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## Agricultural Sustainability through Empowerment of Rubber Smallholders in Thailand

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### Abstract

*Following the economic crisis of 1997 in Thailand, rubber-smallholders along with many other farmers were forced to adjust their farming strategies and systems to maintain viability and remain sustainable into the future. One important aspect of change was empowering such smallholders to have more control over their farm, which had been until that time largely under the influence of their leaseholders and the rubber marketing system. Such empowerment involved several factors, including increased self-sufficiency, better understanding of the causal agents of their expenses and incomes, development of skills, increased participation in the decision-making processes which affected them, and increased participation in community organizations. Based on criteria of farm production and incomes, energy used, clarity of objectives, sufficient capital for necessary investment, and undertaking new initiatives to deal with problems, smallholder empowerment has increased markedly. This paper describes the process and outcome of increased empowerment of rubber smallholders in Thailand since the economic crisis of 1997, focusing particularly on the psychological aspects of the farmers' changing attitudes.*

### 1.0 Introduction

Following the economic crisis of 1997, agricultural development in Southeast Asian countries have followed common objectives and goals mainly centred around the need to provide a sustainable livelihood for farmers and to improve their productivity and income. During most of this century, agricultural development in Southeast Asian countries have emphasized development at both the macro level, through regional and national policy, and at the micro (farm) level through improved agricultural technologies to provide the farmer improved efficiency and productivity. The farmers, especially smallholders, have had to try to change their ways of management and to improve their potentials and abilities for increasing farm efficiency and production leading to increased farm income (DOAE, 1998). It is becoming evident that the higher the rate of growth, the larger the increase in

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inequity of rights and income gap of people between the agricultural sector and the non-agricultural sector. This situation prevails in Southeast Asian countries such as Thailand, Indonesia, the Philippines, and Malaysia (Ivanoff and Roux, 1994), which export a large amount of agricultural products such as rubber, oil palm and rice. More than 70% of total world rubber production comes from Southeast Asia, with more than twenty million farmers in Southeast Asia growing rubber (RRIT, 1999). This situation leads to many questions why smallholders in this region have been left behind, what are the main constraints to improving their situation, and their causes, what are the main factors influencing farmers' achievements, and how can farmers' potential and ability be improved? The current standard of living of smallholder is little different from the past. Farmers still use low agricultural technology such as low yielding strains, indigenous practices and management in their production systems and they have limited skills such as inefficient decision making processes, little initiative in developing new ideas, and a low educational level (Somboonsuke and Shivakoti, 2000). In this context, this research has attempted to (1) find what can be done to adjust and improve smallholding rubber-based farms' efficiency and productivity, and (2) examine what types of empowerment might help in moving rubber-based farm household income towards sustainability.

## **2.0 Empowerment Concept**

Empowerment is a process by which people, organizations, and communities gain mastery over of concern to them (Rappaport, 1987). The various definitions of 'empowerment' are generally consistent with empowerment as an intentional ongoing process centred in the local community, involving mutual respect, critical reflection, caring and group participation through which people lacking an equal share of valued resources gain greater access to and control over those resources (Cornell Empowerment Group, 1989). Empowerment is a process in all levels of organization. The empowering processes for individuals might include participation in community organization. At the organization level, empowerment might include collective decision-making and shared leadership. Empowerment at the community level might include collective action to access government and other community resources (Rappaport, 1984; Zimmerman and Zahniser, 1991).

The empowerment of the smallholder is the empowerment at the individual level of analysis. The construct integrates perceptions of smallholder control, a proactive approach to life, and critical understanding of the socio-political environment (Zimmerman, 1990).

## **2.1 Psychological Empowerment (PE)**

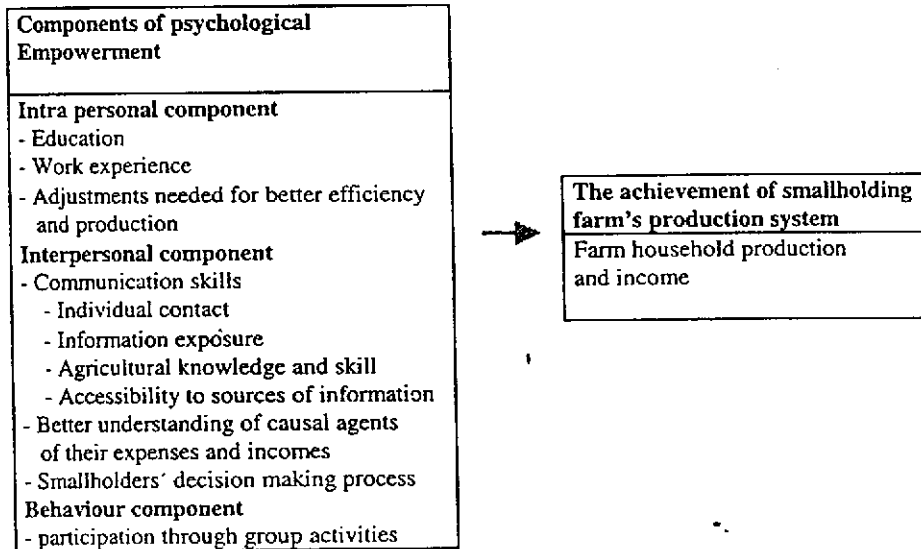
Psychological empowerment is one aspect of empowerment at the individual level of analysis. It includes learning about controlling agents and acting to influence those agents (Zimmerman et al. 1992). Thus, psychological empowerment includes such beliefs that a goal can be achieved through awareness about resources and identifying factors that hinder

or enhance one's efforts to achieve those goals and efforts to fulfil the goals. The components of psychological empowerment can be described in the form of a Nomological Network Model of empowerment at the individual level of analysis (Cronbach and Meehl, 1955). The Nomological Network Model is a theoretical framework that specifies relationships among components in such a way as to help both differentiate and define the construct of concern, and that enables the formulation of a measurement model (Zimmerman, 1993). These constructs are all consistent with empowerment theory. Thus, the components of psychological empowerment in terms of nomological network involve intrapersonal, interpersonal and behavioural components (Zimmerman et al., 1995). The intra-personal component refers to people (i.e. farmers) thinking about themselves and includes domain-specific perceived control, domain-specific self-sufficiency, motivation control and perceived competence. Domain-specific perceived control refers to beliefs about one's ability to exert influence in different life spheres such as the farm, family, work or the socio-political context (Paulhus, 1983). The interpersonal component refers to the understanding people have about their community and their environment (Kieffer, 1984; Fieire, 1973). In agriculture, the 'psychological empowerment of the farmer might include educational-experience, occupational experience, adjustments for better efficiency and production, (intra-personal components), communication skills such as individual contacts, information exposure, agricultural knowledge and skills in practice and management, increased accessibility to sources of information, better understanding of causal agents of their expenses and incomes, smallholders' decision making processes (interpersonal components) and participation through group activities, and using farm energy for production (behavioural component). These components influence the achievement of farm goals and objectives toward the sustainability of farm production and income in the future (Figure 1). In this study, we examine the issues of psychological empowerment in the context of rubber smallholders in southern Thailand. Below we describe the study area, definition and measurement of variables followed by a discussion of each component in order to understand smallholder's decision making process and identify empowerment factors for agricultural sustainability.

### 3.0 Methodology

The study area selected for study was Songkhla Province in Thailand where there are a total of 136,375 rubber smallholders in six main systems of smallholding rubber-based farms as classified by Somboonsuke and Shrivakoti (2000). The classification were based on individual farm production systems, socio-economic structure and agro-ecology and included: rubber-monoculture farming system (R1), rubber-intercrop farming system (R2), rubber-rice farming system (R3), rubber-fruit tree farming system (R4), rubber-livestock farming system (R5) and rubber-integrated farming system (R6). The study area was classified into three agroecozones based on three criteria following the methodology suggested by Trebuil et al. (1983) and Conway (1985): (1) topographic characteristics (primarily land slope), (2) land use and bio-diversity of rubber cultivation, and (3) socio-

**Figure 1: Nomological Network Model for psychological empowerment of rubber smallholders**



Source: Adapted from Zimmerman et al. 1995

economic characteristics. Three communities representative of the agroecozones (Khao Phra community, Ratthaphum district (agroecozone I), Phijit community, Namon district (agroecozone II) and Klong Phea community, Cha Na district (agroecozone III)) were selected using a purposive sampling method with the following criteria: (1) the communities were included as a target area of the Provincial Rubber Development Plan under the Rubber Development Strategic Plan of 1999-2003, (2) they represented each of the 6 classifications in these areas, (3) there were a large number of smallholding farms (more than 70% of all farmers) involved in rubber production, (4) there was variation in topography for comparison of farms among agroecozones, and (5) rubber-smallholders had faced constraints in their production system (DOAE, 1999). 379 rubber smallholders from six systems in three communities were selected using cluster and simple random sampling methods. Secondary data collection method included Participatory Rural Appraisal (PRA) technique and quantitative surveys were carried out by using questionnaires. Data were analyzed using SPSS version 10.0.

### 3.1 Definition and Measurement of Variables

#### *Measurement of Variables*

The measurement of variables for examining the factors influencing farm household income included the ratio and interval scales. The interval scales were classified based on the formula of the interval range (Miah, 1993):

$$\text{Interval range} = \frac{\text{Maximum value} - \text{Minimum value}}{\text{No. of order}}$$

#### *Construction and description of variables*

The construction of variable description were divided into four steps; (1) step I: After we classified the scales of variable, field survey was done by administering questionnaire with key small holders, rural officers, extension officers, and ORRAF officers in study area to set the description of variable scale, (2) step II: Group discussion technique were used for setting variable description in each variable scale, (3) step III: Testing of the description of variables were done by PRA technique with key small holders, rural officers, extension officers and ORRAF officers for confirmation of the validity and reliability of the description of variable scale, and (4) Step IV: Improvement of the description of variable scales (please see Appendix Table-1).

### 4.0 Results and Discussion

The results of this study are described in terms of the components of psychological empowerment, namely intra- personal component, the interpersonal component, and the behavioural component based on the analysis of empowerment variables discussed above.

#### 4.1 Intra-personal Component

The intra-personal component is represented by the variables involving personal experience and potential such as educational and occupational experience, and the adjustments needed for farm development.

##### *Educational experience (EDU)*

The number of years of formal education attended was defined as the educational experience (Table-2). It was found that the average length of formal schooling of smallholders was about 9.0 years; nearly 41% of total smallholders completed preliminary school (5-7years) (Table 1),while only 2% of total smallholders completed above secondary school (>14 years) The educational experience has an effect on the participation in local rubber smallholders' groups in the community, accessibility to government services and sources of information available in community (Oakley et al., 1991).

**Table 1: The Number and Percentage of Smallholders' Educational Experience**

| Educational Level                 | Rubber-Based Farming System (R) |       |     |       |     |      |     |      |     |      |      |      |       |      |
|-----------------------------------|---------------------------------|-------|-----|-------|-----|------|-----|------|-----|------|------|------|-------|------|
|                                   | R1                              |       | R2  |       | R3  |      | R4  |      | R5  |      | R6   |      | Total |      |
|                                   | No                              | %     | No  | %     | No  | %    | No  | %    | No  | %    | No   | %    | No    | %    |
| Just literate (1-4 yr.)           | 5                               | 15.2  | 9   | 20.5  | 9   | 20.5 | 6   | 5.1  | 5   | 4.9  | 1    | 2.7  | 35    | 9.2  |
| Primary school (5-7yr)            | 22                              | 66.2  | 15  | 34.1  | 24  | 54.4 | 53  | 44.9 | 34  | 33.0 | 7    | 18.9 | 155   | 40.9 |
| First Secondary school (8-11 yr.) | 3                               | 9.1   | 19  | 43.2  | 6   | 13.6 | 51  | 43.2 | 41  | 39.2 | 23   | 62.2 | 143   | 37.7 |
| Secondary school (12-13 yr.)      | 2                               | 6.1   | -   | -     | 5   | 11.4 | 6   | 5.1  | 20  | 19.4 | 6    | 16.2 | 39    | 10.3 |
| Above secondary School (≥ 14 yr.) | 1                               | 3.0   | 1   | 2.3   | -   | -    | 2   | 1.7  | 3   | 2.9  | -    | -    | 7     | 1.8  |
| Total                             | 33                              | 100.0 | 44  | 100.0 | 44  | 100. | 118 | 100. | 103 | 100. | 37   | 100. | 379   | 100. |
| Average: (yr.)                    | 7.8                             | -     | 8.1 | -     | 7.5 | -    | 9.8 | -    | 9.7 | -    | 10.4 | -    | 9.2   | -    |

Source: Field survey, 2000.

**Table 2: The Number and Percentage of Smallholders' Occupation Experience.**

| (Yrs)          | Rubber-Based Farming System (R) |      |      |      |      |      |      |      |      |      |      |      |       |        |
|----------------|---------------------------------|------|------|------|------|------|------|------|------|------|------|------|-------|--------|
|                | R1                              |      | R2   |      | R3   |      | R4   |      | R5   |      | R6   |      | Total |        |
|                | No                              | %    | No   | %    | No   | %    | No   | %    | No   | %    | No   | %    | No    | %      |
| 10 and below   | 1                               | 3.0  | 7    | 15.9 | 6    | 13.6 | 19   | 16.1 | 11   | 10.7 | 10   | 27.0 | 54    | 14.2   |
| 11-20          |                                 |      |      |      |      |      |      |      |      |      |      |      |       |        |
| 21-30          | 12                              | 36.4 | 21   | 47.7 | 16   | 36.4 | 57   | 48.3 | 45   | 46.6 | 16   | 43.2 | 170   | 44.9   |
| 31-40          | 12                              | 36.4 | 7    | 15.9 | 19   | 43.2 | 33   | 28.0 | 29   | 28.2 | 8    | 21.6 | 108   | 28.5   |
| More than 40   | 7                               | 21.2 | 8    | 18.2 | 2    | 4.5  | 9    | 7.6  | 13   | 12.6 | 3    | 8.1  | 42    | 11.1   |
| Total          | 33                              | 100. | 44   | 100. | 44   | 100. | 118  | 100. | 103  | 100. | 37   | 100. | 379   | 100.00 |
| Average: (yr.) | 23.6                            | 0    | 20.4 | 0    | 20.9 | 0    | 18.9 | 0    | 21.9 | 0    | 18.4 | 0    | 20.3  | 0      |

Source: Field survey, 2000.

### Occupational experience (AEF)

Occupational experience was defined as the number of years worked at a particular occupation. The average number of years of occupation of smallholders was about 20 years, with nearly 45% of smallholders having worked in rubber farming from ten to twenty years (Table-2). The relatively high experience of smallholders at their occupation also has an effect on adjustment of smallholders to new or changing farm production system. The more smallholders are experienced, the better their decisions concerning the process of farm management, skill, knowledge and attitude in their occupation (Thungwa, 1996). Occupational experience as a tool of the empowerment of smallholders is important to develop and increase the strength and capacity of smallholders in such things as the decision making process for decreasing risk management, and increasing smallholders' learning processes in the production system (Kreangsak, 1990).



*The Level of adjustment needed for better efficiency and production (SAN)*

It has been seen (Table-3) that the majority of smallholders in the study area need only a small level of adjustment to improve their efficiency and production, with the overall average of 2.25 on the scale (where 'small' = 1.76-2.50), because smallholders, have faced limitations such as low educational experience (Table-1) which affect their adoption of such things as new technology and innovation, and also affect their perception and understanding agricultural knowledge, and low capital for investment that affect the expansion of the farm operation. In comparing smallholding systems, it was found that smallholders in system R<sub>1</sub> (rubber-monoculture) have the largest average level of adjustment needed, with 2.91 (moderate level  $x=2.51-3.25$ ). Smallholders in this system derive income from only rubber, and it is insufficient income for the family, so they must

**Table 3: Level of Smallholders' Adjustment Needed for Better Efficiency and Production**

| Rubber-Based Farming System | Level of Adjustment Needed |      |          |      |        |      |    |      |           |
|-----------------------------|----------------------------|------|----------|------|--------|------|----|------|-----------|
|                             | Much                       |      | Moderate |      | Little |      | No |      | Index (x) |
|                             | No                         | %    | No       | %    | No     | %    | No | %    |           |
| Rubber- monoculture (R1)    | 8                          | 24.2 | 16       | 48.5 | 7      | 21.2 | 2  | 6.1  | 2.91      |
| Rubber-intercrop (R2)       | -                          | -    | 13       | 29.5 | 27     | 61.4 | 4  | 9.1  | 2.20      |
| Rubber-rice (R3)            | -                          | -    | 10       | 22.7 | 26     | 59.1 | 8  | 18.2 | 2.05      |
| Rubber-rice (R3)            | -                          | -    | 37       | 31.4 | 63     | 53.4 | 18 | 15.3 | 2.16      |
| Rubber-fruit tree (R4)      | -                          | -    | 36       | 35.0 | 54     | 52.4 | 13 | 12.6 | 2.22      |
| Rubber-livestock (R5)       | 1                          | 2.7  | 13       | 35.1 | 20     | 54.1 | 3  | 8.1  | 2.32      |
| Rubber- integrated (R6)     |                            |      |          |      |        |      |    |      |           |
| Total                       | 9                          | 2.4  | 125      | 33.0 | 197    | 52.0 | 48 | 12.7 | 2.25      |

Source: Field survey, 2000

try to improve their efficiency and production (Somboonsuke and Shivakoti, 2000), while smallholders in system R<sub>3</sub> (rubber-rice) have the lowest average of 2.05, indicating that smallholders in this system have got the farm practice and management experience from their ancestors, especially rice cultivation, and they think it is not necessary to change their way of farm operation. When we examine the issues of adjustment needed in the farm production system bio-physical and socio-economic components, it was founded water resources management, improvement of soil fertility, and coordinated efforts while conducting of feasibility studies and research to improve the irrigation system and management of soil fertility for specific crops were needed, while using high yielding varieties only biological adjustment was needed. And also for improving and strengthening local farmers' group social adjustment was needed while for the establishment of local capital fund for investment and improving local marketing system economic adjustments were needed.

## 4.2 Inter Personal Components

In this study, the interpersonal components of smallholders' empowerment are defined in terms of the individual contract with change agents, information exposure, accessibility to sources of information, agricultural knowledge and skills, better understanding of the causal agents of their expenses and incomes and the decision-making processes leading to transformation which affected them, as described following:

### *Individual contact with change agent (ICA)*

When smallholders have more opportunity to exchange knowledge and to share ideas with change agents, they are empowered in improving farm efficiency and productivity (Zimmerman, 1993). The results of the study, however, showed that smallholders have a low level of individual contact with change agents in their community with an overall average response score index of 2.26 (low level  $x=1.76-2.50$ ) (Table-4). It was found that smallholders faced the main constraints due to insufficient change agents posted in local area, inefficient extension system prevalent in local area and also, less attention paid to contact change agent in community which affected the communication between change agents and smallholders (Somboonsuke and Shivakoti, 2000). In comparing smallholding systems, it was found that smallholders in system  $R_2$  (rubber-intercrop) had the greatest level of individual contact with change agents in the community with an average index of 2.59 (moderate level  $x=2.51-3.25$ ), because production systems of this type needed practiced management and smallholders needed more information including inputs such as fertilizer and improved varieties from change agents. The smallholders in system  $R_5$  (rubber-livestock) on the other hand had the lowest level of individual contact with change agents in the community at an average index of 2.10 (little level  $x=1.76-2.50$ ) because, normally, smallholders who reared livestock had long experience in livestock production and, also, they received their training and experience from their ancestors, and they did not feel it necessary to receive new technology from other sources; also, there were usually only a small, insufficient number of local livestock officers in the community compared to plant specialists.

### *Information exposure (INE)*

Information exposure is one of the most important empowerment factors in the adjustment of smallholding farmers. It also correlates with the rate of adoption and diffusion of innovations of farmers (Roger and Shoemaker, 1971) and affects the success of the operation (Rattanachai and Somboonsuke, 1997). The result of the study shows that smallholders had little information exposure with an overall average of 2.03 (little level  $x=1.76-2.50$ ) (Table-5), indicating that smallholders have little ability and potential of perception and application of agricultural knowledge. Although smallholders have more occupational experience (Table 3), they have low educational status, which is one of the main limiting factors in the adoption and diffusion processes of smallholders. When comparing smallholding systems, it was found that smallholders in  $R_5$  (rubber-livestock)

have the highest level of information exposure at a score of 2.20 (little level  $x=1.76-2.50$ ) because they often have had to adjust their practice and management by themselves and have learned by doing for a long time, while smallholders in R<sub>3</sub> (rubber-rice) have the lowest level of information exposure at 1.70 (never level  $x=1.00-1.75$ ) due to the lowest educational level (Table 1).

**Table 4: Number and Percentage of Individual Contact with Change Agent**

| <i>Rubber-Based Farming System</i> | <i>Level of Frequency of Individual Contact</i> |          |                 |          |               |          |              |          | <i>Index (x)</i> |
|------------------------------------|---|----------|-----------------|----------|---------------|----------|--------------|----------|------------------|
|                                    | <i>Much</i>                                     |          | <i>Moderate</i> |          | <i>Little</i> |          | <i>Never</i> |          |                  |
|                                    | <i>No</i>                                       | <i>%</i> | <i>No</i>       | <i>%</i> | <i>No</i>     | <i>%</i> | <i>No</i>    | <i>%</i> |                  |
| Rubber – monoculture (R1)          | 1   | 3.0      | 21              | 63.6     | 7             | 21.2     | 4            | 12.1     | 2.57             |
| Rubber – intercrop (R2)            | -   | -        | 29              | 65.9     | 12            | 27.3     | 3            | 6.8      | 2.59             |
| Rubber – rice (R3)                 | 1   | 2.3      | 11              | 25.0     | 25            | 56.8     | 7            | 15.9     | 2.13             |
| Rubber – fruit tree (R4)           | -   | -        | 41              | 34.7     | 62            | 52.5     | 15           | 12.7     | 2.22             |
| Rubber – livestock (R5)            | -   | -        | 27              | 26.2     | 63            | 61.2     | 3            | 12.6     | 2.10             |
| Rubber – integrated (R6)           | -   | -        | 8               | 21.6     | 28            | 75.7     | 1            | 2.7      | 2.19             |
| Total                              | 2   | 5.0      | 137             | 36.1     | 197           | 52.0     | 43           | 11.3     | 2.25             |

Source: Field survey, 2000

**Table 5: Number and Percentage of Smallholders' Information Exposure**

| <i>Rubber-Based Farming System</i> | <i>Level of Smallholders' Information Exposure</i> |          |                 |          |               |          |              |          | <i>Index (x)</i> |
|------------------------------------|--|----------|-----------------|----------|---------------|----------|--------------|----------|------------------|
|                                    | <i>Much</i>  |          | <i>Moderate</i> |          | <i>Little</i> |          | <i>Never</i> |          |                  |
|                                    | <i>No</i>  | <i>%</i> | <i>No</i>       | <i>%</i> | <i>No</i>     | <i>%</i> | <i>No</i>    | <i>%</i> |                  |
| Rubber – monoculture (R1)          | -  | -        | 5               | 15.2     | 17            | 51.5     | 11           | 33.3     | 1.82             |
| Rubber – intercrop (R2)            | -  | -        | 11              | 25.0     | 19            | 43.2     | 14           | 31.8     | 1.90             |
| Rubber – rice (R3)                 | -  | -        | 6               | 13.6     | 19            | 43.2     | 19           | 43.2     | 1.70             |
| Rubber – fruit tree (R4)           | -  | -        | 27              | 22.9     | 78            | 66.1     | 13           | 11.0     | 2.11             |
| Rubber – livestock (R5)            | -  | -        | 30              | 29.1     | 64            | 62.1     | 9            | 8.7      | 2.20             |
| Rubber – integrated (R6)           | -  | -        | 7               | 18.9     | 25            | 67.6     | 5            | 13.5     | 2.05             |
| Total                              | -  | -        | 86              | 22.7     | 222           | 58.6     | 71           | 18.7     | 2.05             |

Source: Field Survey, 2000

#### *Agricultural knowledge and skill in practice and management (KUA)*

Knowledge and skill in practice and management are necessary for smallholders to improve farm efficiency and productivity. The influence of the learning system is important because it affects the achievement in the farm operation and also affects the decision making process of smallholders in farm management (Rattanachai and

Somboonsuke, 1997). In this study, the results showed that smallholders have a low level of knowledge and skill in practice and management with an overall average score of 2.06 (low level  $x=1.76-2.50$ )(Table 6). This seems to be largely due to the fact that smallholders are still using indigenous practice and management skills that they have received from their ancestors, and are reluctant to accept and learn new technology and innovations. When comparing smallholding systems, it was found that smallholders in R<sub>6</sub> (rubber-integrated) had the highest level of knowledge and skill in practice and management at a mean score of 2.16 (low level  $x=1.76-2.50$ ), because this smallholding system has a variety of production activities, thus smallholder have to know and search new practice and management to improve the farm operation at all times. Smallholders in type R1 (rubber-monoculture) on the other hand had the lowest level of knowledge and skill in practice and management at a score of 1.82 (low level  $x=1.76-2.50$ ). Smallholders in this system normally had received indigenous knowledge and skills from their ancestors, thus they felt it was not necessary to receive knowledge from the government. They also have a low educational level that affects the adoption and diffusion of technology (Kreangsak, 1990).

**Table 6: Number and Percentage of Small Holders' Knowledge and Skills in Farm Management**

| <i>Rubber-Based Farming System</i> | <i>Level of Smallholders' Knowledge and Skill</i> |          |                 |          |               |          |              |          | <i>Index (x)</i> |
|------------------------------------|---|----------|-----------------|----------|---------------|----------|--------------|----------|------------------|
|                                    | <i>Much</i>                                       |          | <i>Moderate</i> |          | <i>Little</i> |          | <i>Never</i> |          |                  |
|                                    | <i>No</i>   | <i>%</i> | <i>No</i>       | <i>%</i> | <i>No</i>     | <i>%</i> | <i>No</i>    | <i>%</i> |                  |
| Rubber-Monoculture (R1)            | 2   | 6.1      | 4               | 12.1     | 13            | 39.4     | 14           | 42.4     | 1.82             |
| Rubber-Intercrop (R2)              | -   | -        | 25              | 56.2     | 17            | 38.6     | 2            | 4.5      | 2.52             |
| Rubber-Rice (R3)                   | -   | -        | 12              | 27.3     | 17            | 38.6     | 15           | 34.1     | 1.93             |
| Rubber-Fruit tree (R4)             | -   | -        | 15              | 12.7     | 82            | 69.5     | 21           | 17.8     | 1.95             |
| Rubber-Livestock (R5)              | -   | -        | 22              | 21.4     | 67            | 65.0     | 14           | 13.6     | 2.07             |
| Rubber-integrated (R6)             | -   | -        | 9               | 24.3     | 25            | 67.6     | 3            | 8.1      | 2.16             |
| Total                              | 2   | 5.0      | 87              | 23.0     | 221           | 58.3     | 69           | 18.2     | 2.06             |

*Source: Field survey, 2000*

#### *Accessibility to sources of information (AIN)*

Change agents and television are the main sources of information that smallholders can access in community with an average score of 3.35 (much level  $x=3.26-4.00$ ) and 2.51 (moderate level  $x=2.51-3.25$ ), respectively. However, the overall average level of accessibility to sources of information is 2.42 (little level  $x=2.51-3.25$ ), indicating that smallholders, presently, have little access to sources of information in the community. When comparing systems, it was found that smallholders had little access to sources of information in the community (Table-7), with an average level of little ( $x=1.76-2.50$ ). Although most smallholders have television and mainly get information from television.

they have little interest in agricultural programmes. Smallholders normally get information from change agents, however there are inefficient change agents. Inefficient change agents are main constraints of smallholders in accessibility the sources of information in community (Kreangsak, 1990).

**Table 7: Average of Level of Smallholders' Accessibility to Sources of Information**

| <i>Information Sources</i> | <i>Rubber-Based Farming System(R)</i> |                      |                      |                      |                      |                      | <i>INDEX(x)</i> |
|----------------------------|---------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|-----------------|
|                            | <i>R<sub>1</sub></i>                  | <i>R<sub>2</sub></i> | <i>R<sub>3</sub></i> | <i>R<sub>4</sub></i> | <i>R<sub>5</sub></i> | <i>R<sub>6</sub></i> |                 |
| 1. TV                      | 2.0 <sup>2</sup>                      | 2.4                  | 2.5                  | 2.7                  | 3.0                  | 2.5                  | 2.51            |
| 2. Radio                   | 1.5                                   | 1.7                  | 2.2                  | 2.3                  | 1.1                  | 2.0                  | 1.81            |
| 3. Journal                 | 1.6                                   | 1.8                  | 1.1                  | 1.6                  | 2.0                  | 1.7                  | 1.92            |
| 4. Village radio tower     | 1.2                                   | 1.3                  | 1.1                  | 2.2                  | 3.5                  | 2.2                  | 1.61            |
| 5. Newspaper               | 1.6                                   | 2.8                  | 2.0                  | 2.5                  | 2.0                  | 3.0                  | 2.30            |
| 6. Book                    | 2.5                                   | 2.0                  | 2.0                  | 2.5                  | 2.0                  | 2.8                  | 2.30            |
| 7. Poster/Leaflet          | 2.0                                   | 2.0                  | 2.5                  | 2.2                  | 2.0                  | 2.5                  | 2.21            |
| 8. Change Agent            | 3.8                                   | 3.8                  | 3.0                  | 2.8                  | 3.5                  | 2.5                  | 3.35            |
| 9. Rural officer           | 2.5                                   | 2.4                  | 2.5                  | 2.2                  | 2.0                  | 2.8                  | 2.40            |
| 10. ORRAF officer          | 1.5                                   | 3.0                  | 3.0                  | 1.7                  | 3.5                  | 1.8                  | 2.41            |
| 11. Livestock officer      | 2.5                                   | 2.0                  | 3.0                  | 3.0                  | 2.2                  | 1.7                  | 2.41            |
| Average                    | 2.05                                  | 2.29                 | 2.27                 | 2.33                 | 2.43                 | 2.31                 | 2.42            |

*Source: Field survey, 2000*

#### *Better understanding of causal agents of their expenses and incomes*

The more smallholders understand the causal agents of their expenses and incomes, the more they can evaluate their potential and capacity and set plans and implementation strategies. Table 8 shows, however, that smallholders generally have a small level of understanding of the causal agents of their expenses and incomes with an overall average score of 1.48 (little level  $x=1.00-1.67$ ), indicating that smallholders, presently, are not able to evaluate themselves and they don't know how to improve efficiency and production or how to set farm plans and implementation strategies.

**Table 8: Smallholders' Opinions on the better Understanding of Causal Agents of their Expenses and Incomes**

| Farm Situation                 | Rubber-Based Farming System (R) |                |                |                |                |                | Index |
|--------------------------------|---------------------------------|----------------|----------------|----------------|----------------|----------------|-------|
|                                | R <sub>1</sub>                  | R <sub>2</sub> | R <sub>3</sub> | R <sub>4</sub> | R <sub>5</sub> | R <sub>6</sub> |       |
| 1. Farm income                 | 1.5                             | 1.7            | 1.5            | 1.6            | 1.4            | 1.6            | 1.56  |
| 2. Farm capital for investment | 1.2                             | 1.4            | 1.1            | 1.6            | 1.8            | 1.5            | 1.44  |
| 3. Cost of production per year | 1.7                             | 1.9            | 1.5            | 2.2            | 1.5            | 2.0            | 1.80  |
| 4. Farm production per year    | 1.5                             | 1.9            | 1.3            | 1.8            | 1.5            | 1.7            | 1.62  |
| 5. Farm debt                   | 1.2                             | 1.0            | 1.3            | 1.1            | 0.9            | 0.7            | 1.04  |
| 6. Farm saving                 | 1.5                             | 1.4            | 1.2            | 1.8            | 1.2            | 1.4            | 1.43  |
| Average                        | 1.43                            | 1.55           | 1.32           | 1.68           | 1.40           | 1.48           | 1.48  |

Source: Field survey, 2000.

#### *Smallholders' decision-making process*

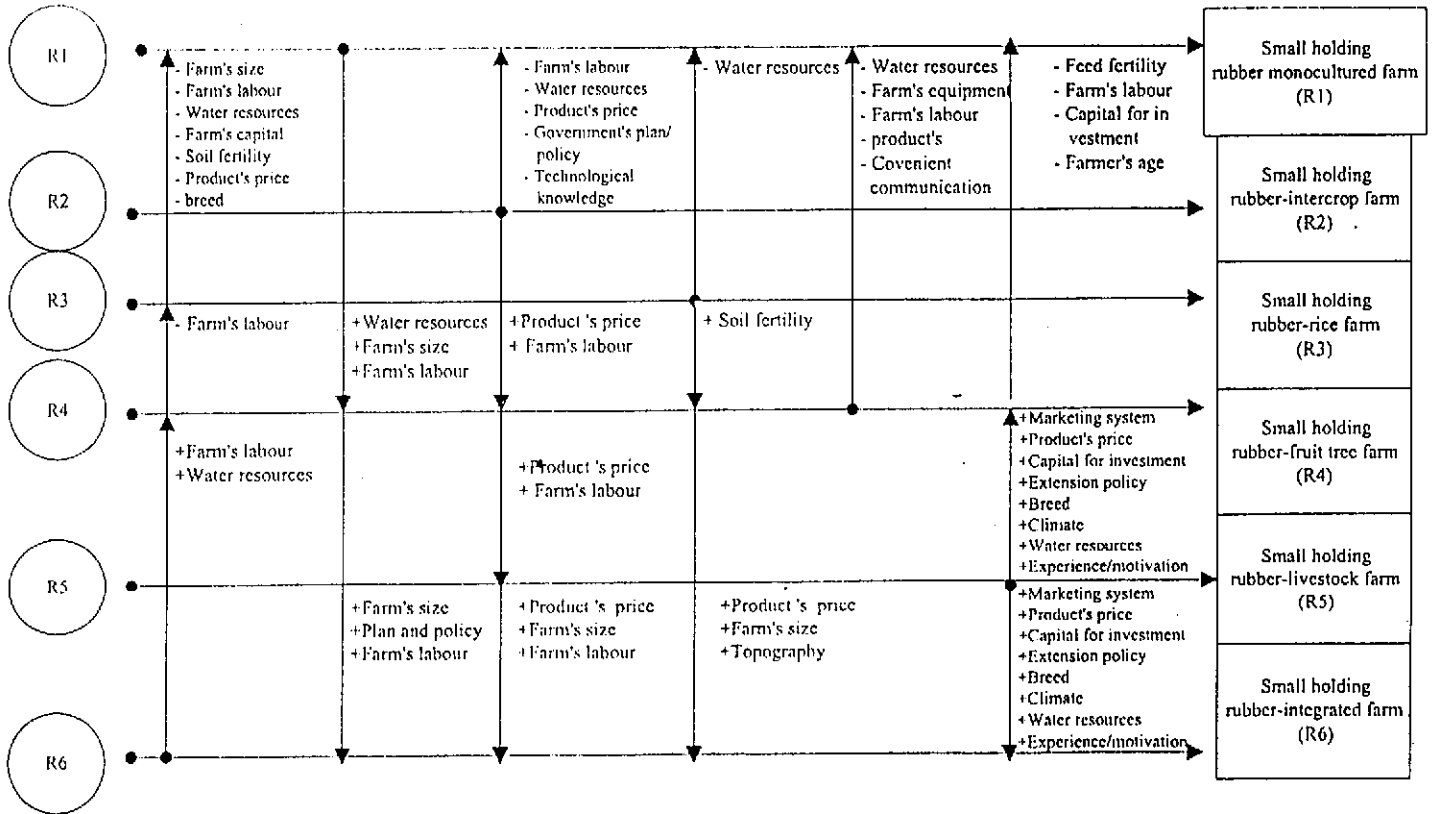
Smallholders' decision-making process can be measured in term of empowerment that affects farm transformation under existing conditions, as explained following and shown in Figure 2: (1) smallholders in smallholding rubber-monoculture farms (R1) will be able to change to smallholding rubber-fruit tree farms given sufficient water resources, farm size and available labour, and to smallholding rubber-integrated farm (R6) if conditions such as product price, farm size, and available labour are met; (2) smallholders in smallholding rubber-intercrop farms (R2) will be able to change to smallholding rubber-fruit tree farms (R4) and smallholding rubber-livestock farm (R5) if conditions of product price and available labour are met, and to smallholding rubber-integrated farms (R6) if product price, farm size, and available labour are satisfied. In addition, it can change to smallholding rubber monoculture farm (R1) under limitations of farm labour, water resources, product price, government plan and policy and technological knowledge; (3) smallholding rubber-rice farms (R3) will be able to change to smallholding rubber-fruit tree farms (R4) if the soil is fertile, to smallholding rubber-integrated farm (R6) under suitable conditions of product price, farm size, and topography, and to smallholding rubber-monoculture farms (R1) if water resources are adequate; (4) smallholding rubber-fruit tree farms (R4) will be able to change to smallholding rubber-monoculture farms (R1) if water resources are limited or farm equipment, farm labour, product price and inconvenient communication are unavailable for the transformation; (5) smallholding rubber-livestock farms (R5) will be able to change to smallholding rubber-fruit tree farms (R4) or to smallholding rubber-integrated farms (R6) under suitable condition, i.e. a good marketing system, product price, capital for investment, extension policy, climate, water resources and smallholders' experience and motivation, and also they can change to a

smallholding rubber-monoculture farm (R1) under limited condition of feed and fertilizer in community, farm labour, and deficient capital for farm investment; (6) smallholding rubber-integrated farms (R6) will be able to change to smallholding rubber-livestock farms (R4) under suitable conditions of farm labour and water resources and to change to smallholding rubber-rice farms (R3) under suitable conditions of farm labour. Also, it can change to smallholding rubber-monoculture farm (R1) under limited conditions of farm size, water resources, farm capital soil fertility, product price and quality. These results indicate that the decision making process leading to farm transformation for better productivity and income is one of variables of smallholders' empowerment.

#### **4.3 Behaviour Component**

The behaviour component of smallholders' empowerment is described in terms of smallholders' participation through local farmers' groups such as rubber sheet-making groups and rubber latex group and the small holders using farms' energy for production such as capital for farm investment, level of farm equipment and machinery use, fertilizer and feed use, actual agricultural labour availability, and daily working period of total farm labour, respectively.

Figure 2: Smallholders' decision-making process



Note : - = unsuitable condition and + = suitable condition -----, able to change



### *Small holders' participation through local farmers' group (PTG)*

Participation is a process which enables smallholders to organize themselves, to identify needs, and to share in the development and evaluation of activities as well as in the benefit sharing from them. Without holding adequate power smallholders can not make effective decisions. The practical significance of people's participation therefore lies at the level where decisions are taken (Wignaraja et al., 1991). In addition, organization is a fundamental instrument of participation. If unorganized, smallholders are unable to build up a power base from which they can claim influence and benefits in their community. Organization is, thus, closely linked to empowerment (Oakley et al., 1991). In this study, the results indicate that smallholders at present are not strong participants in-group activities with an overall score of 2.36 (low level  $x=1.76-2.50$ )(Table-9). Smallholders, normally, participate in some group activities such as group meetings, and express and share ideas, however, they do not participate in setting plans and implementation strategies, co-decision making or solving problems (see the criteria in Appendix Table-1). Although they participate in group meetings (moderate level of participation throughout the group with an average of 2.80) they only observe and get information, while showing a low level of participation in the form of setting plans and implementing strategies (group average of 2.10).

**Table 9: Average and Criteria of the Level of Smallholders' Participation through Group Activity<sup>(1)</sup>**

| <i>Activities<sup>(1)</sup></i>                         | <i>Rubber-Based Farming System (R)</i> |                      |                      |                      |                      |                      | <i>Index</i> |
|---|--|----------------------|----------------------|----------------------|----------------------|----------------------|--------------|
|   | <i>R<sub>1</sub></i>                   | <i>R<sub>2</sub></i> | <i>R<sub>3</sub></i> | <i>R<sub>4</sub></i> | <i>R<sub>5</sub></i> | <i>R<sub>6</sub></i> |              |
| 1. Co-decision-making                                   | 2.1                                    | 1.9                  | 2.4                  | 2.9                  | 2.8                  | 2.6                  | 2.44         |
| 2. Group meetings                                       | 2.0                                    | 2.9                  | 1.7                  | 4.4                  | 3.1                  | 2.7                  | 2.80         |
| 3. Setting plans and implementation strategies          | 2.2                                    | 2.5                  | 1.4                  | 3.1                  | 1.8                  | 1.9                  | 2.12         |
| 4. Solving problems                                     | 2.3                                    | 2.4                  | 1.9                  | 2.6                  | 2.0                  | 2.9                  | 2.35         |
| 5. Opportunity to exchange ideas                        | 2.5                                    | 1.8                  | 2.0                  | 3.1                  | 2.4                  | 2.6                  | 2.40         |
| 6. Opportunity to speak and share ideas between members | 1.9                                    | 2.1                  | 1.5                  | 2.9                  | 1.9                  | 2.3                  | 2.10         |
| Average   | 2.13                                   | 2.29                 | 1.83                 | 2.97                 | 2.37                 | 2.51                 | 2.36         |

<sup>(1)</sup> *Rubber sheet-making group and rubber-latex group*

*Source: Field survey, 2000.*

*Small holders' use of farm energy for production (CAI, FUF, EBM, DWP, and FAL)*

It was found that small holders in all systems have invested capital at an average of 11,333.00 Thai baht per hectare per year (Table-10). The highest amount was found in R6 system with 13,655.73 baht per hectare per year. This system, therefore, was operating under more complicated management, while R2 system has invested the lowest amount with 7,555.00 Thai baht per hectare per year, because that was budget limit set by ORRAF to subsidize small holders who participated in replanting programme. For the use of fertilizer and feed, it was found that the total average use of fertilizer and feed of all systems amounted to 1,422.00 kilogram per hectare per year with the highest was founded in R5 system of 3,265.00 kilogram per hectare per year, and the lowest was founded in R1 system. Average daily working period of farm labour was found at an average of average was 6.57 hours per day with the highest reported in R5 system of 7.45 hours per day per labour and the lowest in R4 system with 6.03 hours per day per labour. It is indicated that smallholders, presently, have worked in their field less than the national daily working period (8 hours per day per labour). In addition, we studied the level farm equipment and machinery use, and the actual agricultural labour, it was found that small holders are using low level of farm equipment and machinery in production system with an overall score of 1.77 (little level  $x=1.76-2.50$ ) and use of actual agricultural labour in their production system averaged 2.35 labours per farm.

**Table 10: The use of Farms' Energy for Production of Rubber-based Farming System**

| <i>Farm Energy</i>   | <i>Rubber-Based Farming System ( R )</i> |           |           |           |           |           | <i>INDEX</i> |
|--|--|-----------|-----------|-----------|-----------|-----------|--------------|
|  | <i>R1</i>                                | <i>R2</i> | <i>R3</i> | <i>R4</i> | <i>R5</i> | <i>R6</i> |              |
| 1.Capital for investment<br>(CAI) (Baht/ha/yr.)                        | 10,329.5                                 | 7,554.5   | 10,494.1  | 9,525.11  | 9,436.99  | 13,655.7  | 11332.60     |
| 2.Level of using farm's<br>equipment and machinery<br>(EBM)(x)         | 1.58                                     | 1.73      | 1.54      | 1.71      | 1.89      | 2.18      | 1.77         |
| 3.Using fertilizer (FUF)<br>(kg/ha/yr.)                                | 84                                       | 155       | 102       | 94        | 326       | 98        | 143          |
| 4.Actual agricultural labour<br>(FAL) (labour/farm)                    | 2.72                                     | 2.20      | 2.43      | 2.05      | 2.17      | 2.54      | 2.35         |
| 5.Daily working period of<br>total farm labour(DWP)<br>(hr/day/labour) | 6.15                                     | 6.82      | 6.91      | 6.03      | 7.45      | 6.08      | 6.57         |

*Source: Field survey, 2000*

#### 4.4 Significant Empowerment Factors for Farms' Household Income

To identify the significant empowerment factors for farm household income, thirteen variables were selected: Education or EDU (X1), Occupational experience or AEF (X2), Adjustment need or SAN (X3), Smallholders' participation through group activities or PTG (X4), Accessibility of sources of information or AIN (X5), Individual contact with change agent or ICA (X6), Information exposure or INE (X7), Agricultural knowledge and skill in management or KUA (X8), Capital for farm investment or CAI (X9), Using farm equipment and machinery or EBM (X10), Using fertilizer or FUF (X11), Actual agricultural labour or FAL (X12), and Daily working period of total farm labour or DWP (X13). Stepwise forward regression estimation procedure was followed. The dependent variable (Y) was farm household income that was the aggregate income of all farm activities. The following regression model was used:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \beta_{13} X_{13} + \varepsilon$$

Where,

|                                     |   |  |
|-------------------------------------|---|--|
| Y                                   | = | Vector of explained indicator or dependent variable; Farm Household income |
| X <sub>1</sub> .....X <sub>13</sub> | = | Vectors of explanatory indicators.   |
| β <sub>0</sub>                      | = | Intercept to be estimated  |
| β <sub>1</sub> .....β <sub>13</sub> | = | Coefficients to be estimated   |
| ε                                   | = | Vector of error term   |

The following estimation equation therefore explains the contributing variables to proportion of farm household income:

$$Y = 295.677 + 0.630 X_4 + 0.305 X_5 + 0.143 X_8 + 0.141 X_{11}$$

The coefficient of multiple determination (R<sup>2</sup>) of 0.466 and adjusted R<sup>2</sup> of 0.460 explained at least 46 percent (Table 11). The Durbin-Watson value of 1.576 confirms the criteria of multiple regression. The high F-Value significant at the 0.01 level confirms the appropriateness of the model. All the significant explanatory variables have a positive relationship with the dependent variable. The constant value of 295.677 shows the theoretical estimate of farm household income. The equation shows that every unit addition of smallholders' participation through group participation (PTG), accessibility to sources of information (AIN), agricultural knowledge and skill in management (KUA) and level of fertilizer use of farm (FUF), increases farm household income surplus by 0.630, 0.305, 0.148 and 0.141 percent, respectively. This indicates that group participation enables smallholders to organize themselves, to identify needs, to share ideas among membership, and to evaluate farm activity to improve farm management. The accessibility

to sources of information in the community and agricultural knowledge and skill in management enable smallholders to easily adjust their approach to management, to understand and evaluate situations, to set plans and implementation strategies, and also to decrease the risk of farm management. The optimum level of using fertilizer also influences the increasing of farm production toward increasing farm household income.

**Table 11: Significant Explanatory Variables for Smallholding Farm Household Income**

| <i>Dependen</i> | <i>Explanatory Variable</i> |                    |                | <i>R<sup>2</sup></i> | <i>Adjust Ed</i>     | <i>Sd. Error of</i> | <i>F-Statistic</i> |
|-----------------|-----------------------------|--------------------|----------------|----------------------|----------------------|---------------------|--------------------|
| <i>t</i>        | <i>Variable</i>             | <i>Coefficient</i> | <i>t-ratio</i> |                      | <i>R<sup>2</sup></i> | <i>Regression</i>   | <i>F-Value</i>     |
| Y               | $\beta_0$                   | 5,437.455          | 10.076***      |                      |                      |                     |                    |
|                 | $x_4$                       | 0.560              | 13.144***      | 0.313                | 0.311                | 39.280              | 171.983***         |
| Y               | $\beta_0$                   | 1,143.400          | 2.786***       |                      |                      |                     |                    |
|                 | $x_4$                       | 0.648              | 16.044***      |                      |                      |                     |                    |
|                 | $x_5$                       | 0.348              | 8.612***       | 0.426                | 0.423                | 35.945              | 139.762***         |
| Y               | $\beta_0$                   | 554.518            | 1.276          |                      |                      |                     |                    |
|                 | $x_4$                       | 0.643              | 16.193***      |                      |                      |                     |                    |
|                 | $x_5$                       | 0.327              | 8.163***       |                      |                      |                     |                    |
|                 | $x_8$                       | 0.142              | 3.662***       | 0.446                | 0.442                | 35.368              | 100.720***         |
| Y               | $\beta_0$                   | 295.677            | 0.682          |                      |                      |                     |                    |
|                 | $x_4$                       | 0.630              | 16.034***      |                      |                      |                     |                    |
|                 | $x_5$                       | 0.305              | 7.625***       |                      |                      |                     |                    |
|                 | $x_8$                       | 0.143              | 3.737***       |                      |                      |                     |                    |
|                 | $x_{11}$                    | 0.141              | 3.678***       | 0.466                | 0.460                | 34.791              | 81.447***          |

Note \*\*\* = Significant at 1% level ( $p < 0.01$ )

\*\* = Significant at 5% level ( $p < 0.05$ )

Durbin-Watson = 1.576

The above analysis indicates that the improvement of farm household income for farm sustainability should be accomplished through (1) enhancement of the smallholders' participation through local smallholders' group activity, and also, enhancement of local smallholder group activities given by the emphasis on participation of membership; (2) providing appropriate training courses to increase knowledge, attitude and skill in practice and management, and (3) using the optimum level of fertilization and decreasing chemical fertilizer.

## 5.0 Conclusion

Although rubber smallholders have a low level of primary schooling, they have significant occupational experience that influence their empowerment such as decision-making

process in farm management and decreasing management risk. In addition, the adjustment needs indicate that smallholders can understand and evaluate the current situation, however, presently, they are little empowered because they are faced with many constraints involving the low level of smallholders' adjustment need, inefficient government plans and policy implementation, low level of individual contact with change agents in the community, low information exposure, low knowledge and skill in practice and management, low accessibility to sources of information, low level of understanding of casual agents of their expenses and income, and low level of group participation. Altogether, these indicate that the full development of smallholders' potential and ability should be the first task of agricultural development in community. It was also found that the four factors most influencing farm household income included group participation, accessibility to sources of information, agricultural knowledge and skill in management and practice, and using fertilizer at farm. The group participation is the most influential factor affecting farm household income. Thus, the enhancement of group activity and smallholders' participation therein are the first suggestions for increasing smallholders' empowerment.

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**Appendix Table-1: Coordinating Schema of Empowerment Variables of Rubber-based Farming Systems**

| <i>Complex variable</i>  | <i>Simple variable</i>   | <i>Measurement scale and description</i>   |
|--------------------------|--|--|
| 1. Education Experience  | 1. The number of years of schooling (EDU)  | 1. Ratio scale   |
| 2. Occupation Experience | 2. The number of years of agricultural practice and management (AEF)                     | 2. Ratio scale   |
| 3. Adjustment need       | 3. The level of adjustment needed for better efficiency and production (SAN)             | 3. Interval scale : four levels:<br>(1) Much adjustment needed ( $\chi=3.26-4.00$ ) -- means the smallholders need to change all processes of production system and normally, they are diligent smallholder and modernized farmers<br>(2) Moderate adjustment need ( $\chi=2.51-3.25$ ) mean the smallholders need to change in some process of production system and normally, they evaluate information for greater detail before decision<br>(3) Little adjustment need ( $\chi=1.75-2.50$ ) mean, the smallholders don't need to change their farm activities, however, they are also, accept the new technology from agent or other sources<br>(4) No adjustment need ( $\chi=1.00-1.75$ ) mean, the smallholders don't need to change their farm activities. |
| 4. Individual contact    | 4. The level of the frequency of individual contact with change agent in community (ICA) | 4. Interval scale : four levels ;<br>(1) Much contact ( $\chi=3.26-4.00$ ) means contact with change agents more than twenty-four times per year.<br>(2) Moderate contact ( $\chi=2.51-3.25$ ) -- means contact with change agents twelve to twenty-three times per year<br>(3) Little contract ( $\chi=1.76-2.50$ ) -- means contact with change agents six to eleven times per year<br>(4) No effective contact ( $\chi=1.00-1.75$ ) -- means contact with change agents less than six times per year  |

Continued



| <i>Complex variable</i>                    | <i>Simple variable</i>   | <i>Measurement scale and description</i>  |
|--|--|---|
| 5. Information exposure                    | 5. The level information received from all sources, and then applied to the farm practices (INE)             | <p>5. Interval Scale : four levels:</p> <p>(1) Much (<math>\chi=3.26-4.00</math>) – indicates farmers who receive extensive new information from various sources, which is then applied to the farm practice and management</p> <p>(2) Moderate (<math>\chi=2.51-3.25</math>) – indicates farmers who receive some information which is applied to the farm practice, usually in specific activities, such as fertilizers or marketing</p> <p>(3) Little (<math>\chi=1.76-2.50</math>) – indicates smallholders who might receive some information on modern farm practice and management, but do not understand how to apply it effectively</p> <p>(4) Never (<math>\chi=1.00-1.75</math>) – indicates smallholders who do not receive new information from any sources, and feel there is no need to change their practice.</p> |
| 6. Knowledge and skill                     | 6. The level of the smallholder's agricultural knowledge and skill about farm practices and management (KUA) | <p>6. Interval Scale : four levels</p> <p>(1) Much (<math>\chi=3.26-4.00</math>) – indicates a test score of over 80% on the applied tests (or <math>\geq 16</math> items)</p> <p>(2) Moderate (<math>\chi=2.51-3.25</math>) – indicates a test score test of 60-79% (12-15 items)</p> <p>(3) Little (<math>\chi=1.76-2.50</math>) – indicates a test score of 40-59% (8-11 items)</p> <p>(4) Very little (<math>\chi=1.00-1.75</math>) – indicates a test score test of less than 40% (<math>\geq 7</math> items)</p>  |
| 7. Accessibility to sources of information | 7. The level of accessibility to existing sources of information in the community (AIN)                      | <p>7. Interval scale : four levels;</p> <p>(1) Much (<math>\chi=3.26-4.00</math>) – indicates an ability to access sources of information at least one time per week.</p> <p>(2) Moderate (<math>\chi=2.51-3.25</math>) – indicates an ability to access sources of information one time per month or twelve times per year</p> <p>(3) Little (<math>\chi=1.76-2.50</math>) – indicates an ability to access sources of information one time per</p>  |

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