Kasetsart J. (Soc. Sci) 24: 156 - 168 (2003) ว. เกษตรศาสตร์ (สังคม) ปีที่ 24: 156 - 168 (2546)

The Sustainable Livelihood of Rubber Small Holder: A Case Study of Rubber- Fruit Tree Farming System in Kao Phra Community, The Southern Thailand

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ABSTRACT

For maintaining sustainable livelihood of small holding rubber-fruit tree farming system, they should try to decrease their vulnerability and limitations set by concerned organizations. The policy should promote creation of farm asset, determine access and rate of asset accumulations, and also, the policy should enable small holders to develop appropriate farm plans and their appropriate implementation strategy in order to achieve farm sustainability. The suggested plan and implementation for supporting these systems include, improvement in the price and marketing system, improvement of the appropriate technology for production and improvement in the agricultural energy for efficiency at the national level. In the regional level, also, the objectives should include the improving coordination mechanism during the implementation of the plan through the maintenance of efficiency with among the organization. In farm level, the objectives aim to increase farm efficiency and productivity for sustainable farm income by empowering small holders and decreasing risks in managing farm.

Key words: sustainable livelihood, para rubber small holder, and farming system

INTRODUCTION

Rubber is world economic crop which has helped sustainability of the development of quality of life and the increase of family income in rubber small holders in many parts of the world (RRIT, 1999a). It is widely grown in Asia, Africa and America. Over the last four decades in Asia, especially in the Southeast Asia region, global trends in rubber cultivation continued to be dominated by three major

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producing countries, Thailand Malaysia and Indonesia (IRSG, 1999). Following the economic crisis of 1997 in Southeast Asia, rubber small holders were forced to adapt and try to maintain economic viability (TRA, 1999). In Thailand there were 800,000 rubber growing farms, out of which 744,000 were rubber small holding farms (RRIT, 1999b), Since 1995, Thailand has become the world's largest rubber producing country with 2.16 million tons in 1999. However, rubber small holders have faced with many constraints that reduced productivity and income due to uneconomic size, price fluctuation, appropriate technology transfer deficiency of capital for investment, labor's shortage, lack of access to credit facility, inefficient market and processing system (Penot, 1999) Thus, a study on sustainability of rubber small holder is necessary for rubber development in Thailand. In this context, the research was attempted to (1) describe the agricultural production system and its component of smallholding rubber – fruit tree farming system, (2) analyze the sustainable livelihood of small holding rubber – fruit tree framing system through the framework of sustainable livelihood, and (3) suggest the possible plan and implementation strategic model for sustainability.

THEORETICAL CONCEPT OF SUSTAINABLE LIVELIHOOD

Livelihood comprises the capabilities, assets, (including both material and social resources) and relevant activities. Sustainable livelihood is when the living can cope with and recover from stress and shock. Also, it maintains or enhances its capabilities and assets both now and in the future, without undermining the natural resources base (Conway, 1985). Thus, livelihood approach is a way to think about the center of development by increasing the effectiveness of development assistance.

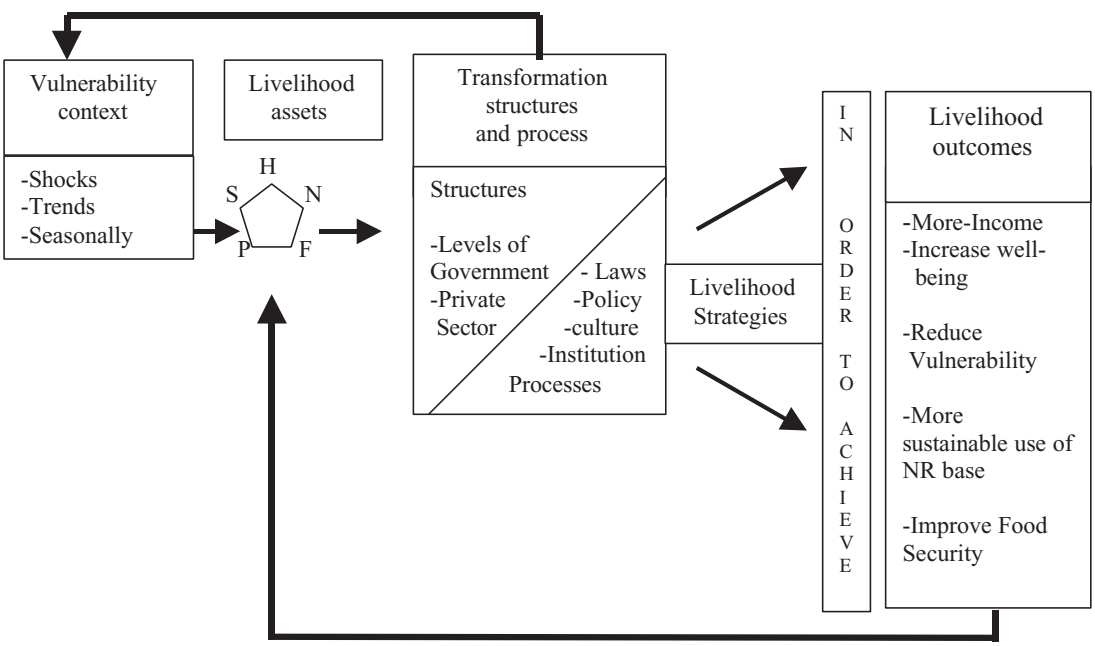
1. The sustainable livelihood framework (SLF) and its components

The livelihood framework is represented as a tool to improve our understanding and analysis of livelihood, particularly the livelihoods of small holders and poor people (DFID, 1997). It is also useful to assess the effectiveness of existing effect to reduce poverty. The framework is centered on people. It aim is to help stakeholders with different perspectives to engage in structured and coherent debate about the many factors that effect livelihoods, their relative importance and the ways in which they interact. The components of framework are encompassed as vulnerability context; livelihood assets, transforming structures and process, livelihood strategies and livelihood outcomes (Figure 1). The framework views people as operators in this context because they have access to certain assets of institutional and organizational environment which influences the livelihood strategies of combining and using open assets in pursuit of beneficial outcomes as objected.

2. The application of SLF for small holding rubber - based farming system.

From theoretical concept of sustainable livelihood, the sustainable livelihood of small

holding rubber-base farming system can be described in term of the framework of sustainable livelihood and its component. The analysis defined sustainable livelihood of small holding rubber-base farms and suggested farm's development for sustainability. The application of SLF for small holding rubber-fruit tree farming system should consist of the main factors, appropriate plan and implementation strategy that influence farm's achievement toward the sustainability of farm. In vulnerability context, It is described in terms of constraints of farm. These contexts are important for farm's operation because they have direct impact on farm's assets status and options that are open to them in pursuit of beneficial livelihood outcomes (or farm's achievement and sustainability). In this context, the framework identifies five core asset categories. (1) natural capital; representing water resources for farm's activity, land use efficiency, climate (temperature, precipitation, and moistures content) and soil texture, (2) social capital; representing the membership of local group and the participatory level through group activity. (3) physical capital; representing farm size (land holding size), and topographic area, (4) financial capital; representing the farm's capital for investment, farm's saving, and farm's debt, and (5) human capital; representing small holders' potential and ability to manage and practice in their farm such as age, the occupation experience, evolution experience, farm's labor, and level of agricultural knowledge in management. For the transforming structure and process, they were represented in terms of the farm's constraints and



Fingure 1 Sustainable livelihoods framework.

Source: The Department of International Development (DFID), 1997

livelihood strategies. The appropriate farm's implementation strategy can improve the farms situation for more efficiency and productivity, and influence farm's achievements toward the sustainability of small holding farms. For the sustainability of livelihood of rubber-based farm, it was described in terms of farm household income, farm's productivity, farm's financial capacity and project analysis (investment appraisal).

METHODOLOGY

The study area was Kao Prha community, Ratthaphum District, Songkhla province. Data were collected from 108 small holding rubber-fruit tree farms from four systems by means the purposive sampling method. They were rubber + durian (32) rubber + mangosteen (26), rubber + durian + Mangosteen (22) and rubber + durian + mangosteen + rambutan (28), respectively (Table 1) through secondary sources, participatory rural appraisal (PRA), and questionnaire in cropping year 2001. Data analysis was based on the component of sustainable livelihood framework such as farm's vulnerability, farm asset, appropriate organization and policy implication, appropriate farm's implementation strategy, and farm's achievement. Suggestion the model of plan and implementation strategies were also analyzed.

RESULTS AND DISCUSSIONS

The results of study are described based on the component of sustainable livelihood framework as following.

1. Farm's vulnerability

Low product price and quality (24.1 %) was the most serious constraints of all systems of rubber-fruit tree farms. In addition, deficient capital for investment (19.4 %), disease and pest (13.9 %) inconvenient infrastructure (13.0 %) and deficient knowledge in management practice (9.3 %) were also important constraints. (Table 2) like other primary commodities, rubber price flexion at great deal depends on both supply and Demand factors in the market and external even during last three year, rubber and fruit tree have fluctuated. And effected rubber small holder to adapt for economic sustainability. In addition, small holders to comprehend

Table 1 The number of small holding rubber-fruit tree farming systems.

System[1/]	Number
1. Rubber-durian farming system	32
2. Rubber-mangosteen farming system	26
3. Rubber-durian-mangosteen farming system	22
4. Rubber-durian-mangosteen-rambutan Farming system	28
Total	108

Remark : [1/]cropping year 2001

and more over individual small holders are unable to cope with it. These constraints show the vulnerability of rubber-fruit tree farming system.

2. Farm asset

The results show the farm asset to achieve positive livelihood outcome. In the table 3 the categories of assets was show that their should be inter-relationship among various capitals**. For natural capital**, small holders use natural water such as cannel rainwater and under ground water. Land use efficiency was 91.98% (percentage area used from total areas) and soil textures are loam clay, sandy clay and sandy loan factor that effect on agricultural product system and the setting appropriate organization and policy implication of rubber-fruit tree farming system. **Social capital**; the results show that small holders are participate in many memberships especially rubber group as rubber sheet making group, Rubber latex group, and fruit tree group, and Farmer group, and also the middle level of participation in group activities ($\bar{x}$ = 2.56 at moderate level). It is indicate that small holders are more bargaining price than the pest. And also, they got new technology from exchange idea and participate in-group activities. **Physical capital**, normally, rubber-fruit tree farms in the southern, Thailand are located in hilly rolling farms in the southern, Thailand are located in hilly rolling area, and unfolded plain area. An average Farm size was 4.55 ha. **Financial capital**, rubber small holders have little capital for in vestment and saving money with 9625.13 bath/ha/yr., and 48,000 bath/ha/yr., respectively while they have debt with 51,660 bath/ha/yr. It is indicated that financial capital of farm was law. **Human capital**, normally, an advantage of age 43.87 years with the occupation, experience and education experience 9.26 years. farm's labor was 1.97 person/family and level of rubber technology knowledge was 1.97 person / family and level of Rubber technology knowledge was low level of knowledge ($\bar{x}$ = 1.95 at low level). Thus, extension and training program should be

Table 2 The main constraints of four small holding rubber fruit tree farming systems.

	Constraints	Number	Percent
1.	Low product price and quality	26	24.1
2	Deficient capital for investment	21	19.4
3	Disease and pest	15	13.9
4	Inconvenient infrastructure	14	13
5	Deficient knowledge in management practice	10	9.3
6	Non-appropriate climate	9	8.3
7	Shortage of farm labor	8	7.4
8	Inefficient local extension system	5	4.6
	Total	108	100

Source: survey research from 108 farms, 2002

Table 3 Farm's asset of four small holding rubber-fruit tree farming systems in Songkhla province.

Natural capital 1/	Social capital 1/	Physical capital 1/	Financial capital 1/	Human capital 1/
• Natural water such as cannel, rain water and under ground water • Land used efficiency 91.98% • Optimum temp : 28ºc • Amount of rainfall 1,696.9 mm and moisture content : 77% • Soil Texture : loan clay, Sandy Loan	• Membership of local group: - rubber sheet and Latex group - fruit tree group - farm group • Participation through Group level : 2.56 (moderate level) (2)	• Average farm size : 4.55 ha • Hilly rolling area and unfolded-plain area	• Farm investment capital: 9,625.13 bath/ha/yr. • Farm saving 48,000 baht ha/yr. • Farm debt: 51,660 baht/ha/yr.	• Occupation experience : 18.87 yr. • Education experience: 9.26 yr. • Age 43.87 yr. • Farm's labor : 1.97 person/family • Level of rubber knowledge on skill about practice and management: 1.95 (low level) (2)

concentrated and goal for improvement empowerment of rubber-small holder.

3. Appropriate organization and policy implication

For decreasing farms' constraint, the result shows the appropriate organization and policy implication that comprised seven organizations as Department of Agricultural Extension (DOAE), Tumpbon Administration Office (TAO), Cooperative Group, Agricultural Bank, Rural Development Office; The Office of Rubber Replanting Aid Fund (ORRAF), and Local Farmer Group, respectively. From the table 4, it is indicated that training course, almost of organization should concerned these activities for decreasing farms' constraint.

4. Appropriate farm's implementation strategy (livelihood strategy)

Fertilizer normally, applied at N:P:K ratio of 15-15-15 both rubber and fruit tree with the quantity of 93,494 kg/ha/yr. Frequency of fertilization is usually twice per year for rubber; and 3-4 time per year for fruit tree. Small holders try to decrease chemical control but providing more natural control. For sale characteristics, there is two way of sale characteristics, as sale through local group and individual sale in local market such as fruit tree production. In addition, the result show that the average number of the economically active farm labor in family is 2.05 persons per family. This is indicated that the family labor is less than required which has effecting hiring out off farm labor, especially, during tapping labor. Average hours of work that farmers spend farm activities are high level

Table 4 The possible responsibility and authority of rubber organization and policy Implication suggestion.

Organization	Policy implication suggestion 1/					
	A	B	C	D	E	F
• DOAE (District)		*	*		*	
• TAO (Sub-district)			*	*	*	*
• Cooperative Group	*		*			
• Agricultural Bank	*					
• Rural Development Office			*	*	*	
• ORRAF			*			*
• Local Farmer Group	*		*		*	*

Source: Survey, 2002

Remark * = Appropriate organization in responsibility and authority

1/ = Suggestion plan and policy implication from both researchers and farmers.

A = Establish local price Insurance system and local capital fund for investment

B = Setting annual plan for extension in community

C = Training course

D = Necessary Infrastructure

E = Enhancement local information center

F = Enhancement labor charring system in community

at 12.5 hr/day/labor (Table 5).

5. Farm's achievement (livelihood outcome)

Economic performance of rubber-fruit tree farm was shown in term of farm's achievement forward sustainable livelihood such as net farm income and relative management; farm capacity and investment appraisal. The result shows that all systems shows light net farm income especially, system of Rubber-Durian≈Mangosteen system (R_3) gross margin (GM), while farm's capacity was lowest performance. All systems show justification of investment appraisal (Table 6).

5.1 Net farm income and relative measurement (NFI)

The results show that rubber + durian + mangosteen framing system (R_3) has the highest NFI of 74,488.98 baht/ha/yr and gross margin value of 86,085.62 baht/ha/yr when compared among within systems. In RRFL, it implies the labor's ability in production system, and the unit of labor used in farm's operation that small holders can get unit of output. Table 6 R_1 system show highest RRFL of 10.40 which it mean that with one unit of labor used in farm's operation, small holders can get 10.40 units of output. And also in RFC and RVC, the results show that R_4 system shows the highest RFC of 12.46 and R_3 system show the highest RVC of 2.56 when compared among within systems.

5.2 Farm's capacity

In financial capacity, it was found that R_3 system has the highest self – financial capacity (SFC) of 86,931.90 baht/ ha /yr. It indicated that this system has high financial potential and ability to take

Table 5 Appropriate farm's implementation strategy.

Strategies	Characteristics [1/]
1. Average farm size	1. 2.36 ha
2. Appropriate system type	2. Four systems (1)rubber + durian (2)rubber + mangoteen (3)rubber + durian + mangoteen (4)rubber + durian + mangoteen + rambutan
3. Fertilizer (Quantity)	3. 15-15-15/934.94 kg/ha/yr
4. Disease and pest management approach	4. Providing more natural control
5. Sale characteristics	5. For rubber production, there are 2 channels; (1) sale through sheet and latex group and (2) individual sale for fruit tree, normally, farmer sale their product in both through fruit tree group and individual sale at local market.
6. Farm's labor	6. 2.05 persons per family
7. Diary working period	7. 12.5 hr/day/labor.

Sources: survey , 2002
Remark: [1/]average value.

up new investment. For debt service capacity (DSC), the positive correlation was found with SFC a system has, the more DSC it has also. The result shows that R_3 system has the highest DSC of 82,431.49 baht/ha/yr. It indicated that these system has ability to pay interest and to cover loan payment in given period. For farm productivity, it was found that R1 system has the highest RRC of 186.35% and R_2 system has the highest RRFEC of 174.60%. It indicated that small holders invest one unit of farm capacity, they get more than one unit of net farm earning.

5.3 Investment appraisal of rubber – fruit tree farming system

In calculation of investment appraisal of four system farms, as show in table 6, it was found that all systems of rubber fruit tree farms show justification in investment appraisal confirmed with BCR value more than one, NPV value more than zero, and IRR value more than opportunity cost (20 years, debt interest rate 5%).Thus, all system of rubber ะ fruit tree farms should be contributed and extended to small holders and they should be involved in planning of sufficiency economic to improve small holders' standard of living under the current economic crisis.

6. Sustainable livelihood framework of small holding rubber-fruit tree farming systems.

Constraints of small holders are found as farm's vulnerability. They have direct impacts upon small holder's asset status. Constrains were low product price and quality, deficient capital for investment, disease and pest, undesirable climate, shortage of farm labor, and inefficient extension system. Therefore, this type requires more intensive management and practices, and more cost of investment. These constraints have directly influenced farm's asset and setting of appropriate plan and policy implication. And also, farms require a range of assets to achieve positive livelihood outcomes. In figure 2, the category of asset was shown that there should be inter-relationship among various capitals. Appropriate organization and policy implication such as DOAE (district level), TOA, Cooperative group, Agricultural Bank and Rural Community office, should be recommended to decrease farm's vulnerability and increase farm's asset. And also, farms require a range of assets to achieve positive

Table 6 Farm's achievement: The economics of small holding rubber-fruit tree framing system.

Economic performance	R_1 (32)	R_2 (26)	R_3 (22)	R_4(28)
1 Net Farm Income and Relative measurement				
• Net farm income (NFI) (baht/ha/yr)	48327.91	31833.08	74488.98	71479.18
• Gross margin (GM) (baht/ha/yr)	54127.19	42470.05	86085.62	83758.6
• Return to family labor (RRFL)	10.4	9.2	9	8.22
• Return to fixed cost (RFC)	9.87	8.19	12.36	12.46
• Return to variable cost(RVC)	2.03	1.73	2.56	2.41
2 Farm's capacity				
2 Financial capacity				
• self-financial capacity (baht/ha/yr) (SFC)	57886.3	4615.31	86931.9	79655.8
• debt-service capacity (baht/ha/yr) (DSC)	54800.31	43112.4	82431.49	73965.45
2 Farm productivity				
• Rate of return to capacity (%) (RRC)	186.35	183.1	160.3	171.47
• Rate of return to farm equity capital (%) (RRFEC)	155.43	174.6	128.69	167.21
3 Investment appraisal (20 years, 5% interest rate)				
• BCR	1.9	2.43	2.2	1.88
• NPV	310,794.21	425,839	547,375.84	497,867.86
• IRR	16%	23%	24%	19%
• Justification	Justified	Justified	Justified	Justified

Source : survey research, 2002

Remark: R: small holding rubber-fruit tree forming system; R_1: rubber + durian farming system, R_2: rubber + mangosteen farming system, R_3 rubber + durian + mangosteen farming system and R_4: rubber + durian + mangosteen + rambutan farming system.

livelihood outcome. This is because small holders need more information; especially, technology, price situation and marketing system. Appropriate policy implication should be (1) establishment of local capital for investment and price insurance system, (2) setting of the annual plan for extension program (fruit tree program), (3) training course for transfer technology, disease and pest control, and management skill, (4) infrastructure development for product transportation within community, and (5) establishment of the labor sharing system to decrease labor constraint.

Achievement of farm was described through successful economic performance that was household income of 151,417.00 bath/ha/yr, productivity RRC, and RRFE of 175.30, and 156.48%, financial capacity SFC, and DSC of 67,649.82 and 63,577.16 bath/ha/yr, and project analysis (investment appraisal) (interest rate 5%); BCR, NPV, and IRR of 2.09, 445,469.32 bath/ha/yr, and 20.5%, respective (Figure 2).

7. Suggestion model of plan and implementation strategies

In suggestion Model (Figure 3)., we classified plan and implementation strategies in to three level on national level, regional level and form level. A lot of attention from the government has been paid to this system as a future alternative. The study in this system in framework of sustainable livelihood leads to suggestion of strategic planning and implementation for future development at farm level, which is in this section, as follows: (1)establishment of village or community fund for investment, (2) establishment of local price insurance system, (3) appropriate plan for local extension, (4) training course about knowledge and skills, (5) construction of infrastructure to transport products, (6) enhancement of strong local farmer group, (7) establishment of the community information center, and (8) analysis of farm efficiency measurement for marking decision.

Plan and policy at regional level have a role to bring national plans to implementation in form of programs. The suggested program should cover (1) local financial program, (2) processing and marketing program, (3) technology transfer program, (4) resource management program, (5) local extension program, and (6) improvement of local infrastructure program. The objective is to coordinate programs in response to national plans, to have programs implemented efficiently and to enhance efficiency of farm level plan implementation.

CONCLUSION ON AND RECOMMENDATION

The result sows that small holders in four systems of rubber-fruit tree farm have to concern and try to decrease their vulnerabilities and risk of management toward economics and sustainability. The framework in this study can be helpful small holders to solve their current problem of rubber and fruit tree production at all farm's size, especially, small holding sector, because, the framework has determined the plan and implementation strategy, official responsibility and goal of development focused mainly at the local level.

For the suggestion of this system, price and

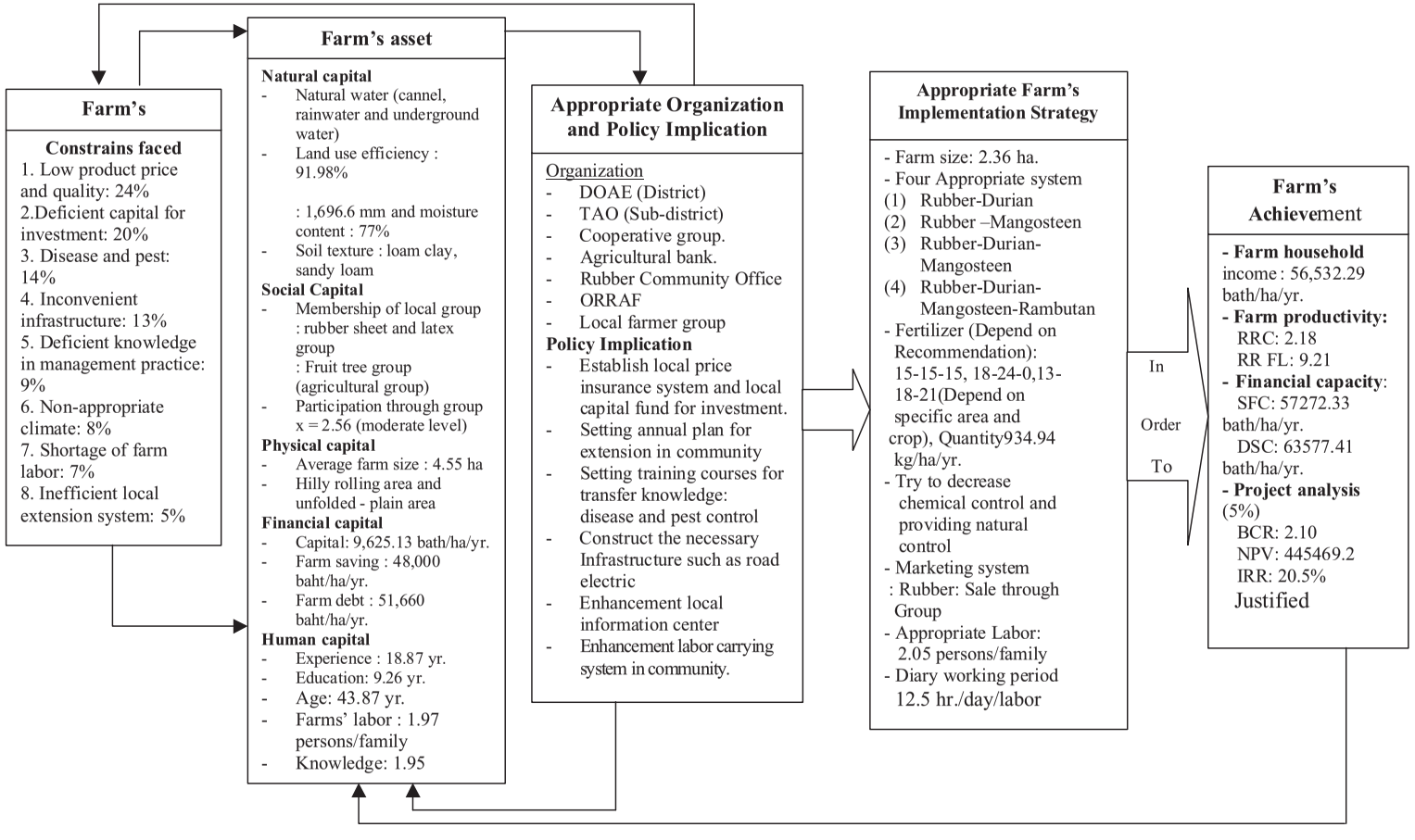


Figure 2 The sustainable livelihood framework of small holding rubber-fruit tree farming (R_4) four systems case studies

Source: Analysis from Table 1-5.

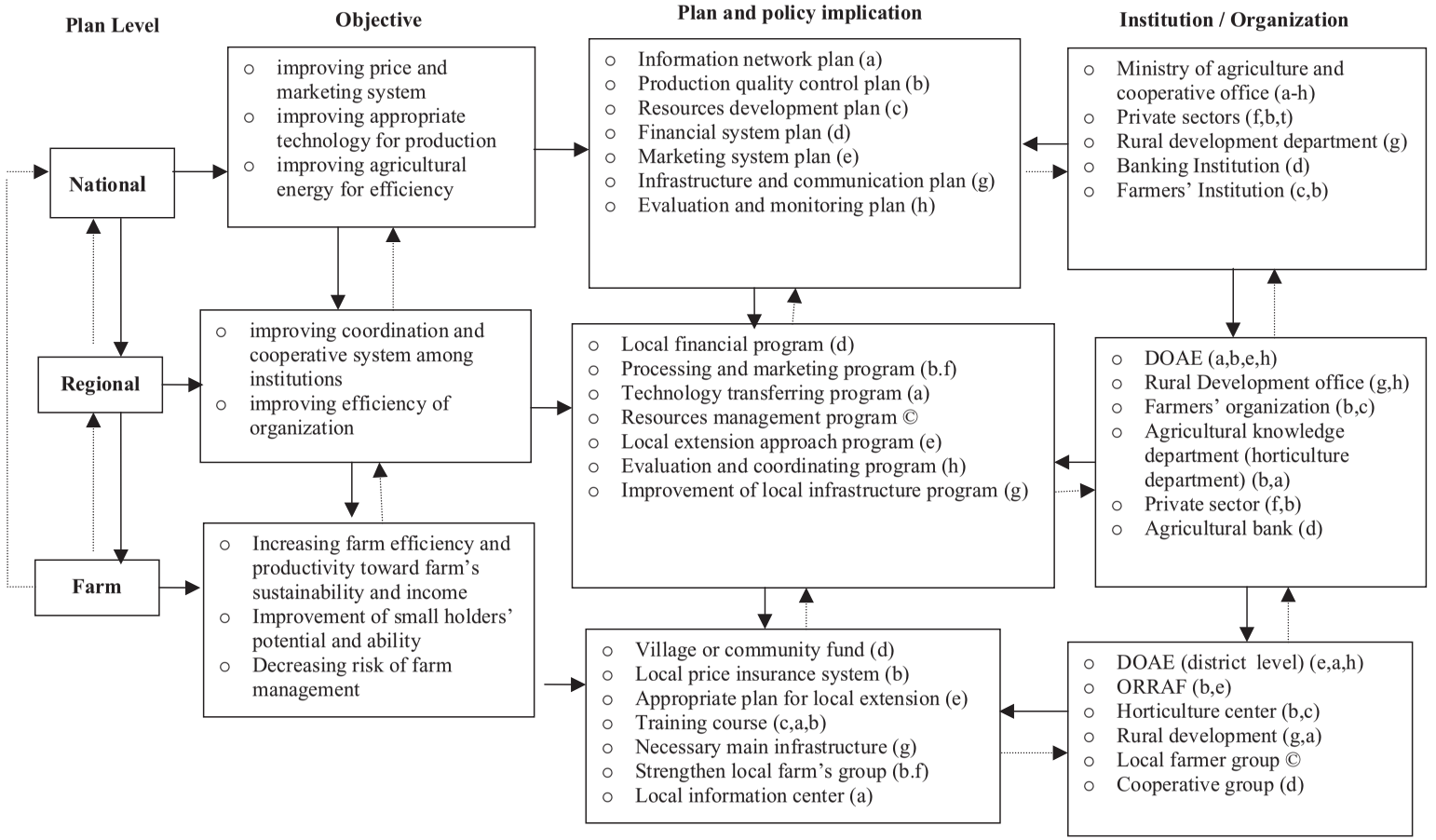


Figure 3 The Suggestion model of plan and implementation strategy of small holding rubber-Fruit tree farming system (R_4)

Source : Analysis from survey research of 108 farms.

marketing plan, production technology and agricultural energy are import, Thus, the recommendation for this research including;(1)enhancement of the production processing program by means training system for transferring the possible production processing technology, (2) establishment of the village marketing committee(VMC) for trying to distribute product in other markets,(3) trying to decease the cost of production such as using bio-fertilizer, (4) strengthening the fruit tree group activities such as decision making, solving group problem, and setting plan and policy implication through the group committee, (5) establishment informal fruit tree school in community through coordination among school teachers, Change agent and farmers' group in community, and (6) Improving community information system.

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