16 (31.37)	28 (54.90)	4 (7.84)	3 (5.89)	51	0.208	3	0.135
	Independency	38 (49.35)	35 (44.45)	2 (2.60)	2 (2.60)	77			

*Significance level 0.05

**Significance level 0.01

In terms of the mass method, hypothesis on the relationship between sex with newspaper and religion with television because X² computed value was less than the standard value. This meant that rubber smallholders of different sex had the difference in receiving rubber information from newspaper and those who had different religion also had difference in receiving rubber information from television. Results also show that there was no relationship between sex, religion, and credit with printed materials, and radio, except to sex in relation to newspaper at the 0.05 level and religion in relation to television at the 0.01 significance level (Table 34 and 35).

Table 34 Relationship between characteristics of rubber smallholders and mass method

Mass method	Frequency of communication			Total	X ²	df	Sig.
	Never	1-4 times per week	above 4 times per week				
Newspaper							
<u>Sex</u>	Men	37 (49.34)	28 (37.33)	10 (13.33)	75	8.657	2 0.016*
	Women	39 (73.58)	12 (22.64)	2 (3.78)	53		
<u>Religion</u>	Buddhism	63 (61.16)	31 (30.09)	9 (8.75)	103	0.076	2 0.692
	Islamic	13 (52.00)	9 (36.00)	3 (12.00)	25		
<u>Credit</u>	Dependency	28 (54.90)	20 (39.21)	3 (5.89)	51	0.156	2 0.211
	Independency	48 (62.33)	20 (25.97)	9 (11.70)	77		
Printed material							
<u>Sex</u>	Men	57 (76.00)	18 (24.00)	0 (0)	75	0.188	2 0.104
	Women	46 (86.79)	6 (11.32)	1 (1.89)	53		
<u>Religion</u>	Buddhism	84 (81.55)	18 (17.48)	1 (0.97)	103	0.078	2 0.678
	Islamic	19 (76.00)	6 (24.00)	0 (0)	25		
<u>Credit</u>	Dependency	38 (74.50)	13 (25.50)	0 (0)	51	0.155	2 0.213
	Independency	65 (84.41)	11 (14.28)	1 (1.31)	77		

Table 34 (Continued)

Mass method		Frequency of communication			Total	X ²	df	Sig.
		Never	1-4 times per week	above 4 times per week				
Radio								
<u>Sex</u>	Men	40 (53.33)	13 (17.33)	22 (29.34)	75	0.113	2	0.439
	Women	34 (64.15)	6 (11.32)	13 (24.53)	53			
<u>Religion</u>	Buddhism	56 (54.37)	15 (14.56)	32 (31.07)	103	0.172	2	0.151
	Islamic	18 (72.00)	4 (16.00)	3 (12.00)	25			
<u>Credit</u>	Dependency	30 (58.82)	6 (11.76)	15 (29.42)	51	0.073	2	0.709
	Independency	44 (57.14)	13 (16.88)	20 (25.98)	77			
Television								
<u>Sex</u>	Men	5 (6.67)	5 (6.67)	65 (86.66)	75	0.091	2	0.586
	Women	2 (3.77)	2 (3.77)	49 (92.46)	53			
<u>Religion</u>	Buddhism	3 (2.91)	4 (3.88)	96 (93.21)	103	7.855	2	0.008 **
	Islamic	4 (16.00)	3 (12.00)	18 (72.00)	25			
<u>Credit</u>	Dependency	3 (5.88)	1 (1.96)	47 (92.16)	51	0.126	2	0.363
	Independency	4 (5.19)	6 (7.79)	67 (87.02)	77			

* Significance level 0.05

** Significance level 0.01

Table 35 Relationship between characteristics of rubber smallholders and broadcasting tower

Broadcasting tower		Frequency of communication				Total	X ²	df	Sig.
		Every day	1-5 times per week	1-2 times per week	1-4 times per year				
<u>Sex</u>	Men	6 (10.34)	39 (67.25)	7 (12.07)	6 (10.34)	58	0.183	3	0.377
	Women	7 (20.58)	17 (50.00)	5 (14.71)	5 (14.71)				
<u>Religion</u>	Buddhism	12 (17.14)	42 (60.00)	7 (10.00)	9 (12.86)	70	0.214	3	0.241
	Islamic	1 (4.55)	14 (63.64)	5 (22.72)	2 (9.09)				
<u>Credit</u>	Dependency	4 (10.26)	24 (61.54)	5 (12.82)	6 (15.38)	39	0.123	3	0.707
	Independency	9 (16.98)	32 (60.38)	7 (13.21)	5 (9.43)				

* Significance level 0.05

** Significance level 0.01

Hypothesis testing by Kendall's tau_b of correlation between variable show that hypothesis in some characteristics of rubber smallholders and communication channels were accepted.

The number of labor was positively significance related with visit to the office at 0.01level. Also there was positive significant relationship between size of rubber plantation with visit to the office at 0.05 level and visit at home or rubber plantation at 0.01 level but the experience in rubber production was negatively and significantly related with phone conversation at 0.05 significance level.

Age was negatively correlated with the agricultural day festival but education had positive relationship at 0.01 level. Number of labor had positive and significant association with the demonstration at 0.01. Experience in production of rubber smallholders was found to have negative significant correlation with the

demonstration at 0.05 and the agricultural day festival at 0.01 level of significance. Member of organization had positive and significant association with the training course, field trip, agricultural day festival at 0.05 level and meeting at the 0.01 significance level.

The relationship between age and newspaper was negatively significant at 0.05 level. Education was found to be positively significantly correlated with newspaper at 0.01 level, printed materials, and radio at the 0.05 significance level. Also there was positive significant correlation between size of rubber plantation with newspapers at 0.05 level and radio at 0.01 level. The relationship between the income per year was positively significantly correlated with newspaper at 0.01 and radio at 0.05 level. Members of organization had positive and significant relationship with newspaper at 0.05 level and printed materials at 0.01 significance level (Table 36).

Table 36 Relationship between characteristics of rubber smallholders and communication channels

Variable	Age	Education	Number of labor	Size of rubber plantation	Income per year	Experience in rubber production	Member of organization
1. Personal method							
- Visit at office	-0.020	-0.043	0.291**	0.155*	0.046	0.052	0.048
- Phone conversation	-0.025	-0.016	-0.068	0.008	-0.036	-0.148*	-0.005
- Visit at home or rubber plantation	0.029	-0.092	0.093	0.175**	-0.083	0.088	-0.100
2. Group method							
- Demonstration	0.009	-0.033	0.212**	0.105	0.050	-0.137*	0.135
- Meeting	0.007	-0.043	0.031	0.001	-0.008	-0.027	0.228**
- Training course	-0.005	0.055	0.021	0.041	-0.022	-0.013	0.198*

Table 36 (Continued)

Variable	Age	Education	Number of labor	Size of rubber plantation	Income per year	Experience in rubber production	Member of organization
2. Group method							
- Field trip	0.002	-0.002	0.001	-0.025	0.087	-0.046	0.177*
- Exhibition	-0.010	0.007	0.036	-0.027	-0.054	-0.091	0.141
- Agricultural Day							
Festival	-0.240**	0.257**	0.086	0.020	0.003	-0.309**	0.160*
3. Mass method							
- Newspaper	-0.149*	0.369**	0.051	0.152*	0.205**	-0.057	0.148*
- Printed							
materials	-0.090	0.168*	-0.055	-0.032	0.080	-0.058	0.322**
- Radio	-0.088	0.127*	0.073	0.179**	0.146*	-0.115	0.034
- Television	-0.087	0.026	-0.002	0.019	0.040	-0.038	-0.054
- Broadcasting							
tower	-0.016	0.053	0.152	-0.019	0.126	0.181	0.015

* Significance level 0.05

** Significance level 0.01

3. Information source: relatives, neighbor, friend, merchant inside and outside community, agricultural extension official (AEO), Rubber Replanting Aid Fund official (RRAFO), government official (GO), extension official of private sector (EOPS), salesman, and local leader were related to adoption of rubber production practices.

The results of hypothesis testing between information sources and adoption of rubber production practices by Kendall's tau_b found that hypothesis was accepted in some information sources and adoption of rubber production practices.

There was no relationship between relatives, merchant outside community, AEO, RRAFO, EOPS, and local leader with adoption of rubber production practices. Neighbor or friend was significantly related to tapping at 0.05 level. Also there was significant relationship between merchant inside the community with tapping at 0.01 and salesman with weed and disease control at 0.05 significance level (Table 37).

Table 37 Relationship between information sources and adoption rubber production practices.

Information sources	Adoption of rubber practices (X^2)						
	Clone	Planting	Pruning	Weed and disease control	Fertilization	Tapping	Sheet-making
- Relatives	n/a	n/a	0.194	0.306	n/a	0.321	0.229
-Neighbor / friend	n/a	n/a	0.201	0.334	n/a	0.443*	0.257
-Merchant inside community	n/a	n/a	0.176	0.153	n/a	0.367**	0.082
-Merchant outside community	n/a	n/a	0.112	0.234	n/a	0.202	0.159
- AEO	n/a	n/a	0.168	0.170	n/a	0.166	0.070
- RRAFO	n/a	n/a	0.220	0.176	n/a	0.268	0.236
- GO	n/a	n/a	0.097	0.064	n/a	0.513	0.189
- EOPS	n/a	n/a	0.097	0.064	n/a	0.513	0.189
- Salesman	n/a	n/a	0.174	3.954*	n/a	0.141	0.233
- Local leader	n/a	n/a	0.152	0.216	n/a	0.144	0.082

n/a Not available

* At significance level 0.05

** At significance level 0.01

4. Communication channel: personal, group, and mass method were related to adoption of rubber production practices.

The result of testing hypothesis between communication channels and adoption of rubber production practices by Kendall's tau_b found that hypothesis was accepted in some communication channels and adoption of rubber production practices.

In communication channel, there was no relationship between all personal and mass method with adoption of rubber production practices. For group method, Field trip was significance related with pruning at 0.05 level. Also there was significant relationship between agricultural day festival with sheet-making at 0.05 level (Table 38).

Table 38 Relationship between communication channels and adoption rubber production practices

Communication channels	Adoption of rubber practices (X^2)						
	Clone	Planting	Pruning	Weed and disease control	Fertilization	Tapping	Sheet-making
1. Personal method							
- Visit at office	n/a	n/a	0.147	0.088	n/a	0.181	0.048
- Phone conversation	n/a	n/a	0.042	0.092	n/a	0.126	0.120
- Visit at home or rubber plantation	n/a	n/a	0.087	0.092	n/a	0.236	0.078
2. Group method							
- Demonstration	n/a	n/a	1.434	1.854	n/a	0.453	0.420
- Meeting	n/a	n/a	0.235	0.195	n/a	0.273	0.230
- Training course	n/a	n/a	0.076	0.192	n/a	0.123	0.155

Table 38 (Continued)

Communication channels	Adoption of rubber practices (X ²)						
	Clone	Planting	Pruning	Weed and disease control	Fertilization	Tapping	Sheet-making
2. Group method							
- Field trip	n/a	n/a	6.785*	1.302	n/a	2.633	1.112
- Exhibition	n/a	n/a	0.435	0.056	n/a	0.000	0.953
- Agricultural Day Festival	n/a	n/a	0.630	2.048	n/a	0.006	4.311*
3. Mass method							
- Newspaper	n/a	n/a	0.137	0.132	n/a	0.176	0.087
- Printed materials	n/a	n/a	0.148	0.127	n/a	0.285	0.256
- Radio	n/a	n/a	0.116	0.201	n/a	0.239	0.248
- Television	n/a	n/a	0.119	0.250	n/a	0.201	0.112
- Broadcasting tower	n/a	n/a	0.483	0.253	n/a	0.483	0.308

n/a Not available

* At significance level 0.05

** At significance level 0.01

Part V The Communication Problems and Suggestion from Rubber Smallholders.

The study noted five important problems: undissemated information at 14.84 percent, lack of rubber information 9.38 percent, no time for information at 5.47 percent, lack of contact with official 3.13, and no interest in making contact with official at 1.56 percent. However, most of rubber smallholders did not expressed the communication problem in rubber information (Table 39).

Table 39 Communication problems of rubber smallholders

(n = 128)		
Communication problem*	Number	Percent
Information not transferred	19	14.84
Lack of rubber information	12	9.38
No time	7	5.47
Lack of contact with officer	4	3.13
No interest in official assistance	2	1.56
No problem	90	70.31

* Multiple responses

The rubber smallholders expected government to bear the major responsibility of solving these problems. They suggested their need to improve the rubber production: increase the meeting with the official at 24.22 percent, increase the distribution of rubber printed materials at 17.97 percent, increase information through various media and training course at 10.94 percent, transfer information through television about 7.81 percent, distribute information through broadcasting tower at 7.03 percent, setting up of broadcasting tower in the community and arrange field trip or demonstration in local area about 3.91 percent, and increase information through radio at 2.34 percent (Table 40).

Table 40 Suggestions from rubber smallholders regarding information transfer

(n = 128)		
Suggestion*	Number	Percent
More frequent meeting with official	31	24.22
Increase the distribution of the rubber printed materials	23	17.97
More frequent training course	14	10.94
More information through various media	14	10.94
More information through television	10	7.81

Table 40 (Continued)

(n = 128)		
Suggestion*	Number	Percent
Distribute information through broadcasting tower	9	7.03
Arrange field trip or demonstration in local area	5	3.91
Setting up broadcasting tower in the community	5	3.91
More information through radio	3	2.34

* Multiple responses

Discussion

Part I Socio-economic Characteristics of Rubber Smallholders

The socio-economic characteristics in this study included sex, age, education, religion, labor, size of rubber plantation, experience in rubber production, income from rubber production, membership in organization, credit, and household facilities.

Sex: More than half of the rubber smallholders at 58.59 percent were men and women at 41.41 percent. It was in congruity with Kongeiu (2005) who reported that most of rubber holders in Phattalung Province were men and the rest were women while Kaewlai (2002) reported that more than half of the rubber holder in Trang Province were also men. Siriprapa (2000) reported that 75.20 percent of rubber growers in Khon Kaen province were male and Prajanphol (2000) presented that the majority of para rubber growers farmers in Loei province were male. Kaewlai (2002) noted that more than half of rubber farmers in Namput sub-district, Muang district, Trang province were male and the rest were female while Kongeiu (2005) revealed that 66.50 percent of rubber farmers in Tamod district of Phattalung province were male and 33.50 percent of them were female. It was in contrast with Kwantong (2002) who mentioned that 58.10 percent of rubber smallholders in Maelarn district, Pattani province were female and the male constituted only 41.90 percent. The main reason was that activities in rubber production were laborious hard and used long

time, more suitable to men than women. Women had the responsibility of preparing food, taking care of children and other housework which need long time. Thus, there were a few women who could do the rubber practices.

Age: Rubber smallholders' ages ranged from 27 to 85 years with a mean of 51.88 years. The result further revealed that majority of the rubber smallholders or more than 80.00 percent were above 40 years old. The average age of the rubber smallholders in the study was higher than the mean age of the selected groups of rubber replanters studied by Innurags (2001) who found that mean age of rubber farmers in Narathiwat was 45.2 years. Kaewlai (2002) found that the mean age of the rubber replanters in Muang district of Trang province was 44.5 years, while Srisompot (2002) found that the mean age of the rubber replanters in Pattani province was 46.3 years. The rubber smallholders in the study were older than in other areas since the young generation of family members moved to other sector for livelihood. They did not want to work in the agricultural sector, preferring more comfortable way of life. The young generation of rubber smallholders thought that rubber plantation and rubber production was hard work for them and they moved to industrial sector. The rest of the labors in agricultural sector were the old men. They still continue because they were too old for other sectors and they did not want to change their lifestyle.

Education: The rubber smallholders included in the study had low educational attainment. More than half of the rubber smallholders at 64.85 percent had been educated at the elementary level, while 22.66 percent had gone to secondary school level. The result was similar to that of Phraiprayom (2000) who reported that the para rubber growers in Loei province had primary level of education while Khamkhot (2001) presented that rubber holders in Nong Khai Province completed primary school of education. Pichakul (2002) found that the owner and labour in Rattaphum district, Songkhla province finished elementary education. Kaewlai (2002) and Srisompot (2002) found that majority of the rubber holders in Trang and Pattani province had four years of formal education. Two main factors contributed to this. Most rubber smallholders came from poor families. The public schools were

also far away from their residences. Phothiwattutham (2003) presented that the rubber holders who received the assistance from the Rubber Replanting Aid Fund in southern and eastern Thailand were educated at Pratomsuksa 4 level. In the past, majority rubber smallholders had to help their parent in the rubber plantation and rubber production for livelihood when they were still young. The main labor in the past was family labor giving them no chance to have formal education. They needed the knowledge about rubber production more than the knowledge from school because rubber knowledge was important for them in their life. They thought that the formal education was not necessary, the primary school was enough for them.

Religion: Almost all rubber smallholders at 80.47 percent were Buddhists and the rest were Muslim. It was similar to Kongeiu (2005) who presented that 84.40 percent of rubber holders in Tamod district, Phattalung province were Buddhists and the rest at 15.6 percent were Muslim. Most of Thai populations were Buddhists. There were only three provinces in southern of Thailand, e.g., Narathiwat, Pattani, and Yala where Muslim population was greater than Buddhists.

Member of Household: The average household size of rubber smallholders was 4.51 persons per household. The number was the minimum at 1 person and the maximum at 10 persons per household. Around half of rubber smallholders at 56.25 percent had members in household less than the mean and the rest with member greater than the average. Prajanphol (2000) found that the para rubber growers in Loei Province had 4 members on the average in each household but Siriprapa (2000) revealed that the average number of member in household of rubber growers in Khon Kaen province were 5.35 persons. Kaewlai (2002) presented that the average number of member in household of rubber holders in Trang province was 4.5 persons per household while Kwantong (2002) reported that the mean average size of rubber household in Maelarn district, Pattani province was 4.78 persons. Kongeiu (2005) shown that the rubber farmers in Tamod district, Phattalung province had 4 – 6 members in each household. Household size in certain areas is quite small because the present rubber smallholders live as single families. They do not live together

with their old families or parents as they have separated from them once get married. This is because they think big families are quite expensive to maintain.

Size of Rubber Plantation: The average rubber plantation size was recorded at 14.51 rais per household. The lowest and highest sizes were 2 and 50 rais per household. More than half of the rubber smallholders at 67.19 percent had the size of rubber plantation of 15 rais or below. The average size of rubber plantation was smaller than the mean plantation size reported by Kongeiu (2005) and Kaewlai (2002) where the mean size of rubber plantation was 18.9 and 18.4 rais in Tamod district of Phattalung province and Muang district in Trang province. The mean size of rubber plantation in this study was lower than other area. The important reason that they did not possess large area of plantation site was that in the past they sold pieces of land to others especially to investors who came to buy land to set up factory. New village and land allocation projects that offered high buying price to the landowners were additional factors that influenced rubber farmers' decision. For another reason, those rubber smallholders needed money for their family spending, for example, tuition fee of their children, family accommodation stuff, houses for their children or family, or buying the another pieces of land that was necessary for their family in the future. Moreover, most of the rubber smallholders were near-senior people. They thought that having large area of plantation land would be difficult for them to manage and their children since they did not want to do this kind of job in the future. On the other hand, if the smallholders still wanted to continue their plan of holding wide plantation site area and they were getting older, they had to hire more outside labors and this would generate problems. For these reasons, those rubber smallholders decided to sell some part of their land to get money for savings or convert it into another forms of property.

Labor in Rubber production: Most of rubber smallholders at 74.22 percent used only labor in their own family. The average number was 1.72 persons per household, with the highest of 5 and the lowest of 1. There were only 10.94 percent who used only hired labor for their production. The highest number of employee was 4 persons and the lowest was 1. The mean of hired labor was 0.53 persons per

household. The average of total labor (family and non-family labor) were 2.26 persons. About 60.00 percent of rubber smallholders used 2 persons for their activity as the plantation were relatively small. Sangsai (1992) reported that the rubber smallholders in Satun province had family labours of 1-2 persons for rubber production. Prajanphol (2000) presented that the average family labour of para rubber growers in Muang district, Loei province were 3 persons while Kaewlai (2002) showed that the mean family labor of the rubber holders in Namput sub-district, Muang district, Trang province were 2.5 persons per household. Accordingly, labor use was classified into family and hired labor. Majority of rubber smallholders used family labor, husband and wife. Main activities for this labor were purchasing and carrying the clone to their plantation, pruning, tapping, collection of rubber latex, and sale of rubber product. Sometimes children assisted after school time in whatever work they could do to alleviate the burden of their parents in plantation work. A rubber smallholder can handle 7-10 rais of rubber plantation. For hired labor, they were used in planting and fertilizing. Some rubber farm owners hired this second type of labor to get rid of weed and rubber disease. They gave reasons of such doing that eliminating weed in rubber plantation had to be treated by spraying liquid chemical weed killer and if they did it by themselves, it would harm their health. In addition, such activity required quite large quantity of labor and time, so the hired labors helped them to avoid risk of chemical contamination from herbicide and also save their time and labor in family. However, there are problems in using hired labor. The labors those were responsible for such activity often dilute weed killer lower than standard formulation ratio in order to spray a certain amount of chemical to a wider range of area than usual at a particular time of investment. Weeds are killed but they regrow at short period of time. This forced smallholders to spend more money on buying herbicide and hiring labor for spraying. However, some smallholders used the hired labor for tapping and collection the latex since their rubber plantation was unproductive.

This kind of hiring labor for such activity found in a group of rubber smallholders who possessed rubber plantation area more than 30 rais and the return rate for the labors was could be compromised. For rubber smallholders who

possessed plantation area less of than 20 rais, they would apply their family contribution as priority when producing rubber products since hiring additional labor would increase their costs more than their revenue since one rubber smallholder could tap 7-10 rais within a day.

Most of the hired labors were from outside (not from within the same community where the rubber smallholders lived.), for example, from northeastern or northern of Thailand and from neighboring countries such as Burma, Laos, and Cambodia. Most of these outside labors were trained to have skills in tapping correctly in order to allow rubber trees to provide rubber latex until 25 to 30 years of tree age. Nevertheless, there were some problems in hiring this kind of labor to work within rubber production. Firstly, during rice cultivation season in northeastern and northern of Thailand, there was a lack of labors because those labors would stop working within rubber plantations and go back to their hometown to grow rice instead. Secondly, there was still a lack of skilled labors especially those who could tap rubber tree correctly and do not unintentionally harm rubber trees.

Experience in Rubber Production: The mean number of years of experience of smallholders in rubber production was 25.08 years. The shortest rubber production experience was 1 year and the longest was 58 years. The percentage were equal between those who had 18-26 years of experience and 27-35 years at 28.13 percent. However, the number of rubber smallholders who had the experience of 26 years or below and above 26 years were in narrow range. Siriprapa (2000) reported that some para rubber farmers in Khon Kaen province had the experience in rubber production for 1-2 years. Kongeiu (2005) found that a number of rubber holders in Tamod district, Phattalung province had more than 16 years of experience. Around 70 percent of rubber smallholders in this study had experience in rubber production of more than 17 years. They started the activities in rubber production when they were young (about 12-15 years old) and they were educated up to the primary level. Most of rubber smallholders began practicing rubber production activities since they were young children by following their parents or relatives into rubber plantation to help them collect rubber product for selling. Then as they grew up, they developed

themselves to be responsible for another tasks such as planting, pruning, weeding, fertilizing, and at last tapping (need practicing in order to avoid damaging rubber trees). These activities were the generated transferring of rubber knowledge from one generation down to another by using relationship of family members in teaching practical ways. The knowledge and skills were from real experiences and a lot of self-practice and experiment to find the best solutions for things those rubber smallholders had done wrongly.

Income from Rubber Production: Almost half of rubber smallholders at 45.31 percent earned income less than 100,000 baht per year and a half of rubber smallholders earned their income between 100,000-499,999 baht per year. Only 4.69 percent who earned from rubber production about 500,000 baht or more per year. The average income of rubber smallholder was 193,993.80 baht per year, with the lowest and the highest income of 18,000.00 and 2,700,000.00 baht per year. The mean income from rubber production of rubber smallholders was higher than that of rubber smallholders in Maelan district, Pattani province which was 26,283.70 baht per year per household (Kwantong, 2002) while Somboonsuke (2002) found that rubber smallholders in Rattaphum district, Na Mom district, and Cha Na district, Songkhla province was 48,827.71 baht per year. In addition, it was higher than the income of smallholders in Muang district, Trang province which was 92,107.08 baht per year as reported by Kaewlai (2002). The important reason for the high income of rubber smallholders in this study was the prices of all rubber products in 2005 were higher than the last years. Then the rubber smallholders earned higher income from rubber production. Rate of income that rubber smallholders would get was depended on area of plantation related to amount of products produced (from tapping). This means the wider the area a smallholder possessed, the more products they could obtain. And the rate of income also depended on the number of labors in tapping because if the rubber smallholders hired many labors, their returns would decrease though they possessed large plantation area. In this case, amount of income that a rubber smallholder obtained would be subtracted by returns for hired labors and this rate of labor returns was not equal in every rubber plantation in that it depended on compromise (Popular rates were 50:50, 60:40, 40:60, 55:45). In addition, other spending such as rubber

plantation maintenance, fertilizers, and herbicide would have to be made as informal agreement between the employer and employee of which party had to spend money on these things. Apart from this, one other factor that influenced rubber smallholders' income was market price of rubber product. If market price was high, the rubber smallholders would get more revenue and vice versa.

Membership of Organization: Most rubber smallholders at 71.88 percent were member of organizations such as group of rubber latex seller, Agricultural Co-operatives (Ag Co-op) and Bank for Agriculture and Agricultural Co-operatives (BAAC). There were 28.12 percent of rubber smallholders who were not member of any organization. They had many reasons for this situation such as unnecessary, dislike, no time, and unawareness. Similarly, Kongeiu (2005) found that large number of rubber holders in Tamod district, Phattalung province had affiliation with organizations. The rubber smallholders were formally organized in order to have capital for the plantation, increase the price of rubber latex, and facilitate exchange information with other persons. Some rubber smallholders in this study did not join of affiliate with any organization because they could operate their activity on their own. It was conceived that being a member was troublesome and waste of time. A small number of rubber smallholders expressed that they were unaware of any organization. Rubber smallholders who were not members of any groups or organization thought that it was not necessary for them to be members of groups or organization because, as their current living condition, they could rely on themselves and their family without help from outside parties. Some of them also added that they did not like to be members because they do not have time for the responsibilities and obligations as they did not have much time to attend in any activities of those groups or organizations. Moreover, there were many rubber smallholders who did not know about rubber groups or organizations, this was because they were not interested in receiving news and information about those groups and organizations. However, the important reason that some rubber smallholders were not members of groups or organizations because they think could depend on their themselves for their livelihood and not on others and everything had to be decided by them. That's why they did not see any benefit of being members of agricultural groups or organizations.

Credit for Rubber Smallholder: More than half of rubber smallholders at 60.16 percent claimed to have never used loans in their rubber production. Around 57.03 percent of rubber smallholders who did not use the credit because they had their own capital for the production, 3.13 percent of them said that it was unnecessary for them. Around one third of all used the credit from the financial institution. Major financial institution was the Bank for Agriculture and Agricultural Co-operatives (BAAC) and other financing institutes were used by a few rubber smallholders. Only small number of rubber farmers got credit from unauthorized institutes. They thought this type of credit source was easier to get because it usually came from their relatives. In addition, rubber smallholders used credit from the Rubber Replanting Aid Fund (RRAF) which provided capital and tools for rubber production. The loan was used in the major activity such as fertilizing, weed and disease control and rubber clone. In addition, each year as prices of these things increased but the rubber smallholders had not much savings, so they had to get some credit for their rubber production. Most of rubber smallholders did not used credit from the financial institution because they had enough capital for rubber production and somebody did not want to be in debt. It was contrast with the result of Kongeiu's study (2005), who presented that the majority rubber holders in Tamod district, Phattalung province used the credit from the financial institution. The Bank for Agriculture and Agricultural Co-operatives loaned the investment to rubber holders. However, the rest used credit from other financial institutions. They had no enough capital for their plantation although they were subsidized by RRAF. Their main financial institution was the government operated institution.

Household Facilities: Television was the most common media channel used by almost all rubber smallholders at 97.66 percent and 67.97 percent had radio in the household. The most common communication device of rubber smallholders was mobile telephone and telephone which were owned by 59.38 percent and 50.00 percent of the rubber smallholders, respectively. Two types of vehicle which was owned by most of rubber smallholders were motorcycle at 96.09 percent and 35.16 percent had pick-up car. Television and refrigerator were household appliances which were most necessary than others. If separate into types, we can see that channel of

getting important news and information for rubber smallholders was through televisions and radios which almost all families had. As prices of television sets and radio receivers decreased, the rubber smallholders could afford for them easily. They watched the news and entertainment programs on television more than any other programs when rubber smallholders finished their daily work. They can see the picture and hear the sound at the same time. It was easy to understand everything which was broadcasted through television. Refrigerator was used to preserve their food for their family because they can not buy the fresh food everyday. Their house and rubber plantation was quite far from the market in the town. They spend a long time going there. They usually bought plenty of foods during market and preserved them in the refrigerator. Almost all of rubber smallholders had motorcycles as a major vehicle of their family in transporting themselves and their rubber products from their plantation to points of selling. Motorcycles were famous among rubber smallholders now that motorcycles were easy to use and could go with them everywhere include in narrow paces and cluttered places. Motorcycle prices were still cheap comparing to other types of vehicle. Moreover, there was long term installment with low interest rate type of paying for motorcycle purchase that allowed smallholders to obtain it easily. An alternative vehicle for rubber smallholders was small trucks. Although small trucks were more expensive than motorcycle, there were major advantages. Firstly, trucks could contain large amount of products and trucks could go onto places like sloped paces and cluttered areas. Secondly, possessing a truck was easier than ever at present because truck dealers offered low or no deposit rate and also low rate of installments and interests. Cars were not popular among rubber smallholders because they get less benefits from cars compared to trucks. The facilities about communication were also necessary for most of rubber smallholders and, in this case, mobile phones were most widely used. Mobile phones were cheap and widely found in markets nowadays, two third of all rubber smallholders had a mobile phone for their own or family purposes. Rubber smallholders told that mobile phones were small, handy, and so easy to use that they could use it to communicate with other people or other parties to get news and information without going out of their house or rubber plantation.

Part II Information Sources and Communication Channels

Information Sources

Neighbors or friends were the main source and relatives were the second source inside the community because they lived in the same community and the houses were located with in a short distance. They were near each other that they could meet and discuss anytime. It was easy to change information and opinion about rubber production. Almost all rubber smallholders receive information from neighbors or friends at 75.00 percent. About a half of rubber smallholders received the rubber production information from their relatives. At 17.19 percent of rubber smallholders got the rubber production information from the merchant inside the community. Around 10.16 percent of rubber smallholders received the rubber production information from local leaders.

The Rubber Replanting Aid Fund official was the main source outside the community and there were 72.66 percent of rubber smallholders who received the information from this source. The other source was the agricultural extension official and there were 17.97 percent of rubber smallholders who mentioned him as a source of information.

Information source inside the community and topic of rubber information

Information source inside the community in this study included the various information sources inside the community or village of rubber smallholders such as neighbors or friends, relatives, and local leaders. The result showed the frequency of communication of rubber smallholders with source inside the community. For the topic of rubber information, the rubber smallholders received much rubber information from source inside the community. Marketing information was transferred to the rubber smallholders more than other topics from these sources, followed by fertilizers, weed and disease control, and rubber clone.

Neighbor: There were 50.78 percent of rubber smallholders who contacted with their neighbors everyday. They lived in the same village where they met at the time they sell their products and transmit information about rubber production. The most common rubber information from this source was marketing, followed by fertilizers, weed or disease control, rubber clone, tapping, planting, and sheet-making. Neighbors were expected to be mentioned more frequently than other sources by virtue of familistic *gemeinschaft* characteristics of the rubber smallholder community. The persons outside the family such as neighbors or friends, could also provide information. The kinship groups and the friendship and neighborhood groups tended to merge in rural Thailand. They were important communicators of knowledge, attitude, belief, values, and behavior. We could easily observe the process in operation in the rural, especially in the morning when they sold the product or early evening when they relax, sit together in small groups at the –tea house in the village and discussed the day happenings. Similarly, Karnjanarungsie (1977) conducted research on some factors affecting the adoption of new improved varieties of rice among farmers, Makok sub-district, Pasang district, Lamphun province. Results showed that most of farmers were informed of new improved varieties by neighbors. Allen (1985) found that a greater proportion of wives of farmers used interpersonal information sources, such as friends and neighbor and Uddin (1988) in his study found that the information from neighbor was significantly associated with productivity. In addition, Padmanuja (1996) studied information acquisition by tribe hilltribe farmers through media in Ban Huay Nam Dang, Kued Chang sub-district, Maetang district, Chiangmai province. The most understood media by the farmers were neighbors while Likitruengsilp (2002) found that the agricultural information exposure of staffs under pastoral training center of Bangkok Archdiocese in Sampran district, Nakornpathom province was mainly based on the agricultural information perception from their friends and colleagues. Furthermore, Kawntong (2002) found that the rubber smallholders in Maelarn district, Pattani province received information from neighbor more than other sources.

Relatives: The persons next to the family members and friends were the relatives. Around 31.25 percent of rubber smallholders contacted with the relative

everyday because their houses were adjacent to each other in the village. They could visit and information is transferred from one to the others all time. The important information from relatives was marketing. The next topic was fertilizers and weed and disease control. The relatives were the important source for rubber smallholder because the kinship groups and the friendship tended to merge in rural areas. They were important communicators of attitude, beliefs, knowledge, behavior, and opinion in daily living. The frequent social contact between an individual and other members serve varied purposes. They might include recreation or exchange of views on personal, social, and business. According to Allen (1985), a greater proportion of wives of farmers used interpersonal information sources, such as family.

Phothi wattuthum (1993) mentioned that the rubber holders in southern Thailand received a great deal of the high level tapping system information from their relatives. In the same way, Likitruengsilp (2002) found that the agricultural information exposure of staff under pastoral training center of Bangkok Archdiocese in Sampran district, Nakornpathom province was mainly based on the agricultural information perception from relatives and Pichakul (2002) reported that the only 6.67 percent of the owners of rubber plantation in Rattaphum district, Songkhla province received information about rubber production from relatives while Kwantong (2002) found that more than half of rubber smallholders in Maelarn district, Pattani province received rubber information from relatives.

Merchant: Rubber smallholders about 17.19 percent communicated with merchant inside their community. Most merchants in the community were selling fertilizers for rubber plantation that rubber smallholders got this topic more than others. However, some merchants sold varied products for rubber production such as herbicide and equipment for rubber production that rubber smallholders could receive rubber information about these topics from this source. Another information topic which rubber smallholders sought from merchant was marketing because some merchants inside the community were the buyers of rubber products (rubber latex and rubber sheet). Similarly, Kongeiu (2005) found that large number of rubber holders in Tamod district, Phattalung province received information about fertilizers for rubber production from the merchant inside the community. In the same, Kwantong

(2002) also found that more than half of rubber smallholders in Maelarn district, Pattani province received the rubber information from merchants who bought rubber products and this merchant was the important information source for them.

Local leader: Rubber smallholders contacted this source everyday at 2.34 percent while rubber smallholders who seldom contacted (once in 2-3 months and once a year) with source were in 3.91 percent. The rubber smallholders received information from local leader about fertilizers, weed and disease control, and marketing. The next frequent information was rubber clone, planting, pruning, tapping, and sheet-making. Local leader was the headman of the community and he was also the spokesman for the community. He was the most influential person in the community. He was expected to play an important role as communicator of information. The data, however, did not confirm this expectation. A relatively small percent of the rubber smallholders in this area has mentioned the local leader as a source of rubber information. The findings of this study indicate that the local leader did not give information to rubber smallholders. It differed from Karnjanarungsie (1977) who conducted research on some factors affecting the adoption of new improved varieties of rice among farmers, Makok sub-district, Pasang district, Lamphun province. Results showed that most of farmers were informed of new improved varieties by local leaders and Padmanuja (1996) studied information acquisition by tribe hill farmers through media in Ban Huay Nam Dang, Kued Chang sub-district, Maetang district, Chiangmai province. The most understood media by the farmers were village headman while Somboonsuke (2002) found that local leader in the community was the main source of information for rubber smallholders in Songkhla province.

The most important source of information of rubber smallholders was neighbors and the next important ones were their relatives. Since the rubber smallholders and those sources of information lived within the same community, distances were not an obstacle of them to exchange information about rubber. Moreover, close relationship among them was another factor that supported flow of information. When a rubber smallholder worked in his or her plantation (fertilizing,

pruning, tapping, collecting product) or when he or she came to point of selling to sell products, they usually met and talked to their neighbors in that they had houses or plantation sites next to each other. Neighbors and friends, consequently, were the most important sources of information for a particular rubber smallholder. Distance was a major barrier between a smallholder and his/her relatives because when their relatives were married, they usually moved to another community and came back only when there was a festival (like one hold by monks in community).

In addition to plantation site factor, most of rubber smallholders and their relatives possessed small pieces of land for rubber plantation in different places although they got lands from their same parents (Most of older smallholders would divided their land into pieces and gave to their children but usually land was not a large one; there was pieces located in different places around). After they had land for planting rubber, they would establish their own houses near by their rubber plantations because it would be convenient for them in doing rubber production activities and their brothers and sisters did the same and since the rubber plantations were not in the same area that rubber smallholders themselves and their relatives usually are not living in the same community.

Merchant was another information source for rubber smallholders because they could get many topics from this source. In addition, the merchant lived in the same or nearby community with rubber smallholders and then it was easy for transferring information together. The merchant could get much information from anywhere, they met a lot of people daily and those people were the sources of information for merchant. Rubber smallholders could seek information for them from this source.

About local leader or community leader, although the leader lived in the same community of rubber smallholders, their houses were located far away from each other therefore it was difficult for them to meet everyday. Moreover, most of the local leaders were always formally assigned by units or organizations and these leaders usually had meetings outside the community in topics both related and not

related to rubber production and rubber smallholders sometimes had to make an appointment to meet the leader in advance if they wanted to discuss something about rubber production. This did not support relationships between the community leader and rubber smallholders, so informal communication among rubber smallholders who had land next to each other would be more effective in exchanging rubber production information. The other factor that did not encourage the community leader as a source of news and information was the effectiveness of announcement. Some rubber smallholders indicated that they did not know about rubber production news from the community leader but from their neighbors, friends, and relatives instead. These were reasons why the community leader was not a primary information source.

Information source outside the community and topic of rubber practices

Information source outside the community in this study refer to the various information sources living outside the community or village of rubber smallholders namely: the Rubber Replanting Aid Fund Official (RRAFO), followed by the agricultural extension official (AEO), extension officials of private sector (EOPS), government official (GO), merchant, and salesmen.

The Rubber Replanting Aid Fund Official (RRAFO): The rubber smallholders at 46.09 percent seldom contacted with RRAFO such as 2-3 months per time or once in a year. Fertilizers issues were presented to the rubber smallholders more than other topics. Weed and disease control was shown to be the second topic by RRAFO to smallholders. Other topics were planting, rubber clone, marketing, pruning, tapping, and sheet-making. The RRAFO was an extension agent in charge of rubber extension work in a block. They were expected to have contact with most of the rubber holders in his work area. They ranked the first in the list of information source outside the community. However, the rubber smallholders seldom met RRAFO because the officials had to be responsible for large number of rubber smallholders. It was not possible for them to contact every individual living in their area. Siriprapa (2000) revealed that the majority of the rubber growers in Khon Kaen province received advices through extension advisors from the Rubber Replanting

Aid Fund workers. Prajanphol (2000) showed that the RRAFOs were the source of the necessary information for the rubber holders in Loei province, too. Pichakul (2002) reported the important information sources about rubber planting in Rattaphum district, Songkhla province was the RRAFO while Kwantong (2002) presented that rubber smallholders in Maelarn district, Pattani province scarcely received rubber information from this source.

The Agricultural Extension official (AEO): The frequency of meeting differed such as once a month, 2-3 months, or once a year. However, there were a few rubber smallholders who contacted with AEO was more because of the responsibility of AEO related to crop other than rubber. The fertilizers were the most common information topic provided by AEO. Topic of rubber clone and planting were of equal percentage from rubber smallholders at 10.16 percent at the same time more than half of rubber smallholders about 9.38 percent received information on weed and disease control from AEO. The AEO was the second most important information source from outside the community. A few rubber smallholders received rubber production information from this source because the responsibility of AEO was not specific only for the rubber. Hence they could not give the detail of rubber production to the rubber smallholders. In addition, the frequent contact between rubber smallholders and AEO were shown over a longer time period than RRAFO. However, the most common information given to rubber smallholders was on fertilizer, which was similar to that provided by RRAFO. In the same way, Brohmsubha (1984) studied farmers' adoption of cropping systems in Sukhothai Groundwater Project Zone 2, Srinakorn district, Sukhothai province. He reported about the source of agricultural information that the farmers in the project received most agricultural information from agricultural extension worker and cooperative extension worker while Rajabuthra (1991) conducted communication behavior concerning home economics activities of the farm women group leaders in Chaiyaphum province. Result showed that in terms of knowledge, farm women group leaders received home economic information from home economic agents and agricultural extension agents. Furthermore, Pichakul (2002) showed that around 10 percent of smallholders received rubber information from the AEO and Kwantong

(2002) found that rubber information from the AEO to rubber smallholders in Pattani was scant.

Merchant: Another one of information source of rubber smallholders outside community was merchant. Although rubber smallholders seldom contacted with merchant but they still got rubber information about fertilizers, marketing, weed or disease control, and planting. Most merchants were the fertilizers dealer and then fertilizers were the most topic which was transferred to rubber smallholders. They got information from this source when they went to buy something for rubber production such as fertilizers, pesticides, herbicide, etc. Some rubber smallholders went to visit the merchant who was liked and talk together about all information including rubber information too. In the same with Kongeiu (2005) found that large number of rubber holders in Tamod district, Phattalung province received information about fertilizers for rubber production from the merchant inside the community. Further more, Kwantong (2002) found that more than half of rubber smallholders in Maelarn district, Pattani province received rubber information from merchant who bought rubber product and they mentioned that the merchant was the important information source for them.

The extension official of private sector (EOPS): There were a few rubber smallholders who received information from EOPS and the frequency of contact was low. Only 2 topics, e.g., were fertilizers and marketing were transferred to the rubber smallholders by this source. A small number of rubber smallholders received the rubber information from EOPS because the worker seldom visited the community. A large number of EOPS came from the fertilizers company and then their purpose was selling the fertilizers. At the present, rubber smallholders preferred to buy fertilizers from the merchant in the community or the shop in the town in preference to buying from the company. The EOPS had been introduced for to the community a long time. Rajabuthra (1991) conducted communication behavior concerning home economics activities of the farm women group leaders in Chaiyaphum province. Results showed that in terms of knowledge, farm women group leaders received home economics information from other agency personnel.

The government official (GO): There were only 3 rubber smallholders who received information from this source. It was a small number and the frequency of contact was uncertain. The important information topic given by the government officials were the variety, fertilizers, and weed and disease control. It was not different from the extension worker of private sector because there were a few rubber smallholders who received rubber information from the government official. Those officials came from many government agencies such as BAAC, Rubber RRIT, and Rubber Market Center. They had parts of their work related to the rubber product. They help the rubber smallholders regarding some rubber practices information. Likewise Prajanphol (2000) reported that the government agencies were the best source of knowledge for rubber holders in Muang district, Loei province and Tucker and Napier (2002) showed that preferred sources and channels of soil and water conservation among farmers in three mid-western US watersheds that the three most frequently used sources for conservation information across the three watersheds included a mix of agencies and agribusiness organization: Farm Service Agency and Natural Resources Conservation Service.

Salesman: The least important source from outside the community of rubber smallholders was salesman. There was only one rubber smallholder who received information once a year from this source. Other rubber smallholders had never contacted salesman that he was not important information source for smallholders. The information from salesman was least important when compared with other sources outside the community. There was only one topic of information given to rubber smallholders by the salesman and that is about fertilizers. Rubber smallholders received the least information from this source because salesman was unnecessary for the rubber smallholder. In the past, salesman supplied fertilizers to the rubber smallholders directly but fertilizers were subsidized by RRAF at present. The rubber smallholders did not buy fertilizers directly from salesman, as such salesman changed his target that of the merchant in the community rather than the rubber smallholders. It was in contrast with Gongpat (1994) who conducted a study on media factors affecting grape growers performance in using agro-pesticide, Damnoen Saduak district, Ratchaburi province. Results indicated that grape growers were exposed to

agro-pesticide sellers while Tucker and Napier (2002) showed that the preferred sources and channels of soil and water conservation among farmers in three midwestern US watersheds for conservation information across the three watersheds included a mix of agencies and agribusiness organization: agri-chemical dealer.

The persons who lived in the same community with rubber smallholders was still the important information source especially neighbor or friend, relative, and local leader. They could contact together all time and then it was easy for transferring information to each other. At the same time, the persons outside of the community of rubber smallholders from the government sector and private sector could be the source of information to them. The rubber smallholders would receive the formal information from these persons. They could take information which was modern, useful, correct, and accurate to rubber smallholders. Then they would be the connecting agent between information from other source and the rubber smallholders. In that way, the person might be a source of consequence in the dissemination of information. And then the transferring information can be enhanced for effective communication if the personal sources had developed skills for communication.

Since rubber smallholders had to get assistance from RRAFO, the most important outside source of information was from RRAFO. Rubber smallholders often met and talked to the RRAFO rather than to other institutes or dealers who sometimes came to talk with those rubber smallholders.

Agricultural support authorities were also another source of information but this source was effective among rubber smallholders who had talked to and built both informal and formal relationship with them for long time and some rubber smallholders knew these authorities through the recommendation of rubber holders who were not smallholders. Some agricultural support authorities could well provide information about rubber production to rubber smallholders because they also grew rubber trees as their part time job. Other authorities from other units both of government and private sector including salespersons were sources of information that provide the least amount of information to rubber smallholders. These people

could not provide the right and related information because their job responsibilities were not directly about rubber production.

Communication Channels

Rubber smallholders received rubber production information through mass method in preference to other methods. The major media was television and broadcasting tower. Meeting was an important channel of group method and office visit was the main channel of personal method.

Colis (1982) observed that traditional strategies of extension such as a combination of meetings with extension technicians, farm and home visits, and farm classes and demonstrations gained resulted in the increase of rice production and net farm earnings.

Personal method and rubber information

The personal method in the study shows the method or channel of transferring rubber production information from information sources to individual smallholder namely; e.g., office visit, farm and home visit, and phone consultation.

Office visit: The RRAFO was the important persons who were contacted by rubber smallholders for this method. The frequency of contact by a half of rubber smallholders were 3 times per year. Most common topic of importance to rubber information included fertilizers, weed and disease control. The least was tapping practice. The rubber smallholders rarely visited the office because it was far from their house or rubber plantation. Smallholders finished the work in rubber plantation at 10.00 – 11.00 a.m. after that they had lunch and take rest in the afternoon. Visit at office was not convenient for the rubber smallholders, then they did not favor this method. Although almost half of rubber smallholders contacted the information source by this method but the frequency of contact was less than 4 times per year. They visited the office only when it became necessary.

Home and rubber plantation visit: Most of the officials who visited the rubber smallholders were the RRAFO. The frequency of visiting was between 1-3 times per year. The fertilizers were the major topic of rubber production which was discussed together. The next topic was weed and disease control and planting. Home and rubber plantation visit was used by RRAFO more than other sources. However, a small number of rubber smallholders who met the official by this method a few times in a year. The reason was that the official had to be responsible for a lot of clients in each area and this method need a long time per smallholder in each visit. Furthermore, they could not meet all smallholders at the same time. In the same way, Escalada (1985) reported that learning strategies based on farmer's needs and use of media to aid the learning situation was effective in terms of learning scores obtained by the farmers. This approach used staggered farmers' classes on rice production complemented by periodic farm visits. Likewise, Phraiprayom (2000) found that the rubber holders in Loei province received additional information on pararubber from visits by government officials. In contrast, Khamkhot (2001) found that rubber plantation owners in Nong Khai province lacked the knowledge due to infrequent visited by the officials.

Phone conversation: The rubber smallholders seldom contacted the information source by phone. The frequency of this method was a few times per year. However, the RRAFO was the main source for this channel. The rubber smallholders who used this method received information on fertilizers more than other information. Other information included planting, weed and disease control and marketing. Phone conversation was the channel which was used by small number of rubber smallholders. The smallholder seldom used this channel a few times a year. It was not convenient for them because they had to contact the official during the office hours (08.30 a.m. – 04.30 p.m.), at this time for the smallholder had not yet finished their activity of rubber production and they relaxed in the afternoon. In addition, sometimes they did not communicate with the official because they were on duty outside the office. In other words, telephone call could not provide insight into the problems faced by the smallholder. The suggestion over the phone could not help solve the problems.

Group method and rubber information

The group method in the study refers to the method or channel of transferring rubber production information from information sources to group of smallholder namely; meeting, the agricultural day festival, training course, demonstration, field trip, exhibition, and video presentation.

Meeting: RRAF transferred information once or twice from the agency to rubber smallholders more than other organization. The others were the Rubber latex seller group (RLSG), Office of Agricultural Extension (OAE), Rubber Research Institute of Thailand (RRIT), Agricultural Co-operatives (Ag Co-op), and local leader. The most common information from meeting was about fertilizers. The next was weed and disease control, planting, rubber clone, marketing, tapping, pruning and sheet-making.

RRAFO used in the meeting for transferring rubber information to rubber smallholders more than other sources. Meeting was useful in communicating information to a large number of people in a short time. It also provided an opportunity for the rubber smallholders to exchange views and seek clarification of messages. It was, therefore, evident that meetings were useful channels of communication in the rubber production practices. In addition, Escalada (1985) reported that learning strategies based on farmer's needs and use of media to aid the learning situation was effective in terms of learning scores obtained by the farmers. This approach used staggered farmers' classes on rice production complemented by discussions, informal talks between subject matter specialist and farmers. Similarly, Padmanuja (1996) studied information acquisition by hill tribe farmers through media in Ban Huay Nam Dang, Kued Chang sub-district, Maetang district, Chiangmai province. The most understood media by the farmers and the highest level of suitability were meeting. Likitruengsilp (2002) found that the agricultural information exposure of staffs under pastoral training center of Bangkok Archdiocese in Sampran district, Nakornpathom province was mainly based on the agricultural information perception from meeting. It was contrast with Kaewlai (2002) who

presented that rubber holders in Namput sub-district, Muang district, Trang province that never received rubber information from meeting method.

Agricultural day festival: This activity was used by Prince of Songkla University (PSU) more than other organization but the frequency of this activity was once a year. The rubber smallholders who went to the agricultural day festival received the main topic of rubber in rubber clone, fertilizers, weed or disease control and tapping. In the agricultural day festival, it presented many items which were related to the agriculture such as technologies, knowledge, or result of research, etc. There were many activities in the agricultural day festival, for example, demonstration, lecture, meeting, seminar, indoor and outdoor exhibition, or workshop. The rubber smallholder who joined this channel is only one-third of all rubber smallholders because the place of agricultural day festival was far from their community. Anyway, agricultural day festival would be held only once a year due to high costs such as cost of labors and long time preparation. Other smallholders feel that they spent the money for travel or vehicle to the place, food, and some goods. They thought that it was unnecessary for their life, they could seek the agricultural information from other channels.

Training course: RRAF arranged training course for rubber smallholders more than other organization. The average frequency was 1-2 times per year. The most common information from training course were fertilizers, followed by planting, weed or disease control, rubber clone, tapping, marketing, pruning, and sheet-making. Training course was another channel which was used to transfer rubber information to rubber smallholder in Hat Yai district, Songkhla province. However, most rubber smallholders were not trained in rubber production practices. They reported that this activity was not organized in the community last year. The next reason was no time for this and others were not interested. Most of training courses were held by the organizations in Hat Yai district and some courses last for many days. It was not convenient for the smallholders to join those training courses. Then training course which was hold and announced in the community could be useful for all more than other places. Prajanphol (2000) mentioned that the rubber holders were trained by the

agricultural extension workers as well as by the Rubber Replanting Aid Fund workers. Siriprapa (2000) reported that the majority of the rubber growers in Khon Khan province received the advices from the Rubber Replanting Aid Fund workers through training method. It was in congruity with the result of this study but it was different from the result reported by Kaewlai (2002) who showed that rubber holders in Namput sub-district, Muang district, Trang province never received rubber production information through training course.

For other activities in group method such as demonstration, field trip, and exhibition were used a few times, they were not popular in transferring information for information source and rubber smallholders in the current study.

Mass method and rubber information

The mass method in the study referred to the method of transferring rubber production information from information sources to mass of smallholders such as television, radio, newspaper, printed material, and broadcasting tower.

Television: Most rubber smallholders (around 89.06 percent) watched television everyday and the rest watched sometimes in a week. They received the rubber information from television. The most common information was marketing and the price of rubber products, other topics were fertilizers, planting and weed or disease control, while the rest was accessed by the target in small numbers. Two-thirds of rubber smallholders received the rubber information from television because it was the basic household facility of most rubber smallholders. Rajabuthra (1991) conducted communication behavior concerning home economics activities of the farm women group leaders in Chaiyaphum province. Results showed that in terms of knowledge, farm women group leaders received the home economic information from television. According to Gongpat (1994) who conducted a study on media factors affecting grape growers performance in using agro-pesticide, Damnoen Saduak district, Ratchaburi province. Results indicated that grape growers were exposed to television while Likitruengsilp (2002) found that the agricultural information

exposure of staffs under Pastoral Training Center of Bangkok Archdiocese in Sampran district, Nakornpathom province was mainly based on the agricultural information perception from television. It was similar with the result of Kwantong (2002) who reported that rubber smallholders in Maelarn district, Pattani province received the most common rubber information from television and Somboonsuke (2002) showed that television was the main channel of information for the rubber smallholders in Rattaphum, Namom, and Chana, Songkhla province. Although they watched the entertainment programe more than other programes but the rubber smallholders received rubber information from the news request and the most common topic was marketing since the rubber product prices were reported in the local television programe. They watched television after they finished their job in a day and it was the time for news section that provide rubber information. However, the rubber production practices were presented the least on television programe. Most rubber smallholders could not find the rubber production practices information from television.

Radio: Around 27.34 percent of the rubber smallholders listened to radio everyday and around 14.85 percent of rubber smallholders listened to it sometime in week. The rubber smallholders received rubber information from radio in the same way as the television, they received information about the price of rubber product more than other topics. They were given information on other topics in a few times. Radio played a role in communication of rubber information but it was not as much as television. Furthermore, Kwantong (2002) reported that the rubber smallholders received the rubber information from radio less than television. Due to the reason, the smallholders watched television more than listen to radio. They could see the picture and hear the voice from television at the same time but they only hear the voice from the radio. So radio was uninteresting to them. It was the same for the programme, they listened to the entertainment radio programe more than others. They had access to less the least rubber information through this channel. In contrast, Brohmsubha (1984) studied farmers' adoption of cropping systems in Sukhothai Groundwater Project Zone 2, Srinakorn district, Sukhothai province. He reported that mass media from which the farmer received the much agricultural information was radio.

Similarly, Arayangkura (1985) studied farmers' adoption of new technology in broadcasting of pregerminated wet rice grain in Bung Kham Phroi sub-district, Lam Luk Ka district, Pathum Thaneer province. The result showed that communication channel through which most of farmers got the technical knowledge by their own experiences and from the radio information while Rajabuthra (1991) conducted communication behavior concerning home economics activities of the farm women group leaders in Chaiyaphum province and Padmanuja (1996) studied information acquisition by hill tribe farmers through media in Ban Huay Nam Dang, Kued Chang sub-district, Maetang district, Chiangmai province. The most preferred media by the farmers was radio. Result showed that in terms of knowledge, farm women group leaders received the home economics information from radio. According to Likitruengsilp (2002) who found that the agricultural information exposure of staffs under pastoral training center of Bangkok Archdiocese in Sampran district, Nakornpathom province was mainly based on the agricultural information perception from radio.

Newspaper: Some rubber smallholders read newspaper regularly. The rubber smallholders at 59.36 percent did not read newspaper. The main reason of them was the problem of eyesight as the average age was 51.88 years. Another reason was they had no newspaper in their house and community, they thought that newspaper was lavish for them. Furthermore, they had low education and then reading was difficult for them too. Most of newspaper which gave information on rubber production was daily newspaper such as Thairat, Dailynews and price of rubber products were reported more than other topic of rubber information. The next was fertilizers, planting and weed or disease control. Other topics provided little information. Some rubber smallholders were advantaged by rubber information in newspaper but someone disagreed with this. They suggested that newspaper had to provide more information on rubber production than what is available at the present. Newspaper was read by less than half of rubber smallholders because majority was old. They could not read small letters in the newspaper and they had low educational level, so they were not smooth for reading. In addition they told that newspaper was unnecessary in their life. They could save the money if they did not buy it. The

rubber smallholders who read newspaper reported that there was little information on the rubber production. They thought it was not worthwhile buying the newspaper everyday. In addition they could read newspaper at the house tea of the community and they could get information from conversation with others here. In addition, Likitruengsilp (2002) found that the agricultural information exposure of staffs under pastoral training center of Bangkok Archdiocese in Sampran district, Nakornpathom province was mainly based on the agricultural information perception from newspaper but it was in contrast with Kaewlai (2002) who found that rubber holders in Namput sub-district, Muang district, Trang province never got rubber production information from newspaper.

Printed material: Some rubber smallholders received the information from printed material every month while others seldom got it (more than 3 months per time) or once a year. They got the printed material from the information source. The most common from were brochure and pamphlet more than other types of printed materials. They found rubber information on fertilizers and planting more than other topics. The second most frequent topic of rubber information mentioned was weed and disease control, followed by pruning, rubber clone, tapping, and sheet-making. RRAF delivered printed material to rubber smallholders more than other organization. The frequency of printed material distribution was once in 1-2 months while some rubber smallholders received it once in 6 months. The rubber smallholders reported that the printed materials were useful. Gongpat (1994) conducted a study on media factors affecting grape growers performance in using agro-pesticide, Damnoen Saduak district, Ratchaburi province. Results indicate that grape growers were exposed to posters. Phraiprayom (2000) presented that the pararubber growers in Loei province received the rubber information from printed materials such as guidance brochures, manuals, and pamphlets. Lohapasai (2001) studied farmer's adoption of recommended practices in raising tiger shrimp in Pattani province. The results showed that the source of farm information was magazines, journals. Lisewise, Tucker and Napier (2002) showed that the preferred sources and channels of soil and water conservation among farmers in three mid-western US watersheds for conservation information across the three watersheds included a mix of agencies and

agribusiness organization: farm magazines were the most important communication medium for accessing agricultural information in the three watersheds. It was in contrast with Kwantong (2000) who reported that most rubber smallholders in Maelarn district, Pattani province never got the rubber information from printed materials.

Broadcasting tower: The broadcasting tower in the community was another media in mass method, some rubber smallholders received information from it. The frequency of broadcasting was different such as everyday, once a week, once a month, once in several months, and once a year. The main rubber information from broadcasting tower was marketing which was about the price of rubber product. The information in fertilizers was the next, followed by planting, weed and disease control, and clone, with little information on pruning and they did not receive information about tapping and sheet-making from the broadcasting tower. However, broadcasting towers in some village did not report in rubber information to residents in community because it reported other issues such as general news, community news, sports, government or official news. The most common information from the village broadcasting tower were the general news because presented news from the printed materials such as newspaper, leaflets, poster, or brochure, etc. Sometimes they announced the government activities from any organization or the activity in the community. Mostly villages broadcasting tower was located at the community leader house and the announcer was the community leader. Padmanuja (1996) studied information acquisition by hill tribe farmers through media in Ban Huay Nam Dang, Kued Chang sub-district, Maetang district, Chiangmai province. The media with the highest level of suitability were broadcasted. Kaewlai (2002) revealed that rubber production information was never sent to rubber holders in Namput sub-district, Muang district, Trang province through the village broadcasting tower in the community.

There were many channels of communication such as personal, group, and mass media. The suitability of each channel was different. The result of this study found that some communication channels of rubber smallholders in personal contact,

group contact and mass contact. In personal method, office visit had the most frequency because rubber smallholders found the officials more than waiting for the official at home or plantation and the rubber smallholders accessed to the detail of information more than other channel. On the other hand, rubber smallholders choose the suitable time for them about visiting official at the office. For group method, meeting was the channel which sent information to rubber smallholder more than others. The official had a date with a lot of rubber smallholders in the same time and much information was sent from a source to target in a short time. It was save time and budget of official and rubber smallholders. About mass method, television was the most important channel. The rubber smallholders preferred to television rather than other channel in mass method because everybody could see and hear everything at the same time. At the present, every household had television set and the price was cheaper than the past that almost everybody could have one set at home.

Communication channels that transfer information from different sources could be classified as personal method, group method, and mass method.

An important source of this channel was RRAFO. RRAF was the one that directly worked with rubber smallholders because the rubber smallholders got assistance from RRAF. Those rubber smallholders had to visit RRAFO at the office to get information about rules and regulations in getting assistance and also to get rubber production problem solving. The rubber smallholders would visit RRAF office only when they were free from working within their plantation or when they really need some helps now that the office location was far from their rubber plantation. Moreover, sometimes the rubber smallholders' free time was not matched with office hours of RRAF or they came to the office but did not meet persons they wanted to meet since there was few RRAFO but there were many rubber smallholders under their responsibilities in field working. Coming but not talking to anyone wasted rubber smallholders' time and money and therefore this channel was not practical for them to get information.

RRAFO was an important information source of this channel as that of office visit channel. One effective way in monitor and evaluating whether rubber smallholders did things as rules and regulations was home and rubber plantation visit because this facilitated the officials to see the real conditions by themselves and to be able to answer rubber smallholders' problems in right way by talking to them directly. Through this channel, rubber smallholders did not need to waste their time and money to get information from RRAFO but by this way, the officials could communicate to a few rubber smallholders at a time in that they had to spend time in commuting. Moreover, each official had to be responsible for many rubber smallholders and this made only little frequency in visiting each rubber smallholder's rubber plantation. In a year, rubber smallholders could meet the RRAFO only 1 to 2 times, so they did not continually receive news specific to their needs and had to get news in another way by themselves.

Sometimes rubber smallholders used mobile phone to talked with RRAFO but this way was not popular for them when compared to the first two methods. Although mobile and home phones were communication devices that widely used by rubber smallholders, those rubber smallholders usually used in general purposes such as talking to their relatives, children, and friends to know their living conditions rather than getting information about rubber production from RRAFO. The rubber smallholders mentioned that talking over phones was not an effective way of communication to get details on topic talking to the officials and the relationship between them and those officials was not close enough to talk by phone. In addition, problems the rubber smallholders faced did not require solutions immediately, so the study found that just only fewer rubber smallholders get information through phones.

Meeting of communication channel was one of group method and RRAF was the source of information that applied this channel the most by the reason that frequent meeting was one way to communicate with rubber smallholders rapidly and less time consuming. Meeting would be held after rubber smallholders were members of RRAF and information those rubber smallholders would get from meeting was about how to do rubber production practices correctly as technical and academic way

and also rules and regulations in getting assistance from RRAF including processes of assistance, duration of assistance, and methods of assistance. Each time of meeting would be held by RRAF who appointed date and place of meeting and also target group (rubber smallholders). Then RRAFO would make an appointment with target rubber smallholders who lived within responsible area to attend the meeting. By this way, most of the time, the rubber smallholders had to come to RRAF office to attend the meeting. However, RRAFO occasionally could be able to make an appointment and held meeting in area of community without RRAF command if meeting detail was not directly related to rules and regulations. This time, meeting did not force rubber smallholders to spend their money and time in traveling because RRAFO would come to rubber smallholders' plantation instead. Other units, especially with the government, usually applied this method in informing news and information and asking for cooperation in doing some activities since this method could help them to communicate with large number of rubber smallholders at a time and during meeting time, rubber smallholders and officials could build relationship through discussing. Meeting also saved money for both rubber smallholders and officials, so for these reason, meeting was one communication channel that was practical and popular among receivers (rubber smallholders) and source of information (RRAF).

Agricultural day festival was another way of group method communication. By this communication channel, there were various kinds of activity held in one place at a time, for example, exhibitions, demonstrations, contests and competitions, trainings, meetings, agricultural academic seminars, and including agricultural products selling. A major purpose of the festival was to expose agricultural knowledge and technology of organizations, farmer groups, and individual farmers to the public. This activity created communication channel in communicating information about agriculture and also rubber to large number rubber smallholders and they could get information right to their needs in different ways. Anyway, agricultural day festival would be held only once a year due to high costs such as cost of labor and long time preparation. For some rubber smallholders who did not attend the festival, they gave reason that attending would increase their daily spending for vehicle or transportation, food, and products sold in the festival. They considered this

kind of spending was not necessary and if they wanted to get some information, they could get it from other channels without attending the festival.

Training course also was one of group method communication. Rubber smallholders would get more knowledge and additional skills from learning and practice in one time. The parties that usually offer this kind of training were organizations both of government and private sector. There were limitations of this communication channel. Training, firstly, would open only for persons who were qualified and this forced some of rubber smallholders never attend this kind of activity and got more information from this channel. Secondly, the party that held the training session was not the one who selected persons attend the activity but community leader or group leader did instead. If these leaders did not inform about training to every rubber smallholder in the community, there would be fewer smallholders in the training. In addition, rubber smallholders who had close relationship with those leaders would have more chance to be selected. However, after training, some rubber smallholders shared their experience and knowledge with their families, neighbors, friends, and relatives. This means information could be transfer from one person to another. But if it was in different way, there would be no information passed to the ones who did not attend training session.

Television was an important channel of mass method communication. There were several advantages of this communication channel. Television could transmit information to wide range of public in short time spending and television sets were possessed by almost every family. Transmission through televisions was quite good however due to specific characteristics of rubber production practices that rubber smallholders had to deal with, information through televisions might not be able to reach the rubber smallholders. Most of rubber smallholders would tap rubber trees around one to two o'clock in the morning (depending on size of tapping area) and would finish tapping around five to seven o'clock. After that they would collect products and take it for selling. All of these activities were usually accomplished before noon and in the afternoon the rubber smallholders would take rest and sleep early in order to have enough energy for tapping in the early morning on the next day.

According to their daily activities, they would have problem in getting information through televisions because during the time of farming, they did not had chance of watching television and during their resting time (afternoon to evening), there was no any agricultural programs shown or if there was, it was shown only in few minutes. When the rubber smallholders rested, entertainment programs on television could capture them and their family interest more than agricultural ones. In fact, there was little information about rubber on television, so they usually did not get rubber information from television and some rubber smallholders who got some they indicated that they just ran into it. Sometimes, if they realized about rubber information on television, they still did not get all details and also did not have additional source of information to study further. In addition, some of them could not remember or did not know the important part of each time that information transmitted, they consequently received just some part of details.

Radio belonged to another channel mass method communication. The study shows that one third of all rubber smallholders listened to radio everyday but did not receive any information about rubber production. However, the market rubber prices was the most informed information that those rubber smallholders realized on radio. Most of them listened to radio between twelve to 3.00 p.m. because during this period those rubber smallholders rested after finished working in the morning. Not many rubber smallholders handed handy radios along with them when went working in their rubber plantations in that their buying habit was changed, they bought radio sets that use home electricity rather than bought small ones with electrical cells. In addition, social influence also affected buying decision of rubber smallholders because these days most people usually bought audio sets with functions of radio receiving and tape cassette/ CD/ DVD player and they considered that kind of audio sets was too expensive to buy. Anyway, this new type of audio sets generated some problems to elder rubber smallholders now that they could not remember how to make functions work and thought that this kind of things was about children or teenagers. Therefore they, elder ones, did not know how to use the audio sets and also were not interested in receiving information on radios. Moreover, rubber plantation sites where rubber smallholders worked were covered by tall rubber trees and were too dense to receive

radio signal. If the radio the rubber smallholders handed along could receive some amount of signal, the sound was not continually transmitted and this was boring and annoyed rubber smallholders in listening to radio while working.

Newspaper was also one channel of mass method. Newspaper was different from televisions and radios because rubber smallholders had to have reading and translating ability in what they were reading since news presented in form of alphabets and some pictures. Some rubber smallholders considered newspaper as thing that wasted their family income. There was no free newspaper provided in their community or in some communities, there were free ones but not provided every day, so newspaper was something that rarely found for reading news. Another problem about newspaper as a channel of communication was some rubber smallholders did not have reading skills in that they were educated just from primary school level and some of them were not educated, so they were not able to read. Small font size made difficulty in reading for fifty-year-old rubber smallholders because they had to spend more time in reading or might have eye-sight problem and some rubber smallholders had less time to rest because of reading newspaper. News in newspaper could be received from the other type of communication channels such as televisions and radios which not necessary for rubber smallholders to be able to read at the first place. Reading newspaper was not accepted by most of rubber smallholders. However, newspaper was still an alternative for rubber smallholders who were educated from secondary school level and over because these rubber smallholders had good reading skill and understand all things presented and rubber smallholders could choose to read parts that they were interested without reading all sections of it. Most popular newspaper was daily newspapers that of Thairat and Daily News and rubber smallholders mostly could find newspaper from bookstands of grocery stores in central town. Information rubber smallholders got from newspaper usually about rubber market prices and the next frequently found was about fertilizer and herbicide. Other topics occasionally appeared on newspaper as rubber smallholders said and they added news in newspaper mostly was about crime, politics, and sports not about agriculture. For these reasons, rubber smallholders did not hope that they would get much information from this type of communication channel.

Printed material or agricultural printed material was quite not effective in capture rubber smallholders' interest due to this material was specific to only groups of receivers. One fifth of all rubber smallholders got information through this channel every month. Medium or printed material about agriculture that most of rubber smallholders receive was leaflets. Information in leaflets was about fertilizer and rubber planting. An organization that provided most of leaflets about rubber was RRAFO and rubber smallholders would get it when they attend meeting or training held by RRAFO. Other topics found in leaflets were pruning, rubber clone, tapping, and rubber sheet making. Rubber smallholders who used to get this kind of leaflets mentioned that they get information that benefited them in rubber production and they could reread topics in leaflets for many times, so they could do rubber production practices in the right way. Leaflet was not an effective medium when used by rubber smallholders who were not able to read. Although, at first, they did not understand what was printed in leaflets, this group of rubber smallholders usually knew information in leaflets by asking and talking with ones (for example their children or relatives) who understand printed information.

Rubber smallholders accepted the broadcasting tower as communication channel in that this channel was similar to radio. Most rubber smallholders got information through this medium. The difference of this communication channel and radio was frequency in receiving information because in some communities, there was information transmission everyday or in another places transmission depended on free time of directors or formal community leaders such as village headmen since broadcasting tower usually located nearby these persons' houses (there was few community where transmission was not under community leader control). Rubber information transmitted mostly about rubber market prices and the next important one was fertilizers, planting, weed killing and rubber clone. The least mentioned topic was about pruning, tapping, and rubber sheet making. There were barriers in transmission rubber information through this channel. The first barrier was bad condition of broadcasting towers due to a lack of maintenance (most of them were out of order because of no maintenance). Secondly, there was a lack of people responsible for maintaining the towers and being program director. In some

community, people never got information from this channel by this reason. Next, the directors of transmission did not provide information about rubber but only general news within community about sports or news from municipal government. Lastly, distance of transmission was limited. Rubber smallholders who lived far away from broadcasting towers would never get information from this kind of communication channel because they cannot be reached. The ones who were responsible for the towers should explore the area and installed more speakers. However, talking with rubber smallholders, all of them hoped that there would be continuously wide range of transmission because they would get up to date information and could plan strategies to face conditions affected their work and living.

The Effective Method for Transferring Information

Officials transferred rubber information to group representative and those representatives passed on to others. The second was the printed materials which were delivered to rubber smallholders, followed by field trip and meeting in community and use media issued. The rubber smallholders suggested that the officials transferred information through their representatives; it was more efficient method of diffusing information than others as they could talk with their representative at anytime. The printed material could be useful for the smallholder with high educational level. Those smallholders thought that this method was good for them because they could read and repeat it. For other method such as field trip, meeting and used media, or home visit, etc: such as human, time, and money were needed. Less than half of smallholder thought that these methods were good. Similar finding to Siriprapa (2000) who reported that the rubber holders in Khon Kaen province needed 7 items of extension services. There were frequent visits of extension workers to the plantations, the additional seminar on technology, conferences with extension workers on technology transfer in the village, observation tours, field demonstration, distribution of handbooks, information via local media. Prajanphol (2000) presented that the rubber holders in Muang district, Loei province told that technical brochures produced by related government agencies were the best source of knowledge. However, they needed the extension and communication from the officers more than in the past i.e.

frequency of contact and the services provided by related government agencies, field trip, experiences of the farmers, technical training and exposure to technical information sources. Furthermore, Phraiprayom (2000) revealed that the rubber holders in Loei province needed guidance brochures as the preferred source for most their need in descending order were growing manuals, pamphlets, leaflets, posters, and agricultural journals. As for the content most needed in the brochures was how to build pararubber curing houses. The contents that should be covered in manuals, pamphlets, leaflets and posters were diseases and insects.

Part III Adoption of Recommended Production Practices by Rubber Smallholders

Rubber production practices include rubber clone, planting, pruning, weed or disease control, fertilizers, tapping, and sheet-making. There were only 4 to 7 topics that were adopted such as rubber clone, planting, pruning, and weed or disease control. For the adoption of the remaining 3 to 7 practices, topics were different.

Rubber Clone

Rubber clone was a basically very important for rubber plantation. Main products from tapping were dry rubber and seed: grain of wood, and others were by-product from rubber plantation.

All rubber smallholders need information about the rubber clone, studying the suitable rubber clone before planting and used the recommended rubber clone. All of the rubber smallholders used RRIM 600 rubber clone in their plantation. In the past, there were some rubber smallholders who planted their rubber plantation with other clones but everyone switched to RRIM 600 at this time. RRIM 600 was adopted by all rubber smallholders because it had many virtues such as high yield of rubber latex, thin bark for easy tapping, and resistant to rubber disease. As a result, RRIM 600 was the most used rubber clone. All rubber smallholders were satisfied in RRIM 600 and they confirmed that they will continue planting this rubber clone. Local merchant was

the main source of seedling supplier for rubber smallholders because the rubber smallholders would receive information or suggestion about rubber clone suppliers or seedling sources from relatives, friends or neighbors that where they could buy rubber clone which was exactly right, no deceiving, to their needs with low price as they could be affordable and, more important, where the place of selling was located not too far from their plantation or places of them in order to avoid the cause of damaging due to transportation. For RRIM 600 rubber clone type which was generally accepted by most of rubber smallholders, they got suggestion about this clone from RRAFO. Those rubber smallholders would get this type of suggestion when they went to RRAFO for subsidy. The RRAFO would provide information about rubber plantation, including appropriate rubber clone for a particular growing area. Some of the rubber smallholders would get rubber clone information from friends or neighbors and RRITO by talking and exchanging knowledge and news rather than talking directly about rubber clone issue. Most of the rubber smallholders had experimented on growing another types of rubber clone before trying RRIM 600. However, when comparing the production by using one's own experience, talking and visiting their friends' or neighbors' rubber plantation influenced their decision to use RRIM 600 instead of the other rubber clone types and were willing to choose this clone in the long time. Chuntirapong (2000) mentioned that the rubber smallholders in the northeastern Thailand chose RRIM 600 clone for planting in their rubber plantation. Prajunphol (2000) found that the rubber holders in Muang district, Loei province used the variety RRIM 600 in their rubber plantation while Khamkhot (2001) presented that the rubber holders in Nong Khai province who was member and non-member of the Rubber Replanting Aid Fund grew RRIM 600 pararubber breed. Kaewlai (2002) reported that the rubber holders in Namput sub-district, Muang district, Trang province favor the RRIM 600 clone for rubber growing. Phukwiwat, et al. (2002) revealed that rubber smallholders in 9 provinces of the southern Thailand most preferred RRIM 600 for rubber clone.

Planting

All rubber smallholders planted the rubber tree in the early rainy season. The size of hole was 50 x 50 x 50 centimeter and the space of planting rubber tree was 3 x 7 meter for the plain area or 3 x 8 meter for the sloping area.

They accepted and followed the knowledge they received from the training course of the Rubber Replanting Aid Fund (RRAF) because they were satisfied in the growth of rubber tree. The rubber smallholders could plant the rubber tree about 70-75 trees per rai. Most of rubber smallholders hired the labor for this activity. Source of labor were both inside and outside their community. Each activity in planting received different payment such as the first ploughing are paid about 150-400 baht per rai and 100-250 baht per rai for the second ploughing. In planting, they paid about 25-30 baht per tree including many activities; dig the hole, plant the seeding, and cover the root. They were paid about 4-6 baht per hole for digging the hole. In this rubber practices, the rubber smallholders adopted it and all of them followed the Rubber Replanting Aid Fund's advice in their plantation. Khamkhot (2001) found that the rubber holders in Nong Khai province, both member and non-member of the Rubber Replanting Aid Fund used growing space of 3x7 meters, growing hole size 50x50x50 centimeters, and growing in May to June. Kaewlai (2002) reported that the growing space in rubber plantation of the rubber holders in Namput sub-district, Muang district, Trang province were 3x7 and 3x8 meters.

Pruning

The rubber smallholders started to prune when the tree was 1 year old. They stopped pruning when the tree was 3 or 4-5 years old. However, there was someone who started to prune the rubber tree when the tree was 3 months old. They stopped this activity when the tree was 5 meters in height or 2-3 years old. Pruning could protect the tree from rubber disease and wind damage. They do this activity themselves and used the simple tool such as scythe. All of rubber smallholders pruned the young rubber trees. They adopted the pruning in rubber production.

Siriprapa (2000) and Prajunphol (2000) reported that rubber holders in Khon Kaen province and Muang district, Loei province pruned off undesirable branches of para rubber trees while they were relatively young.

Weed or disease control

All of rubber smallholders adopted the recommended weed or disease control practices. They removed the weed in their plantation to protect the tree from rubber disease as the weed was the source of some diseases. The rubber smallholders used many methods of controlling weed in their plantation, e.g.: rooting out the weed by mowing, cutting weed by cutter, planting of legume for mulching the land, and using chemical spray. Two types of chemical spray were used by the rubber smallholders. These were Paraquat and Glyphosate. The chemical was diluted with water at ratio of 1:20 before spraying. They used chemical to rapidly remove the weed in a short time, required minimum labor, low cost, and could be applied in a large area more than other methods. Around 10 percent of the rubber smallholders never used the chemical to control or eradicate weed in their plantation because they did not want to damage the environment and themselves. Most of the rubber smallholders reported that there were few rubber trees which were destroyed by disease and the detriment was little. However, they stopped tapping once they found disease at the rubber tree which was recuperated. The common diseases found infesting the rubber plantation were leaf fall or black stripe.

All rubber smallholders adopted and practiced to follow the advice of the Rubber Replanting Aid Fund. However, they changed this practice when they were not provided with assistance. They presented that there were many factors which influenced their decision. Siriprapa (2000) showed that the weed and disease control of rubber holders in Khon Kaen province used labor for weeding in their plantation twice a year. Kaewlai (2002) reported that the rubber holders in Namput sub-district, Muang district, Trang province removed weeds in the rubber plantation by hand at 40.50 percent, lawn mower at 31.60 percent and chemical control at 25.70 percent. Phukwiwat, et al (2002) presented that around 61 percent of the rubber holders in 9

provinces of the southern Thailand did nothing with the disease in rubber tree; the rest used the chemical and pruning methods. Photiwattutham (2003) revealed that the rubber holders in the south and east of Thailand eradicated weed in their plantation by human labour without using the chemical or machinery.

Fertilizers

Before tapping, some rubber smallholders used the 20-8-20 formula fertilizers for the rubber tree. Someone used other formula for the trees such as 16-8-14. They put the fertilizers every 3 months. After tapping, the rubber smallholders put the 15-15-15 formula for the trees and other formula for someone. They put the fertilizers twice a year for rubber plantation. However, some rubber smallholders first applied the fertilizers when rubber trees were 3 months old. The fertilizers formula 16-8-14 was applied around the canopy of the young rubber trees about 20 centimeters from the stems. In the slopping area, fertilizers were applied in the 3 holes dug around the canopy. They used about 30 grams of fertilizers per rubber tree every 3 months. This activity was done until the rubber trees were 3 years of age. After that, they used 20-20-20 formula of fertilizers applied at 50 grams per tree per 6 months. There were many methods of fertilizing, for example: sowing fertilizers between the rows of rubber trees, digging a hole around the root, and digging a furrow between the rows of rubber trees until the rubber trees were 5 years old. After tapping, the rubber trees were applied with 1 kilogram per tree of 15-15-15 formula of fertilizers once a year. However, some rubber holders used manure in their plantation. This was because manure was cheaper and thought to improve the soil much better than the chemical fertilizers. Starting on the eighth year, the rubber holder had to buy the fertilizers or manure on their own because the RRAF only provides assistance in 7 years period. Half of them give fertilizers once a year and the rest used manure twice a year. Although most of rubber smallholders followed by the RRAF's advice about fertilizing in rubber production but some rubber smallholders did not practice. They reported that it expended time, labor, and money. They did so when they thought that it was suitable time which was uncertain.

For fertilizing, all rubber smallholders adopted it when they received assistance from the RRAF. After that half of rubber smallholders drop it and changed the activity. They used fertilizers less than the advised by the RRAF because they need to save the money. When they were out of the assistance of the RRAF, they have to buy fertilizers themselves. Then someone use smaller amount of fertilizers per tree per rai and someone put only one time in a year. Sangsai (1992) mentioned that the majority of rubber smallholders in Satun province used chemical fertilizers with the 1-6 years old tree and then they used the lower rate of chemical fertilizers with older trees. Siriprapa (2000) found that the weed and disease control method of rubber holders in Khon Kaen province added fertilizers twice a year. Prajunphol (2000) reported that the rubber holders in Muang district, Loei province put chemical fertilizers provided by the RRAF after rubber trees started to tap. Phukwiwat, et al (2002) showed that around 91.10 percent of rubber smallholders in 9 provinces of southern Thailand preferred chemical fertilizers for their rubber plantation, organic fertilizers at 15.40 percent, and mixed fertilizers at 8.90 percent. Kaewlai (2002) presented that the fertilization of rubber holders in Namput sub-district, Muang district, Trang province at 96.60 percent put the fertilizers only once a year for the plantation under tapping. Most of them choose chemical fertilizers and the favorite formula for them was 15-15-15. There were a few rubber holders used mixed fertilizers for their rubber tree and around 4.50 percent also used a little organic-fertilizers to rubber tree. Phothiwattuthum (2003) revealed that the rubber holders who receive the assistance from the RRAF in south and east of Thailand used chemical fertilizers of 15-15-15 formula and other formula do 15-7-18 was also used. A few rubber holders used both chemical and organic fertilizers. They sowed in the rubber plantation about 41-50 kilogram per rai once a year because they need to save the money. In addition, Kongeiu (2005) found that most rubber holders in Tamod district, Phattalung province put fertilizers once a year at about 50 kilograms per rai (1 bag of fertilizers) in January.

Tapping

The rubber smallholders started to tap the rubber tree when it was 7 years old. However, someone started at 50 centimeters around the rubber tree which can be younger or older than 7 years. Only 8.59 percent of rubber smallholders began to tap at less than or more than 7 years old. They started to tap the trees at the height of 150 centimeters above the ground at the first time but someone started at 120 centimeters. The angle of tapping line was 30 degree. For tapping system, a few rubber smallholders tapped the tree at 1 day or 2 days and stopped 1 day before they tapped again in the week. Most rubber smallholders tapped the rubber trees every 3 days with 1 day interval because they needed the money for the daily expenses. However, someone tapped at 1 day interval because they have large rubber plantations and believed that it yields the concentrated rubber latex more than other tapping system. Each rubber smallholders confirmed that they continued to use the tapping system which was done at this time. The time of tapping for each rubber smallholders can be different. The rubber smallholders who had more than 30 rais started at around 1:00 a.m. while those who had the area of less than 30 rais started at around 4:00 a.m. They finished tapping at about 6:00 or 7:00 a.m. after which they collected the rubber latex for sale. Most of the rubber smallholders employed labor for tapping. The labor was either local or foreign. There were several way of sharing the benefit between the owners and the employees, i.e. 50:50, 55:45, 60:40, and 70:30 sharing systems. The period of tapping for each year was from May to February and stopped from March – April.

Most of rubber smallholders adopted some practices of tapping system suggested by the RRAF. It depends on the width of rubber trees, they tapped at 50 centimeters wide. They tapped the tree at the height of 150 centimeter above the ground at the first time and followed by the advice of the RRAF. However they rejected the frequency of tapping and time of tapping. Their frequent tapping was more than the advice because they need much money for the daily expenses. In addition, the time of tapping was set on their own and they learnt from their experience rather than the RRAF's advice.

Chuntirapong (2000) found that the rubber smallholders in the northeastern Thailand started to collect rubber latex when rubber trees were 6-7 years old. They tapped the trees for 8-10 months per year and tapping was based on the climate conditions. Phukwiat, et al (2002) showed that around 52.30 percent of rubber smallholders in 9 provinces of southern Thailand tapped every 3 days with 1 day interval, 27 percent tapped the trees everyday, with 1 day interval at 3.50 percent of all. Most rubber small holders stopped tapping in summer for about 1-2 months. Kaewlai (2002) reported that the rubber holders in Numput sub-district, Muang district, Trang province started the tapping in rubber trees when the trees were 6-7 years old and they stopped tapping in summer. The scotch of trees was 150 centimeter above ground. Around 49.20 percent of them tapped 4 days and 1 day interval, 35.30 percent tapped 5-6 days and 1 day interval, 3 days and 1 day interval at 12.10 percent, and tapped everyday at 3.40 percent.

Sheet-making

For the rubber product, most of rubber smallholders sell their product as rubber latex. About one-fifth sold the rubber sheet as their product.

At the present, the rubber smallholders sold the rubber latex more than the rubber sheet because it was more convenient and easy, enabled them to be paid, and saved time, labor, money. However, someone still sold the rubber sheet because they needed a lot of money. They sold twice a month as the rubber sheet. Almost all sold their product to the local buyer because it was easy for them. Some areas the rubber smallholders gather into a group in selling the rubber latex too. There were a few rubber smallholders who sold them to the buyer outside the community because they got the higher price for product than selling in the community. The rubber product which was bought by outside merchant was the rubber sheet. All of rubber smallholders who sold the rubber latex confirmed that they would not sell the rubber sheet again although the price was higher.

The rubber smallholders changed the type of rubber product for selling from the past. In the past they sold rubber sheet as the product but they sold rubber latex about 10 years ago. In selling this product they could save labor, time, and money than rubber sheet although they earned less than rubber sheet. By this way, the comparison between the distribution of rubber buyer and other agricultural buying stores indicated that the rubber market had better distribution system. Such a distribution has the rubber buying stores in villages and rubber smallholders had various options in selling rubber products.

In addition, Kaewlai (2002) reported that the rubber holders in Numput sub-district, Muang district, Trang province at 69.60 percent sold the rubber latex as their rubber product because they can finished the daily task in a short time. The rest sold product as the rubber sheet because they needed higher price for rubber product. Kwantong (2002) found that around 43.24 percent of the rubber smallholders in Maelarn district, Pattani province sold rubber latex, rubber sheet at 31.08 percent, and rubber lump at 25.68 percent. The important buyer of rubber latex and rubber lump was the merchant in the village while the rubber buyer in the community or near by area was the main buyer for rubber sheet. Phothiwattuthum (2003) revealed that the rubber holders who received the assistance from the Rubber Replanting Aid Fund in south and east of Thailand sold rubber products to merchant in village or sub-district more than other buyers. It was similar to the study by Kongeiu (2005) who showed that rubber holders in Tamod district, Phattalung province sold the rubber product as rubber latex more than other rubber product.

Part IV Hypotheses Testing

The study on socio-economic characteristics, information source and communication channel of rubber smallholders were proceeded on the following hypotheses:

1. Socio-economic characteristics of rubber smallholder: sex, age, education, religion, labor, size of rubber plantation, income from rubber production, experience

in rubber production, member of organization, and credit were related to information sources in rubber production practices.

The result of testing hypothesis between characteristics of rubber smallholders (sex, religion, and credit) and information sources (inside and outside community) by chi-square found that there was no differences in receiving rubber production practices from information sources of rubber smallholders of different characteristics. Because of χ^2 from analysis was less than the standard value and then the hypothesis was rejected. The result of testing hypothesis between characteristics of rubber smallholders: age, education, labor, size of rubber plantation, income from rubber production, experience in rubber production, and member of organization with information sources (inside and outside community) by Kendall's tau_b correlation found that hypothesis was accepted in some characteristics of rubber smallholders and information sources.

There were no relationships between sex, religion, and credit with all information sources inside the community. The same was true with the information sources outside the community, except for credit which had positive relationship with the agricultural extension officials at 0.05 significant level.

This differ from the study of Likitruengsilp (2002) who conducted a study on the agricultural information exposure of staffs under pastoral training center of Bangkok Archdiocese in Sampran district, Nakhonpathom province. The results found that the relationship of variable showed that the age was significantly related with the human media such as friends, relatives, and colleagues including the local area network.

2. Characteristics of rubber smallholder: sex, age, education, religion, labor, size of rubber plantation, income from rubber production, experience in rubber production, member of organization, and credit were related to communication channel in rubber production practices.

In personal method, there were no relationships between sex, religion, and credit with visit to office and calling by phone, except for religion having positive relationship with visit at home or rubber plantation at 0.05. Credit had positive relationship with visit at home or rubber plantation at 0.01 level. The hypothesis was accepted for these variables.

In the group method, there were no relationships between the demographic characteristics of rubber smallholders and demonstration, meeting, training course, field trip, exhibition, and the agricultural day festival. However, credit had relationship with field trip at 0.05 level and then the hypothesis was accepted between testing credit and field trip. Because of X^2 from analysis was less than the standard value. The meant that rubber smallholders who were different in credit had the differences on receiving rubber information from field trip.

In terms of the mass method, there were no relationship between sex, religion, and credit with newspaper, printed materials, radio, and news-tower broadcasting, except to religion which was positively related with the television at 0.05 significance level. The hypothesis was accepted in relationship between sex with newspaper and religion with television. This is because X^2 from analysis was less than the standard value. The meant that rubber smallholders who were different in sex had differences in receiving rubber information from newspaper and who were different in religion had difference in receiving rubber information from television.

It was in congruity with the result of Likitruengsilp (2002) who conducted a study on the agricultural information exposure of staffs under pastoral training center of Bangkok Archdiocese in Sampran district, Nakornpathom province. The results found that the relationship of variable shows that the education level, working experiences, and the income was significantly related to the printed media.

3. Information source: relatives, neighbor, friend, merchant inside and outside community, agricultural extension official, Rubber replanting aid fund official,

government official, private sector employee, salesman, and local leader were related to adoption of rubber production practices.

The result of testing hypothesis between information sources and adoption of rubber production practices by Kendall's tau_b found that hypothesis was accepted in some information sources and adoption of rubber production practices.

There was relationship between information sources inside community; neighbor or friend and tapping of rubber smallholders at 0.05 level and merchant inside community related with tapping at 0.01 significance level.

In information sources outside community, there were no relationships between merchant outside community, agricultural extension officials, Rubber replanting aid fund officials, official of government, official of private sector, and local leader with adoption rubber production practices except to salesman who related with weed or disease control at 0.05 significance level.

4. Communication channel: personal, group, and mass method were related to adoption of rubber production practices.

The result of testing hypothesis between communication channels and adoption of rubber production practices by Kendall's tau_b found that hypothesis was accepted in some communication channels and adoption of rubber production practices.

In personal method, there were no relationships between visit at office, phone conversation, and visit at home or rubber plantation and adoption of rubber production practices.

In the same way for mass method, there were no relationships between newspaper, printed materials, radio, television, and village broadcasting tower and adoption of rubber production practices.

For group method, there were no relationships between adoption of rubber production practices and demonstration, meeting, training course, exhibition, and campaign, except to field trip which was related with pruning at 0.05 significance level. Agricultural day festival had relationship with sheet-making at 0.05 level.

Part V The Communications Problems and Obstacles of Rubber Smallholders

The study noted five important problems: unspreading of news, lack of rubber information, no time for information, lack of contact with officer, no interest from officer. However, most of rubber smallholders have rectified the communication problem in rubber information.

The rubber smallholders expected government to bear the major responsibility of solving these problems. They suggested their need to improve the rubber production: increased the meeting with the officer, increase the circulation of rubber document, increase information through various media and training course, more information through television, distribute information through broadcasting tower, establish broadcasting tower in the community and arrange field trip or demonstration in local area, and increase information through radio.

For the communication problem of rubber smallholders, the important problem was lack of information about rubber production. The causes were 1) they used a great of time for rubber production and need to relax, then they had no time for receipt of information, 2) time of broadcasting information from television or radio was not related with the free time of rubber smallholders, then they could not receive the information from these media, 3) low education of rubber smallholders was a cause of lack of information because they could not read and understand the document or printed matter from information source, 4) an official had provided assistance to the rubber holders and rubber plantation on a large scale, he could not meet smallholders often enough. This was similar with Piteerattananon (2003) who studied factors related to the adoption of management methods in oil palm plantation among Bacho settlement cooperatives members, Narathiwat province. The results

found that the cooperatives had to increase information exposure about oil palm plantation to members. Technology had to be transferred by training course, demonstration, and field trip more than other methods because the members had low education and could not read Thai document. Similarly, Kwantong (2002) presented a comparison of motivations in different forms of rubber production among rubber smallholders in Maelarn district, Pattani province that rubber smallholders did not get the knowledge about rubber production from the government. The government had to add the role more than the past in transferring rubber production knowledge to the rubber smallholders. Kaewlai (2002) studied the practices and opinion of rubber farmers on rubber tapping system in Namput sub-district, Muang district, Trang province. He reported that most rubber farmers had low education and then the information was transferred by the simple media, easy for their understanding, and did not spend their time in rubber production daily. The suitable media was television, radio, and broadcasting tower in community. Kongeiu (2005) studied social-economic factors correlated with decision on chemical fertilizers uses of rubber farmers in Tamod district, Phattalung province. The results presented that the rubber farmers who had a lot of experience in rubber production could be the information source in personal method to young generation. The older farmers gained the experience and the knowledge for rubber practices in the area and could transfer to other rubber farmers in that area.

CHAPTER V

CONCLUSION AND RECOMMENDATIONS

Based on the results of the study, the following conclusions and implications are drawn.

Conclusions

1. The evidence that personal contacted in face to face situations between extension agencies especially the Rubber Replanting Aid Fund Official (RRAFO) and rubber smallholders were not only basic mean of communication but were also effective in adoption of rubber practices. It implied that personal contacted between RRAFO and rubber smallholders should be enhanced for effective communication. However, the RRAFO had to work with a large number of rubber smallholders. This did not allow them on opportunity to make personal contact with all rubber smallholders.

2. The Rubber Replanting Aid Fund Official (RRAFO) was found to be the important source of information. The rubber smallholders obtained detailed information about rubber practices from RRAFO. Their help was sought to evaluate and conduct trial of the practices. It was essential that they should not only have a comprehensive training in rubber practices but also in communication skills.

3. The findings showed that television was relatively more influential than other mass media. It was possible to make effective use of television as a channel for communicating rubber information.

4. The education was the discriminating variable in the use of information sources and channels. The use of mass media increased with the level of education. To communicate information to rubber smallholders through printed material such as

posters, leaflets, booklets, brochures, or magazines, they might be learn how to read and write.

5. It was found that neighbors or friends were sought as information source by the most smallholders. To make them effective communicators of rubber information, it was useful to train a few selected rubber smallholders in each village on an organized basis.

6. Personal method such as neighbor, friend, relative, and the government agencies were the important channel for transferring information to rubber smallholders. It was the best channel for smallholders which accessed to rubber information. It the same time, mass method could help the distribution information to them especially television and radio. The information source ought to use the several channels more than only one for transferring information, knowledge, and technology.

Communication was basic to all human undertakings. It was a process of transmitting ideas, attitudes, knowledge, skills, and behavioral patterns. Consequently, communication in agricultural extension was process of transmitting new ideas, skills, knowledge, and technology related to improving practices of farming. Each event was a consequence of an act of communication. An act of communication involved the key elements such as source, message, channel, and receiver. Of these elements, channels lied at the core since desired information needs to be relayed through some media.

This research attempted to study communication sources and channels in production practices of rubber smallholders. Regarding the communication sources of rubber smallholders from inside their community, neighbors or friends were the most important source for rubber information (fertilizer, weed and disease control, and marketing). The Rubber Replanting Aid Fund official was the most important source from outside community for further information in fertilizers, weed and disease control, and planting. As for the rubber smallholders's use of communication channels, personal method especially home and farm visit were the most important

interaction process in satisfying them for rubber information. Demonstration, meeting, and field trip were the important methods of group contact in satisfying rubber smallholders who were members of an organization. The most important mass media was television because anyone could access to information through this media and it was the basic appliance in every household. In addition, other communication channels such as radio, newspaper, and printed material were used by educated rubber smallholders. There were relationships between the background characteristics with communication sources outside the community more than sources from inside the community. Characteristics of rubber production such as number of labor, size of plantation, income per year, and experience in rubber production had correlation with communication channels (personal method, group method, and mass method) more than the personal characteristics (age, level of education, religion, and credit).

Consequently, this study showed that there were many communication sources and channels in satisfying rubber smallholders' need for information. Communication sources and channels should be geared to the needs and fitness of rubber smallholders and implemented through personal and methods that offer the greatest chance of success.

The favorite rubber clone of rubber smallholders was RRIM 600 because it gave high latex yield, and endured hard tapping. Most of the rubber smallholders used chemical fertilizer but the quantity of fertilizer was less than the required amount. This resulted in the rubber tree having reduced growth rate when they were tapped; low rubber latex yield. Most of rubber smallholders indicated that the practices recommended by the Rubber Replanting Aid Fund were difficult for them to follow. The production practices had a high labor requirement, high capital requirement, required extra technical skill resulting to lower profit earned or returns. Thus, the rubber smallholders had to use their own production practices as they were cheaper and easier to implement.

From the foregoing results, it was found that personal contact in face to face situations was the basic mean of communication and other channels such as printed

materials, training courses, field trip or visit to rubber smallholders, etc. were the supporting communication device in the adoption process. The rubber smallholders mainly obtained information through personal contact in face to face situations with their neighbor or friend, the Rubber Replanting Aid Fund official or merchant at the different stages in each rubber practice topic. Mass media were barely relatively used.

Furthermore, the findings of this study showed that personal contact in face to face between rubber smallholders and neighbor or friend and the Rubber Replanting Aid Fund officials were not only the basic means of communication but were also effective in the adoption process. This implied that personal methods should be enhanced for effective communication. Presently each of the Rubber Replanting Aid Fund officials had to take care of many clients which consequently reduced the number of clients whom they could have face to face contact.

Recommendations

Based on the salient findings and conclusions presented, the following were recommended:

1. Personal interaction between extension agencies and rubber smallholders should be enhanced for effective communication. The reduction in the number of rubber smallholders per Rubber Replanting Aid Fund Officials would enable the officials to have more face to face interactions with all their clients.

2. The Rubber Replanting Aid Fund Officials and the agricultural extension officials were found to be the important sources of information. Most rubber smallholders obtained detailed information about their rubber production from these agents. Therefore, it was essential that they should not only have a thorough training in rubber production subject matter but also in communication skills.

3. Many rubber smallholders need the rubber printed materials. Then the number of printed materials about recommended rubber production and practices should be increased. To communicate information to rubber smallholders through printed materials such as posters, leaflets, or exhibitions, they may be taught how to comprehend the message. Providing any information through published media, the sources of information should concern much about educational level and health condition of rubber smallholders because most of rubber smallholders were at age of over fifty years old and completed only primary school education level. The most important problems in receiving news and information through published media were about reading small alphabets and the reader's comprehensive ability. The use of many picture and large alphabets could help the target audience, who were mostly old with low education. To use the published media effectively as it could be major source of information for rubber smallholders in the future, the providers should design the medium to eliminate the two mentioned problems. In addition, they should support to develop the quality of the medium to be an important source of rubber information for rubber smallholders now that this type of media could be kept for reread at any time in the future.

4. Rubber smallholders' relatives, friends or neighbors were important human being media type in transmitting information to rubber smallholders themselves. From the study, most of rubber smallholders would get information from these sources of information by talking (considered as one type of communication channels) therefore rubber information could be transmitted quite well through this communication channel. It did not require large amount of investment or time consuming but could give great outcome. Information was also clear, simple, and easy to understand when transmitted through this communication channel and if there was any missing information transmitted, it would not generate serious troublesome to both providers and receivers because they could compromise by talking to each other again. In order to transmit information effectively, training, educating, and communication skill developing could help people who were considered as sources of information to be able to act as good information senders.

5. It was found that neighbors were sought as information sources by most rubber smallholders. To make them effective communicators of rubber production practices information, it was useful to train a few selected smallholders in each village on an organized basis. This task could best be attained through short training courses in their community for progressive rubber smallholders.

6. Information about rubber production practices was hardly changed. Rubber smallholders could learn about the production from their ancestors and they also could learn by themselves when they practice farming activities. Learning from experienced rubber smallholders could be an important way of informally sending information to inexperienced ones within the community. Officials of any parties could take advantage from this communication channel by having experienced rubber smallholders educate other smallholders in training sessions. Experienced rubber smallholders could easily educate other smallholders in the sessions because they were all rubber smallholders who had similar living condition that encouraged good transmission and group understanding.

7. Information senders should apply multi media to send information to receivers because various types of media could inter-supplement one another to make transmission to be effective and appropriate in any situation and information would be reached by wide range of receivers. To extend information on rubber production practices to rubber smallholders through many media: personal method (face to face, home and rubber plantation visit, etc), group method (meeting, demonstration, field trip, etc), and mass method (television, radio, broadcasting tower, newspaper, printed material, etc.). These would increase their rubber production efficiency ensuring higher returns. It was thus essential to provide detailed information on the interactions among the various factors which generate the observed behavioral patterns.

8. One important factor in sending information was about receivers' need. Institutions and officials should find out that rubber smallholders really want any information and should provide the exact information for them. They also should

apply right way in sending information in order to make transmission most effective and rubber smallholders could get use from that sent information.

9. Although it was good to present any information through mass media such as television and radio, there was some limitation for rubber smallholders in receiving information. Lifestyle of rubber smallholders was different from other types of farmer. They always worked at night and rested during day time. Therefore, to provide any information through television or radio to the rubber smallholders, the information providers should arrange time of present to match the rubber smallholders working time. In addition, programs should be interesting to capture rubber smallholders' interest to encourage the rubber smallholders pay attention to information and make use of it.

10. Community radio would be another alternative for the ones who would like to send information to groups of people. This way did not require high investment rate and the information senders could choose topic of information to broadcasting by their requirements. Rubber production related institutions could invest in this communication channel to send information only about rubber topics for the rubber smallholders in the area. If the information senders choose to use this communication channel, they should firstly study and plan date and time of transmission, styles of programs, and knowledge and detail would be presented. In addition, information senders should plan to help rubber smallholders to have participation with programs on radio to shape things exactly right to the rubber smallholders needs and make information transmitted effectively.

11. Broadcasting tower in each community should get maintenance to be in a good condition and ready for use. From the study, it found that there were broadcasting towers in almost every community but they were not used properly. In some community, they did not make any use of their broadcasting towers because there were no direct responsible people who had to maintain those broadcasting towers and no people who act as the directors. Broadcasting towers in some community were in bad condition, broken down, and some parts were lost but they

were still left there without repairing. According to the study, the frequency of transmission and topics of information transmitted through broadcasting towers in some community depended on the convenience and preference of the directors therefore rubber smallholders did not frequently receive information related to their rubber production. Any parties who work directly related to broadcasting through broadcasting should help in educating people in communities to use their broadcasting towers in the right way and help them to have transmission skills in order to frequently transmit information to people in the community. Good management in broadcasting through broadcasting towers would help the community develop effectiveness of information transmission without large additional costs as they could use their existing broadcasting towers. For this reason, letting people in a particular community take part in this kind of management would be one of the best ways in information transmission within the community.

12. Involving parties should encourage rubber smallholders to do non rubber related activities, for example, stock-raising, fishery, handicraft, and integrated farming, etc. These additional activities could help low income rubber smallholders increase their revenue without migrating to other areas or changing to other industries. At last, they should support these smallholders to be interested in doing such activities such as providing training, demonstrating, and visual educating.

13. News and information that would be transmitted to rubber smallholders should be corrected and up dated because some information are from an experiment or testing in only one particular area and it could not be applied to rubber smallholders in another area. After updating and found that information in hand was not appropriate for rubber smallholders in the area, information senders should correct it by having some cooperation of local officers and rubber smallholders and this cooperation would encourage participation and information acceptance of rubber smallholders.

14. To help the rubber smallholders evaluate usefulness and applicability of the recommended rubber production information in local situations, extension

officials should ensure that successful demonstrations are conducted in each community. To enable the rubber smallholders to try the practice, extension officials must get the visual evidence validated by the peer group. It is, therefore, essential to secure participation and involvement of the peer group in any demonstration. This will provide them with similar learning experiences and enable them to compare notes when validating the evidence.

Suggestion for Further Study

This research was the first of its kind which attempted to study information sources, communication channels and adoption of rubber production practices in Songkhla Province. Any research on the following aspects could further provide useful knowledge to understand communication process related to extension work in all its ramifications.

1. Study about interpersonal communication in the area may be very useful to find how the rubber information gets diffused in the system. It may further help in predicting the pattern of diffusion of certain information in the system and outlining the appropriate communication strategy.

2. Study in relation to the effectiveness of various sources and channels will provide a more valid basis for selection and use of various sources and channels. Such studies will make the communication process more efficient and effective.

3. Study conducted in the area of social, cultural, and psychological factors of rubber smallholders which influence the selection and use of various sources and channels will further go a long way in determining the pattern of usages of various sources and channels. Such knowledge will further enable an extension official to modify his communication strategy. Knowledge acquired in the areas stated above will provide valuable basis to outline communication strategy to those who are engaged in the task of agricultural development.

4. Study of decision innovation process of rubber smallholders will explain about the adoption of the rubber practices, e.g. the study can find the behavior of smallholders in decision making about rubber practices or rubber innovation in each area.

5. Study of using appropriate multimedia in transmitting rubber production information to rubber smallholders in a particular area and condition of rubber smallholders in the area. There were differences among rubber smallholders in different areas including physical characteristics and biological differences, lifestyle, belief, tradition, culture, and education differences. Various types of media should be adapted to match different characteristics of rubber smallholders in order to help information transmitted effectively.

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APPENDIX

Questionnaire

Information Sources, Communication Channels, and Adoption of Rubber Production Practices: A Case Study of Rubber Smallholders in Amphoe Hat Yai, Changwat Songkhla

Name of rubber smallholders:

Address: House Number Village Tambon Amphoe Hat Yai

I. Characteristics of rubber smallholder

O Personal Data

1. Sex

Male

Female

2. Age years

3. Religion

Buddhist

Christian

Muslim

Other (specify)

4. Education level

Illiterate

Pratomsuksa 4

Pratomsuksa 6

Mutthayomsuksa 3

Mutthayomsuksa 6

Diploma or Certificate

Bachelors Degree

Other (specify)

5. Household member person (s)

6. Total size of your rubber plantation rai

7. How many family labors who work in your rubber production? person (s)

8. How many hired labors who work in your rubber production? person (s)

9. How many total labors who work in your rubber production? person (s)

10. How many years do your experience in rubber production? year (s)

11. What type of rubber product do you sell?

12. Buyer is

13. Income from sale per time baht

14. How many days do you tap in a week? day

15. How many days do you tap in a year? day

16. How many days do you stop tapping in a year? day

17. Are you a member of group or organization?
 Yes
 No reason (skip to 19)
18. What kind of group or organization are you a member?
 (Can be more than 1 choice)
 Customer of Bank for Agriculture and Agricultural Co-operative
 Saving Co-operative Agricultural Co-operative
 Rubber Latex Seller Group Other (specify)
19. Do you use credit in rubber production?
 Yes
 No reason (skip to 21)
20. What source of credit do you use in rubber production?
 (Can be more than 1 choice)
 Relatives Neighbor or friend
 Merchant in your community or local area
 Commercial bank
 Bank for Agriculture and Agricultural Co-operative
 Co-operative or Agricultural Co-operative
 Other (specify)
21. What kind of production activities you use the credit for?
 (Can be more than 1 choice)
 Prepare soil Clone Planting
 Fertilization Weed and disease control Tapping
 Sheet-making Other (specify)
22. What kind of facilities, vehicles or electric appliance do you have?
 (Can be more than 1 choice)
 Television Radio Refrigerator
 Motorcycle Van Sedan / car
 Pick-up truck Telephone Mobile phone
 Other (specify)

II. Information source and communication channel of rubber smallholders

Information source

How often do you contact with these person?

Person	Contact		Frequency	Rubber information topics								
	Yes	No		Clone	Planting	Pruning	Fertilizer	Weed/disease control	Tapping	Sheet-making	Market	Etc. Specific
1.Relatives												
2.Neighbor/friend												
3.Merchant in community												
4.Merchant outside community												
5.AEO												
6. RRAFO												
7.Government official												
8.Private sector official												
9.Salesman												
10.Local leader												
11.Teacher in community												
12.Other												

Communication channel

Do you use these channels for transferring information about rubber production?

Channel	Yes	No	time per month	Person / Organization	Rubber information topics								
					Clone	Planting	Pruning	Fertilizer	Weed/disease control	Tapping	Sheet-making	Market	Other
1.Office visit													
2.Letter													
3.Make phone													
4.Home / farm visit													

Do you use to participate in these activities for exchange rubber information in last year?

Activity		Organization	Number of arrangement	Number of participation	Reason of non-participation	Rubber information topics								
						Clone	Planting	Pruning	Fertilizer	Weed/disease control	Tapping	Sheet-making	Market	Other
1.Demonstration	Yes No													
2.Meeting	Yes No													
3.Training	Yes No													
4.Field trip	Yes No													
5.Exhibition	Yes No													
6.VDO showing	Yes No													

Activity		Organization	Number of arrangement	Number of participation	Reason of non-participation	Rubber information topics								
						Clone	Planting	Pruning	Fertilizer	Weed /disease control	Tapping	Sheet-making	Market	Other
7.Movie	Yes No													
8.Contest	Yes No													
9.Agricultural day festival	Yes No													
10.Campaign	Yes No													

Mass method

★ Newspaper

1. Do you read newspaper to get information related to rubber production?

Yes

No reason (skip to 6)

2. How often did you read to information related to rubber production from newspaper last year?

Everyday

1-2 times / week

3-4 times / week

Once a month

Every month

Once in 2-3 months

Above 3 months / time

Once a year

Other (specify)

3. What time do you read newspaper?

4. What topic do you get rubber information from newspaper?

(Can be more than 1 choice)

Clone

Land preparation

Planting

Fertilization

Diseases control

Weed control

Tapping

Sheet-making

Marketing

Other (specify)

5. Do you think that the rubber information in the newspaper is good enough?

Yes

No something would be changed is

★ Radio

6. Do you listen to radio to get information related to rubber production?

Yes

No reason (skip to 11)

7. How often did you read to information related to rubber production from radio last year?

Everyday

1-2 times / week

3-4 times / week

Once a month

Every month

Once in 2-3 months

Above 3 months / time

Once a year

Other (specify)

8. What time do you listen to radio?

9. What topic do you get rubber information from radio?

(Can be more than 1 choice)

Clone

Land preparation

Planting

Fertilization

Diseases control

Weed control

Tapping

Sheet-making

Marketing

Other (specify)

10. Do you think that the rubber information from radio is good enough?

Yes

No something would be changed is

★ Television

11. Do you watch television to get information related to rubber production?
 Yes
 No reason (skip to 16)
12. How often did you watch to information related to rubber production from television last year?
 Everyday 1-2 times / week 3-4 times / week
 Once a month Every month Once in 2-3 months
 Above 3 months / time Once a year Other (specify)
13. What time do you watch television?
14. What topic do you get rubber information from television?
 (Can be more than 1 choice)
 Clone Land preparation Planting
 Fertilization Diseases control Weed control
 Tapping Sheet-making Marketing
 Other (specify)
15. Do you think that the rubber information from television is good enough?
 Yes
 No something would be changed is

★ Printed material

16. Do you read agricultural printed material to get information related to rubber production?
 Yes
 No reason (skip to 21)
17. How often did you read to information related to rubber production from agricultural printed material last year?
 Everyday 1-2 times / week 3-4 times / week
 Once a month Every month Once in 2-3 months
 Above 3 months / time Once a year Other (specify)
18. What time do you read agricultural printed material?
19. What topic do you get rubber information from agricultural printed material?
 (Can be more than 1 choice)
 Clone Land preparation Planting
 Fertilization Diseases control Weed control
 Tapping Sheet-making Marketing
 Other (specify)
20. Do you think that the rubber information from agricultural printed material is good enough?
 Yes
 No something would be changed is

★ **Broadcasting tower**

21. Do you hear village broadcasting tower to get information related to rubber production?
- Yes
- No reason (skip to part III)
22. How often did you hear to information related to rubber production from village broadcasting tower last year?
- Everyday 1-2 times / week 3-4 times / week
- Once a month Every month Once in 2-3 months
- Above 3 months / time Once a year Other (specify)
23. What time do you hear village broadcasting tower?
24. What topic do you get rubber information from village broadcasting tower?
(Can be more than 1 choice)
- Clone Land preparation Planting
- Fertilization Diseases control Weed control
- Tapping Sheet-making Marketing
- Other (specify)
25. Do you think that the rubber information from village broadcasting tower is good enough?
- Yes
- No something would be changed is
- In your opinion, what is the most effective method to transfer information related to rubber production to plantationer?
- Face-to-face information transfers by government officer
- Reported information, from government officer, by community representatives
- Announcement through media such as video, slide, etc. by government officer
- Field trip arranged in other community by government organization
- Printed materials such as leaflet, bulletin, brochure, etc. distributed by government organization or officers
- Newspaper column produced by government organization
- Radio or television program produced by government organization
- Other (specify)

III. Adoption in rubber production practice of rubber smallholder

1. Do you practice these topics in your rubber production?

Rubber production practices	Rubber smallholder's practice	
	Yes	No
Rubber Clone		
1) Seek information about clone.....		
2) Study about the suitable rubber clone for the area		
3) Use the recommended clone		
Planting		
4) Planted in the early rainy season		
5) Size of hole was 50 x 50 x 50 cm.		
6) Distance of rubber tree was 3 x 7 m. or 3 x 8 m.		
Pruning		
7) Start pruning the rubber tree when the tree was 1 year old		
8) Stop the pruning when the tree was 3 years old		
Weed or disease control		
9) Eradication weed or disease in the plantation		
Fertilizers		
10) Before tapping: apply the 20-8-20 formula fertilizers		
11) Put the fertilizers every 3 months		
12) After tapping: use the 15-15-15 formula		
13) Put twice a year after tapping		

Rubber production practices	Rubber smallholder's practice	
	Yes	No
Tapping		
14) Started tapping at 7 years old		
15) Tree height was 150 centimeter from the ground		
16) Tapping 1 day and 1 or 2 day interval		
Sheet-making		
17) Making sheet as the rubber product		

IV. The problem and obstacle of communication about rubber of rubber small holder

1. Do you have any problem and obstacle in communication about rubber production?

.....

.....

.....

.....

.....

2. Do you have any comment or suggestion on transferring of rubber information from source through channel to rubber small holder?

.....

.....

.....

.....

.....

☆ The question for the focus group

○ Rubber Clone

1. What kind of clone planted in your plantation?
 - All local clone reason
 - All clone endorsed by ORRAF (specify) reason
 - Some local clone rai
 - Some clone endorsed by ORRAF (or other governmental agencies)
 - (specify) 1) number rai
 - 2) number rai
 - 3) number rai
2. Where do you buy the clone?
3. How long have you been using these clones in your plantation? year(s)
4. How do you know about the clone endorsed by ORRAF in the first time?
5. How did you decide to use the clone endorsed by ORRAF in your plantation?
 - Did not use it reason (skip to 8)
 - Did it immediately reason (skip to 7)
 - Did it after some time reason
6. How long did it take before you decided to use that clone in your plantation?
7. In the future, do you use this clone when you plant again?
 - Yes
 - No reason

○ Planting

8. When do you start to plant the rubber tree in your plantation?
9. How many size of hole do you use for planting?
10. How many distance of rubber tree do you do?
11. Why do you use this method for your planting?
12. How do you know about this planting method?
13. In the future, do you use this method when you start to plant again?
 - Yes
 - No reason

○ Pruning

14. . Do you prune rubber tree in your plantation?
 - Yes
 - No reason (skip to 20)
15. When do you start to prune the rubber tree in your plantation?
16. How do you do for pruning rubber tree?
17. When do you stop to prune rubber tree?
18. Why do you stop to prune in that time?
19. In the future, do you prune when you plant again?
 - Yes
 - No reason

○ Weed control

20. . Do you control weeds in your plantation nowadays?
- Yes
 - No reason (skip to 25)
21. How do you control weeds in your plantation? (Can be more than 1 choice)
- By using hand reason (skip to 26)
 - By using cutting tools reason tool (skip to 26)
 - By using chemicals
 - Other (specify)
22. What kind of chemicals do you usually use to control weed in your plantation?
- 1) Chemical name Dose
 - 2) Chemical name Dose
 - 3) Chemical name Dose
 - 4) Chemical name Dose
 - 5) Chemical name Dose
23. How do you know about chemical name, dose and usage?
24. How did you decide to use chemicals for weed control?
- Did it immediately reason
 - Did it after some time reason
 - How long did it take before you decided to use those chemicals in your plantation?
 - Did not use it reason
25. In the future, do you use this method for your plantation?
- Yes
 - No reason

○ Disease control

26. Have rubber disease in your plantation?
- Yes
 - No reason
27. What rubber disease do you find in your plantation?
- 1.)
 - 2.)
 - 3.)
 - 4.)
 - 5.)
28. How do you do when you find rubber disease in your plantation?
- Nothing
 - Use chemical reason (skip to 34)
 - Other (specify)
29. How do you manage with the rubber disease?
- 1.)
 - 2.)
 - 3.)
 - 4.)
 - 5.)

30. Do you control disease in your plantation nowadays?
 Yes
 No reason (skip to 37)
31. How do you control disease in your plantation?
 No using chemical reason
 By using chemicals (skip to 33)
 Other (specify)
32. If you do not use chemical for disease controlling, how do you control?
 (skip to 37)
33. What kind of chemicals do you usually use to control weed in your plantation?
 1) Chemical name Dose
 2) Chemical name Dose
 3) Chemical name Dose
34. How do you know about chemical name, dose and usage?
35. How did you decide to use chemicals for weed control?
 Did it immediately reason
 Did it after some time reason
 How long did it take before you decided to use those chemicals in your
 plantation?
 Did not use it reason
36. In the future, do you use this method in your plantation?
 Yes
 No reason

○ Fertilizers

37. Do you apply fertilizers in your plantation?
 Yes
 No reason (skip to 44)
38. Before tapping the rubber trees, do you used fertilizers?
 Yes
 No reason (skip to 40)
39. What kind of fertilizers do you use in your plantation before tapping?
 1) Formula of fertilizers Age of rubber
 Dose Method
 2) Formula of fertilizers Age of rubber
 Dose Method
 3) Formula of fertilizers Age of rubber
 Dose Method
 4) Formula of fertilizers Age of rubber
 Dose Method
 5) Formula of fertilizers Age of rubber
 Dose Method
40. After tapping the rubber trees, have you used fertilizers?
 Yes
 No reason (skip to 43)

41. What kind of fertilizers did you use after tapping?
- 1) Formula of fertilizers Dose
 - Using time Distance from stem Method
 - 2) Formula of fertilizers Dose
 - Using time Distance from stem Method
 - 3) Formula of fertilizers Dose
 - Using time Distance from stem Method
 - 4) Formula of fertilizers Dose
 - Using time Distance from stem Method
 - 5) Formula of fertilizers Dose
 - Using time Distance from stem Method
42. How do you know what kind of fertilizers and on what dose you should use in your plantation?
43. How did you decide to use fertilizers in your plantation?
- Did it immediately reason
 - Did it after some time reason
 - How long did it take before you decided to use that clone in your plantation?
 - Did not use it reason
44. In the future, do you use fertilizers in your plantation?
- Yes kind of fertilizers
 - No reason

○ Tapping

45. Do you tap rubber tree in your plantation?
- Yes area rai
 - No reason (skip to 56)
46. How old of rubber tree do you begin tapping?
47. In the first tapping, you start at meter from the ground.
48. What is your tapping system?
- Tapping everyday
 - Tapping 1 day and 1 or 2 days interval
 - Tapping 2 days and 1 or 2 days interval
 - Tapping 3 days and 1 or 2 days interval
 - Tapping 4 days and 1 or 2 days interval
 - Tapping 5 days and 1 or 2 days interval
 - Other (specify)
49. Do you know how to tap rubber tree in this method?
50. How many days in a year do you tap the tree? day
51. When do you start tapping in each year?
52. How many days in a year do you stop to tap the tree? day
53. When do you stop tapping in each year?
54. How did you decide about tapping in your plantation?
- Adopt it immediately reason
 - Don't adopt it immediately reason
 - How long do you adopt tapping in your plantation?
 - Reject it reason

55. In the future, do you use tapping system in your plantation?

- Yes kind of fertilizers
- No reason

○ Sheet - making

56. How do you sell your rubber products?

- Rubber sheet (skip to 59)
- Rubber latex reason
- Rubber sheet and latex reason
- Other (specify) reason

57. The average price of rubber latex is baht / kilogram

58. To whom or what group you sell your latex to?

- Merchant inside community Merchant outside community
- Group of latex buyer Factory
- Other (specify)

59. What kind of rubber sheet you usually maker?

- No. 1 No.2 No.3 No.4
- Other (specify)

60. How do you know the method of sheet – making?

61. The average price of rubber sheet is baht / kilogram.

62. To whom or what group you sell your rubber sheet to?

- Merchant inside community Merchant outside community
- Group of rubber sheet buyer Factory
- Other (specify)

63. How did you decide about tapping in your plantation?

- Adopt it immediately reason
- Don't adopt it immediately reason
- How long do you adopt tapping in your plantation?
- Reject it reason

64. In the future, do you make rubber sheet for your product?

- Yes reason
- No reason

BIOGRAPHICAL DATA

Name – Surname	Mrs. Apinya Ratanachai
Date of birth	27 July 1969
Place of birth	Ratchaburi province
Education	B.Sc. (Agriculture) Prince of Songkla University M.Sc. (Agriculture) Kasetsart University
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