

# QUANG NGAI RURAL DEVELOPMENT PROGRAM (RUDEP) - PHASE 2

## Farming Systems Study in Program Communes



**VIETNAM-AUSTRALIA**

*Prepared for*

**AusAID**

Australian Embassy  
8 Dao Tan Street  
Ba Dinh District,  
Hanoi, VIET NAM

19 April 2004

VIE1506

*Prepared by*

URS Sustainable Development  
in association with Kellogg Brown & Root and  
World Wide Project Management Services  
Project Managers and Consultants  
Adelaide Australia

## **DONOR AGENCY**

### **AusAID**

Australian Embassy

8 Dao Tan Street, Ba Dinh District, Hanoi, Viet Nam

Ph: +84 4 8317754/Ext 175 (Project Officer), Fax: +84 4 8317711

## **LEAD COUNTERPART AGENCY**

### **Department of Planning and Investment**

96 Nguyen Nghiem Street, Quang Ngai Town

Quang Ngai Province, Viet Nam

Ph: +84 55 825701

## **PROGRAM MANAGEMENT UNIT**

No 4 Pham Van Dong Street, Quang Ngai Town

Quang Ngai Province, Viet Nam

Ph: +84 55 816261-6, Fax: +84 55 816260

## **AUSTRALIAN MANAGING CONTRACTOR**

### **URS Sustainable Development**

25 North Terrace

Hackney SA 5069

Ph: +61 8 8366 1000, Fax: +61 8 8366 1001

Program ..... URS Australia Pty Ltd  
Manager: Dee Hartvigsen 25 North Terrace, Hackney  
International Projects Manager South Australia 5069 Australia  
Tel: 61 8 8366 1000  
Program .....  
Director: Ted A'Bear  
Vice President  
Sustainable Development  
Fax: 61 8 8366 1001

Date: 19 April 2004  
Reference: VIE1506  
Status: Final

# CONTENTS

<b>Acronyms</b>	<b>iii</b>
<b>1 Introduction</b>	<b>1</b>
1.1 Program Objective	1
1.2 Objectives of Farming Systems Study	1
1.3 Method	1
1.3.1 Implementation Process	1
<b>2 Importance and Significance of Farming Systems</b>	<b>3</b>
<b>3 Survey Result on Current Situation and Economic Efficiency of Farming Systems in Quang Ngai Province</b>	<b>5</b>
3.1 General information	5
3.1.1 General information of Quang Ngai Province	5
3.1.2 Characteristics of Agroecological Zones	6
3.1.3 Mountain Zone	6
3.1.4 Lowland Zone	7
3.1.5 Coastal Land Zone	7
3.2 Survey results on farming systems at communes	8
3.2.1 Current situation and solution for agricultural activities in surveyed communes	8
3.2.2 Evaluation on current situation of household farming systems	15
3.2.3 Assessment of current situation of cropping systems at surveyed communes	21
<b>4 Orientation in Developing Sustainable Farming Systems</b>	<b>29</b>
4.1 Development of household systems	29
4.2 Orientation in developing cropping systems	29
4.3 Orientation in animal production development	34
4.3.1 Pig raising	34
4.3.2 Cattle raising	35
4.3.3 Chicken raising	35
4.4 Orientation of off farm activity development	35
<b>5 Conclusion and Recommendations</b>	<b>36</b>
5.1 Mountainous zone (Son Hai, Son Trung, Son Giang, Nghia Tho Communes)	36
5.2 Lowland and coastal land zones (Pho Chau, Hanh Phuoc, Duc Pho, Duc Phong Communes, Binh Minh Communes)	36

## TABLES

Table 1: Current Situation and Solution for Agricultural Activities in Surveyed Communes.....	8
Table 2: Economic Efficiency of Household Farming Systems .....	15
Table 3: Advantages and Disadvantages of Farming Systems.....	20
Table 4: Area and Yield of Cropping Systems and Animals.....	21
Table 5: Economic Efficiency of Cropping Systems .....	23
Table 6: Economic Efficiency of Livestock Husbandry at Program Communes	26
Table 7: Advantages and Disadvantages of Cropping Systems .....	28

## FIGURES

Figure 1: The Conceptual Framework for Farming Systems Research in Quang Ngai .....	3
---	---

## ANNEXES

Annex 1: Transect of Communes	
Annex 2: Priority Ranking of Crops and Animals and Selecting Type of Income Generation	
Annex 3: Crops and Animal Production in Two Agroecological Zones	
Annex 4: Forest Land Use of Quang Ngai Province	
Annex 5: Seasonal Calendars in Quang Ngai Province	
Annex 6: Workshop on Farming Systems in Quang Ngai Province	

## Acronyms

ATL	Australian Team Leader
DARD	Department of Agriculture and Rural Development
DDO	District Development Officer
FSR	Farming Systems Research
FCO	Finance and Credit Officer
FYM	Farm Yard Manure
GAD	Gender and Development
HH	Households
IEO	Infrastructure and Environment Officer
IPM	Integrated Pest Management
LGE	Local Gender Experts
MARD	Ministry of Agriculture and Rural Development
MEGO	Monitoring and Evaluation/GIS Officer
PRA	Participatory Rural Appraisal
PMU	Program Management Unit
QN	Quang Ngai
QWU	Quang Ngai Women's Union
RUDEP	Quang Ngai Rural Development Program
SALT	Sloping Agricultural Land Technology
TOT	Training of Trainers
VAC	Vegetable, Aquaculture, Cage for Animal
VACR	Vegetable, Aquaculture, Cage for Animal, Forestry
VSCF	Village Savings and Credit Facilities
VTL	Vietnamese Team Leader
WU	Women's Union

# 1 Introduction

## 1.1 Program Objective

Improving the capacity and poverty alleviation for local community, developing sustainable production based on available natural resources, gradually settling and enhancing material and spirit life and finally contributing to protect environment.

## 1.2 Objectives of Farming Systems Study

1. Identify major farming systems in Quang Ngai Rural Development Program (RUDEP) communes.
2. Determine income from major farming systems identified in (1) above.
3. Determine the advantages and the major constraints of these farming systems for further development.
4. And proposing new sustainable farming systems in the future.

## 1.3 Method

### 1.3.1 Implementation Process

- Identifying study sites.
- Introduction to study sites.
- Collecting information from departments at provincial, district and commune levels.
- Field visits to collect information from households and examine (check) selected data.
- Data processing and draft report writing.
- Organizing workshop involving stakeholders in province to clarify present situation of major farming systems, identifying solutions and activities aimed at improving income for local people.
- Editing data and writing final report.
- Completing final report.

### *Scope of study:*

*Provincial level:* The range of activities at this level included:

- Reviewing geography, soil and different climatic ecological condition in the province.
- Reviewing the current agricultural production and farming systems in the province.
- Proposing possible development strategies for the Program communes.

This data was collected from departments and divisions in the province from reports, statistical books, development strategies and direct interview.

*District level:* The range of activities at this level included:

- Reviewing the current agricultural production and farming systems in the districts such as Mo Duc, Son Tinh, Son Ha, Binh Son, Nghia Hanh, Duc Pho and Tu Nghia.
- Identifying advantages and disadvantages in the current agricultural production to orientate research and development activities in different ecological regions.

These data were also collected from departments and divisions in district from reports, statistical books, development strategies and direct interview.

*Commune level:* The range of activities at this level concentrated on:

- Determining the current status of agroforestry, aquaculture and business development.
- Determining the present major farming systems in nine communes: Duc Phong, Tinh Tho, Son Hai, Son Trung, Son Giang, Binh Minh, Hanh Phuoc, Pho Chau and Nghia Tho.
- Identifying advantages and disadvantages in the current agricultural production to orientate research and development activities in different ecological regions.
- Seasonal calendar.
- Transection map.

Data from commune level was collected as follows:

- Official data from the statistical book, reports and development orientation of communes.
- PRA work in communes which included commune leaders, organization mass and hamlet leaders.
- Direct interview and observation.

*Household level:* The range of activities at this level concentrated on:

- Households' production systems (cropping, animals).
- Current situation and solution for production systems.
- Agricultural management practices.
- Forestry and aquaculture production.
- Determining the economic efficiency of the identified farming systems in the interviewed households of nine RUDEP communes.
  - Total revenue = total production in kg multiplied with price per kg
  - Total variable cost = land preparation + fertilizer + seed + pesticides + irrigation costs
  - Gross margin = total revenue - total variable costs

Household level data came from two sources:

Interviews with individual households using a prepared questionnaire (Twenty five households in each village were randomly chosen as targets for the formal interview), and

Group discussions (the groups were selected using a stratified random sample including hamlet leaders, poor, medium and better off household representatives).

The results of the above study have been used to propose a research and development orientation for each ecological region and RUDEP can use as resources for strategy of poverty alleviation and sustainable income generation and improve household living standard.

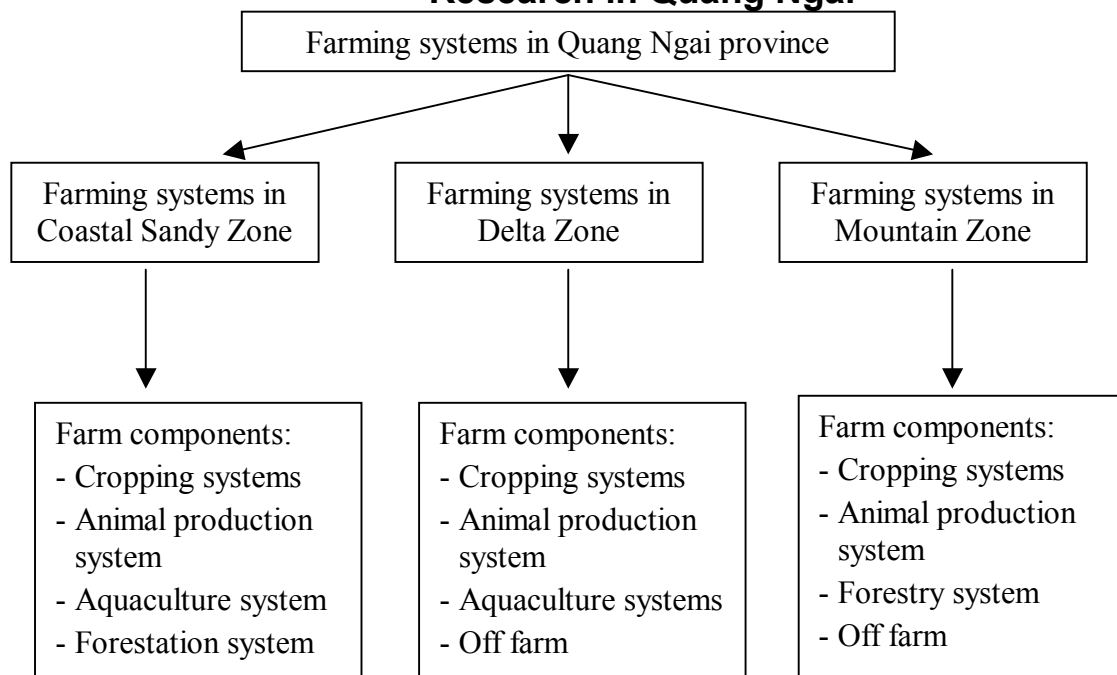
## 2 Importance and Significance of Farming Systems

Farming systems is complex, including farm production and consumption components and processes as well as the interaction between the farm and the environment within the farm boundary. Up to now, the farm household has been considered the important unit in farming systems research (Zandstra et al., 1981).

Farming systems research uses information about the farm's various production and consumption systems (the animal production systems, the cropping systems, the secondary production activities that add value to primary products) and about the farm's environment (biophysical, institutional, socio - economic) to identify ways to increase the efficiency with which the farm uses its resource. From some concepts as mentioned above, the conceptual framework was developed for the farming systems study at Quang Ngai province in which cropping systems played a very important role in all three agro ecological zones (Figure 1).

In the past, Vietnam, as well as other developing countries, applied development strategies based on achievements of the Green revolution, concentrating on the main agricultural products such as rice and maize. These strategies were designed to contribute to development through an impact on yield and intensification (fertilizer application, irrigation and pest control). However, this could only be achieved under suitable ecological conditions. Consequently, it was not appropriate in marginal ecological zones. Even though, in suitable ecological zones, yields of crops and animals have an upper limit due to effects of people, environment and market resulting in decreasing input efficiency and also affecting the speed of development of agricultural production in general.

**Figure 1: The Conceptual Framework for Farming Systems Research in Quang Ngai**



To look for techniques or solutions aimed at overcoming constraints in agricultural production, improving yield of crops and animals, business sustainability and enhancing living standard for households, we need to develop an integrated farming system. From a scientific research aspect, we should study existing farming systems and develop suitable sustainable models in each ecological zones. We should also promote biodiversity in each proposed system.

Nowadays, monoculture, especially monoculture rice in developing countries, seems to be unsuitable for those agricultural systems where households have less knowledge of production management. Agriculture with sustainability, stability, equity and productivity seems to be more readily accepted in many developing countries. An integrated farming system is a new direction to such an agriculture that links all farming activities in a unique system.

Farming systems research (FSR) has been undertaken for a few years in Vietnam but considerable results were obtained and can be disseminated to those areas with similar agro-ecosystems. Study on farming systems proved its role in improving yield of crops and animals, enhancing household income and developing rural areas.

FSR and the development of socio economic models are not new, but there are few suitable models to identify in Quang Ngai province in the past. At present there are some models such as VAC (Crop and animal production and aquaculture model), VR (agroforestry model) which have been applied in some places. However, they are still not in RUDEP Program communes. Local people hope to have adaptable farming systems model in Quang Ngai to increase their income and livelihood. In addition, climate, soil and topography conditions in Quang Ngai have typical characteristics, and it is necessary to set up models which meet the requirements as following: adapting with practical conditions, increasing income for farmers, improving soil fertility, maintain ecological condition and environment protection.

### 3 Survey Result on Current Situation and Economic Efficiency of Farming Systems in Quang Ngai Province

#### 3.1 General information

##### 3.1.1 General information of Quang Ngai Province

Quang Ngai has total agricultural land about 99,055.6 ha occupying 19.3% of the total natural land area of the province with 80% of the provincial population engaging in agriculture (*Quang Ngai Statistical Yearbook, 2002*).

**Crop production:** Occupies 67.8% of the agricultural land with the value of agricultural production achieving 1,211,899 million VND in 2002. Rice production increased from 204,794 tons (1992) to 329,618 tons (2002). Yield of all crops increased, especially for rice increased from 2.24 tons/ha (1992) to 4.06 tons/ha (2002) (*Quang Ngai Statistical Yearbook, 2002*). However, increasing rate of Quang Ngai agriculture production is still slow as compared with other provinces in the region and in the whole country. Yield of main crops is also low, due to unsuitable varieties, low quality variety, unbalanced intensification and unstable market for products.

**Animal production:** Occupies 27.5% of the agricultural land with the value of agricultural production achieving 491,494 million VND in 2002. At present, there are 42,871 buffaloes, 181,733 cattle and 517,448 pigs increasing 1%, 0.98% and 1.09% per year, respectively (*Quang Ngai Statistical Yearbook, 2002*). However, pigs often fluctuate because of unstable price, high feed price, low quality breeding and diseases epidemics.

**Forestry:** The province has a total area of 143,220.4 ha of forestry land in which planted forestry from implementation of program and project namely 327, 773, and PAM is 42,033.2 ha. Annually, there is above 45,000 ha of regeneration forest and 8,800 ha of protection forest. Covering degree of forest until to 2000 is 27.6%, but it is still low as compared with Central region and whole country (*Final Report on 5 Years of Department of Agriculture and Rural Development, 2001*). However, unused land area is still high (448,385.7 ha) (*Quang Ngai Statistical Yearbook, 2002*).

**Fishery:** Aquatic gross output increased from 46,896 tons (1997) to 78,052 tons (2002), average increasing of 1.11% per year. Aquaculture area is from 372 ha (1997) to 649 ha (2002) with 1,049 tons of gross output (*Quang Ngai Statistical Yearbook, 2002*). Because fishery households lack capital, they only catch near the shore resulting in low yields of catching, in addition there is an unstable market, production efficiency is low. Aquaculture developed very fast but there is no detailed design and plan, water environment is polluted resulting in diseases epidemic, so that some local was loss (for an example in Duc An commune - Mo Duc district in 2000, loss 20 billion VND) (*Final Report on 5 Years of Department of Agriculture and Rural Development, 2001*).

In general, agriculture in Quang Ngai province has impressive progress, however, there is still some issues to solve including:

- Have no design and arrange suitable crops to utilize advantage comparative of each ecological region.
- Change in cropping patterns is still slow.
- Crop varieties and animal breeding have not paid attention.
- Agricultural production depend on market and unstable price leads to fluctuating production area.
- Inappropriate land use, high bare land area cause environment pollution.

### 3.1.2 Characteristics of Agroecological Zones

The agro- ecology of Quang Ngai province is very diverse including many components such as crop production, animal production, forestry and off farm activity and each component has many kind of crops, animals etc. However, each agro ecological zone has typical characteristics on climate condition, topography, and customs leading to having representative farming systems. According to the document on "*Plan of development Quang Ngai province until 2010*" of Department of Agriculture and Rural Development (2001), agroecological zones can be divided into three zones as follows.

### 3.1.3 Mountain Zone

Mountain zone in Quang Ngai has five districts including Tra Bong, Son Ha, Ba To, Son Tay and Minh Long. Total natural land area in this zone is 322,532ha, occupying 68,68% total natural land area of the province, in which agricultural land area is 23,240.1ha occupying 7,2% total natural land area. Forestry land is 114,126.3ha, occupying 35,8% of which forest land is 11,126ha, the rest is bare land. This zone is divided into 3 sub agro-ecological zones:

Mountainous zone

Hilly zone

Transition lowland zone

Average temperature in the year is 25.4°C, fluctuating among months 21,4°C - 28,1°C. Lowest temperature occurs in December to February (22,8°C).

Average rainfall amount is 3637mm with two rainy seasons. 70% total rainfall amount concentrates in September to December which often causes flood and soil erosion.

The main cropping patterns of this zone are

- Paddy rice (Winter - Spring season) - paddy rice (Summer season)
- Upland rice +corn or bean
- Peanut (Spring season) - Corn (Summer season)
- Corn (Spring season) - Peanut (Summer season)
- Sugarcane
- Cassava

### 3.1.4 Lowland Zone

The lowland zone includes Quang Ngai town, Binh Son, Nghia Hanh, Son Tinh, Duc Pho, Mo Duc, Tu Nghia and Ly Son districts, mainly with rice production. Total natural land area is 108,093ha (occupying 23.02% total natural land area of the province), but population only occupies 50% total population of province. It is divided into 3 sub agro-ecological zones:

Hilly and transition lowland zone

Dryland zone

Rice land

Average temperature in the year is 25.8°C, fluctuating among months from 21,7°C - 28,9°C. Lowest temperature occurs in December to February (19.1°C). Average rainfall amount is 2341mm with 70% total rainfall amount concentrates in October to December which often causes flood and soil erosion.

The main cropping patterns of the zone are:

- Rice (Winter - spring season) - Rice (Summer season)
- Rice (Winter - spring season) - Rice (Summer season) - Rice (Autumn season)
- Peanut (Winter - spring season) - Rice (Summer season) - Sweet potato (Winter season)
- Corn (Winter - spring season) - Peanut (Summer season) - Sweet potato (Winter season)
- Watermelon (Spring season) - Watermelon (Summer season)
- Sugarcane
- Cassava

### 3.1.5 Coastal Land Zone

Coastal land zone stretches from Binh Son to Duc Pho district, is located along the sea. Total natural land area is 39,000 ha (occupying 8.30% total natural land area of province) and population occupies 25% total population in the province.

Soil texture is mainly sandy. Soil is very poor fertility and often saline and acid (Soil survey, 2002 in *"Plan of development Quang Ngai province until 2010"* of Department of Agriculture and Rural Development (2001)). It is also divided into three sub-agroecological zones including:

Paddy rice land zone

Dry land zone

Coastal land zone

Annual average temperature is nearly similar with lowland zone. Total rainfall amount is 2,044 mm and concentrates on October to December, easy to cause flood and affect to people life in the zone.

The main cropping patterns of this zone are:

- Rice (Winter - spring season) - Rice (Summer season)

- Rice (Winter - spring season) - Rice (Summer season) - Rice (Autumn season)
- Peanut/melon (Winter - spring season) - corn/melon (Summer season) - rice (Autumn season)
- Corn/melon (Winter - spring season) - Peanut/melon (Summer season) - Sweet potato (Winter season)
- Sugarcane
- Cassava

## 3.2 Survey results on farming systems at communes

### 3.2.1 Current situation and solution for agricultural activities in surveyed communes

**Table 1: Current Situation and Solution for Agricultural Activities in Surveyed Communes**

Item	Advantages	Constraints	Reasons	Solutions
<b>I. NGHIA THO COMMUNE - TU NGHIA DISTRICT</b>				
1. Crop production (0.54 ha /hh)	Abundant labour	<ul style="list-style-type: none"> <li>- Lack of water</li> <li>- Lack of technology</li> <li>- Unstable market</li> <li>- Lack of new varieties</li> <li>- Low soil fertility, many gravels</li> </ul>	<ul style="list-style-type: none"> <li>- No irrigation</li> <li>- Low education, less participation in training courses</li> <li>- Not understanding about demand and supply</li> <li>- Not paying attention to variety</li> </ul>	<ul style="list-style-type: none"> <li>- Constructing irrigation system</li> <li>- Organizing training course and visiting</li> <li>- Understanding demand from the market</li> <li>- Improving crop variety</li> </ul>
2. Animal production (1,5 fattening pigs and 0,3 Cattles, 2,34 buffaloes/hh)	<ul style="list-style-type: none"> <li>- Abundant labour</li> <li>- Large area for animal raising</li> </ul>	<ul style="list-style-type: none"> <li>- Lack of technology</li> <li>- Unstable market</li> <li>- Lack of good breeding</li> <li>- Many diseases</li> <li>- Lack of capital</li> </ul>	<ul style="list-style-type: none"> <li>- Low education, less participation in training courses</li> <li>- Not understanding about demand and supply</li> <li>- Not paying attention to breeding</li> <li>- Bad raising facilities and do not inject</li> </ul>	<ul style="list-style-type: none"> <li>- Organizing training course and visiting</li> <li>- Understanding demand from the market</li> <li>- Improving animal breeding</li> <li>- Building raising house and injecting</li> <li>- Credit</li> </ul>
3. Forestry (1.55 ha/hh)	Bare land area is high	<ul style="list-style-type: none"> <li>- Low soil fertility, many stones, high slope, difficult for exploitation and transportation.</li> <li>- Lack of technology</li> <li>- Lack of tree variety</li> <li>- Not allocate land for household yet</li> </ul>	<ul style="list-style-type: none"> <li>- Slope topography, remote area</li> <li>- Low education, less participation in training courses</li> <li>- Lack of capital</li> <li>- Depending on land policy</li> </ul>	<ul style="list-style-type: none"> <li>- Improving capacity</li> <li>- Supporting high quality tree variety</li> <li>- Land allocation</li> </ul>
4. Off farm activity (fire wood cutting)	Abundant labour	Have not off farm activities	<ul style="list-style-type: none"> <li>- Low education</li> <li>- Lack of capital for develop off farm activities</li> </ul>	<ul style="list-style-type: none"> <li>- Setting up off farm activities.</li> <li>- Training off farm activities for farmers</li> </ul>

Item	Advantages	Constraints	Reasons	Solutions
<b>II. HANH PHUOC COMMUNE - NGHIA HANH DISTRICT</b>				
1. Crop production (0.306 ha/hh)	Abundant labour	<ul style="list-style-type: none"> <li>- Unstable market</li> <li>- Submergence land</li> <li>- 3 rice crops per year with unstable yield</li> <li>- Lack of farm yard manure (FYM)</li> </ul>	<ul style="list-style-type: none"> <li>- Not identify suitable crop yet</li> <li>- Difficult to drain water due to submergence land</li> <li>- Not pay attention to process FYM</li> </ul>	<ul style="list-style-type: none"> <li>- Understanding demand from market</li> <li>- Improving crop variety</li> <li>- Encouraging farmer to use FYM</li> <li>- Training on techniques of FYM making</li> <li>- Changing into 2 rice crops per year</li> </ul>
2. Animal production (1 cattle, 15 chickens, 0.5 sow, 1 fattening pigs and 2 piglets/hh)	- Abundant labour	<ul style="list-style-type: none"> <li>- Lack of capital</li> <li>- Diseases epidemic</li> <li>- Lack of pasture area</li> <li>- Unstable market</li> <li>- Variety degeneration</li> </ul>	<ul style="list-style-type: none"> <li>- Low income and lack of capital</li> <li>- Lack of diseases control techniques</li> <li>- Unknown about demand of the market</li> <li>- Farmer does not pay attention to the variety selection</li> </ul>	<ul style="list-style-type: none"> <li>- Loaning capital</li> <li>- Paying attention to control diseases</li> <li>- Providing information about the market</li> <li>- Building model of pig raising for lean meat.</li> <li>- Building model of hybrid sown raising</li> <li>- Building model of Sind hybrid Cattle raising</li> <li>- Goat raising at home</li> </ul>
3. Forestry (0.12 ha/hh)		<ul style="list-style-type: none"> <li>- Land is not allocated for household yet</li> <li>- High slope and low soil fertility</li> </ul>	<ul style="list-style-type: none"> <li>- Depending on land policy</li> </ul>	<ul style="list-style-type: none"> <li>- Allocating forestry land for household</li> <li>- Selecting suitable crop</li> </ul>
4. Off farm activity (brick, noodle, mungbean cake making, silkworm raising)	<ul style="list-style-type: none"> <li>- Abundant labour</li> <li>- Traditional work</li> </ul>	<ul style="list-style-type: none"> <li>- Unstable market</li> <li>- Do not design concentrated production zone</li> <li>- Environment pollution</li> </ul>	<ul style="list-style-type: none"> <li>- Lack of information about the market</li> <li>- Spontaneous business development</li> <li>- Bad consciousness about environment protection</li> </ul>	<ul style="list-style-type: none"> <li>- Grasping information about demand of market.</li> <li>- Designing production zone</li> <li>- Promulgating regulation of environment protection</li> </ul>
<b>III. PHO CHAU COMMUNE - DUC PHO DISTRICT</b>				
1. Crop production (0.355 ha/hh)	- Abundant labour	<ul style="list-style-type: none"> <li>- Lack of water</li> <li>- Unsuitable cropping pattern</li> <li>- Low soil fertility</li> <li>- Lack of technology</li> <li>- Low yield</li> <li>- Lack of consumption market</li> </ul>	<ul style="list-style-type: none"> <li>- Lack of capital</li> <li>- Saline and acid sulfate water</li> <li>- Long duration variety, unsuitable with climate and soil condition</li> <li>- Acid sulfate soil</li> <li>- Have not participated in training courses</li> <li>- Variety degeneration</li> <li>- Unstable price</li> </ul>	<ul style="list-style-type: none"> <li>- Building irrigation system</li> <li>- Soil reclamation</li> <li>- Selecting rice variety suitable with two crop seasons</li> <li>- Replacing old varieties by high yield and good quality varieties</li> <li>- Organizing training courses about technology transfer of crop production</li> <li>- Field visiting models</li> <li>- Setting up network of collecting products</li> </ul>

Item	Advantages	Constraints	Reasons	Solutions
2. Animal production (1 pig, 0.7 cattle and 11 chickens + ducks/hh)	<ul style="list-style-type: none"> <li>- Abundant labour</li> <li>- Large pasture area</li> </ul>	<ul style="list-style-type: none"> <li>- Lack of capital</li> <li>- Lack of technology knowledge</li> <li>- Degradation variety</li> <li>- Epidemic disease</li> <li>- Lack of food</li> <li>- Unstable market</li> </ul>	<ul style="list-style-type: none"> <li>- Low income</li> <li>- Have not participated in training courses - Lack of knowledge in diseases control and sty hygiene</li> <li>- Have not place to process food</li> <li>- Unstable price</li> </ul>	<ul style="list-style-type: none"> <li>- Organizing training courses about animal production techniques and diseases control</li> <li>- Increase veterinarian in the commune</li> <li>- Providing new animal breeding such as Sind hybrid Cattle, lean meat fattening pig and chicken.</li> <li>- Breeding production at local</li> <li>- Monitoring market happenings</li> </ul>
3. Forestry (1.25 ha/hh)	<ul style="list-style-type: none"> <li>- Large bare land area</li> <li>- Abundant labour</li> </ul>	<ul style="list-style-type: none"> <li>- Policy</li> <li>- Low soil fertility</li> <li>- Lack of tree variety</li> </ul>	<ul style="list-style-type: none"> <li>- Have not land allocation policy</li> <li>- Soil have many stones and high slope</li> <li>- Growing only eucalyptus with low economic efficiency and over exploitation of soil</li> </ul>	<ul style="list-style-type: none"> <li>- Planting acacia in sloping land and low fertile soil.</li> <li>- In low slope land and better fertile soil, growing acacia, cinnamon at high layer and pineapple, vegetables at low layer</li> <li>- Certificate for land use right</li> </ul>
4. Fishery	<ul style="list-style-type: none"> <li>- Large fishing ground</li> </ul>	<ul style="list-style-type: none"> <li>- Lack of fishing means</li> <li>- Lack of capital</li> <li>- Lack of port</li> </ul>	<ul style="list-style-type: none"> <li>- Low income</li> </ul>	<ul style="list-style-type: none"> <li>- Loaning capital</li> </ul>
5. Off farm activity (fishing, small business)	<ul style="list-style-type: none"> <li>Abundant labour</li> </ul>	<ul style="list-style-type: none"> <li>- Lack of capital</li> <li>- Lack of technique to process coconut coir</li> <li>- Lack of processing place</li> <li>- Lack of consumption market</li> </ul>	<ul style="list-style-type: none"> <li>- Low income</li> <li>- Have not visited in other places yet</li> </ul>	<ul style="list-style-type: none"> <li>- Loaning capital</li> <li>- Organizing training course on processing technique</li> <li>- Visiting in other provinces</li> </ul>
<b>IV. TINH THO COMMUNE - SON TINH DISTRICT</b>				
1. Crop production (0.83ha/hh)	<ul style="list-style-type: none"> <li>Abundant labour</li> </ul>	<ul style="list-style-type: none"> <li>- Unstable market</li> <li>- Some dry land areas, growing rice with low efficiency</li> <li>- Unstable yield with 3 crop seasons</li> <li>-Lack of technology</li> <li>- Pests and diseases</li> </ul>	<ul style="list-style-type: none"> <li>- Not identify suitable crop with market requirement</li> <li>- Poor soil fertility and lack of water</li> <li>-Traditional customs in cultivation</li> <li>- Less opportunity to train</li> </ul>	<ul style="list-style-type: none"> <li>- Grasp market demand</li> <li>- Improve crop variety</li> <li>- Change rice growing land to peanut growing land</li> <li>- Change 3 rice crops to 2 ones</li> <li>- Organizing training courses on techniques of crop production and IPM</li> </ul>

Item	Advantages	Constraints	Reasons	Solutions
2. Animal production (2.4 cattles, 2.8 pigs, 0.3 buffalos, 37 chickens, 30 ducks/hh)	- Abundant labour - Large area for animal raising	- Lack of capital -Disease epidemic -Unstable market -Bad variety - Lack of technology in production	- Low income -Limited disease control - Do not know market demand - Local people have not paid attention to variety selection - Less opportunity to train	- Support capital - Pay attention to control disease - Provide information about market demand - Set up demonstration on pig raising for lean meat - Set up demonstration on Sind crossing Cattle raising - Grass planting and Cattle breeding supplying - Organizing training course
3. Forestry (0.32ha/hh)	Near residential area	- Land is not allocated for household yet - Land with high slope and low fertility	Depend on land management department	- Allocate forest for household - Plant forest, cover bare land
4. Off farm activity (hired labour)	Abundant labour	Not developed, farmers work far from their home	Have not traditional business	- Open service of product processing - Training on business
5. Fishery (0.015 ha/hh)	Abundant labour	- Have not potential to develop fishery - Drought and flood	A little of pond and water area for aquaculture	- Utilize pond area to raise fresh fish - Set up demonstration on rice- fish
<b>V. DUC PHONG COMMUNE - MO DUC DISTRICT</b>				
1. Crop production (0.34ha/hh)	Abundant labour	- Lack of water - Lack of technology for crop production -Unstable market - Lack of short duration variety - Pests and diseases	- Submergence land, difficult to drain - Low education, less opportunity to train -Have not grasped market demand - Have not paid attention to variety selection	- Building irrigation system -Train technology, set up demonstration and field visiting - Grasping market demand - Improve variety -IPM training
2. Animal production (2 fattening pig, 0.9 sown, 24 chickens and ducks, 1 cattle, 0.03 buffalo)	- Abundant labour - Large area for animal raising	- Lack of capital -Disease epidemic -Unstable market -Bad variety - Lack of technology in production	- Low education, less train - Have not grasped market demand - Have not paid attention to variety selection - Lack of capital	- Train techniques, set up demonstration and field visiting - Grasp market demand - Improve variety - Support capital
3. Forestry (0.66 ha)	Near residential area, easy to protect	- Forest land is allocated to organization mass, they did not take care and protect good	- Lack of protection attitude	- Allocate forest land for household -Forest design, set up fruit garden combination with animal production

Item	Advantages	Constraints	Reasons	Solutions
4. Off farm activity ( <i>dry pancake making, wine cooking, small business</i> )	-Abundant labour - Have experience	- Small scale of production - Lack of capital	- Small production and spontaneous	-Look for market -Set up business group
5. Fishery	-Have large fishing ground - Have condition for fresh fish raising	- Lack of capital -Catching near the shore - Low yield -Lack of knowledge and techniques of aquaculture -High investment - Unstable market	- Poor farmer -Lack of fishery - Do not train -Price depend on the market	- Loan capital -Invest fishery - Train shrimp raising technique - Make plan and design shrimp raising area - Grasp information of market - Set up demonstration on rice and fish raising
<b>VI. SON HAI COMMUNE - SON HA DISTRICT</b>				
1. Crop production ( <i>0.6ha/hh</i> )	-Abundant labour -Crop diversity	- Lack of water - Lack of technology -Unstable market - Lack of new variety - Soil erosion - Lack of services	-No irrigation - Low education, less train - Have not market - Have not paid attention to variety selection - Shift cultivation, slash and burn	- Building irrigation system - Anti-illiteracy, train techniques, set up demonstration and field visit - Support capital to build market - Improve variety - Set up model in sloping land (SALT)
2. Animal production	- Abundant labour - Large area for animal raising	- Lack of capital -Disease epidemic -Unstable market -Bad variety - Lack of technology in production	- Low education, less training -Have not market - Have not paid attention to raising variety - Bad raising house and do not inject	- Anti-illiteracy, train techniques, set up demonstration and field visit. - Support capital to build market - Improve variety -Build raising house and inject for animal - Loan capital
3. Forestry	- Large area and high soil fertility	- Have not allocated land for household - Soil leaching and erosion, difficult transportation - Lack of tree variety - Lack of capital	- Depend on Land Management Department - Sloping topography and far road - Poor farmer	- Allocate land for household - Support seedling - Support capital for forest plant.
4. Off farm activity (wood exploitation)	- Abundant labour - Materials available	- Have not by trade -Lack of knowledge and experience	Low education	- Open service of product processing - Train business

Item	Advantages	Constraints	Reasons	Solutions
5. Fishery	Have 2 crossing rivers	Flood often occurs	Strong flow	-Set up demonstration on VAC and VACR - Fresh fish raising
<b>VII. BINH MINH COMMUNE - BINH SON DISTRICT</b>				
1. Crop production (0.68 ha/hh)	-Abundant labour - Large land area in some hamlets	-Lack of water and flood -Lack of new variety -Low soil fertility and many stones -Unstable market -Lack of technology	-Lack of irrigation system -Less opportunity to train	- Dig pond and construct wells - Replace cropping patterns (growing sesame and grafting cashew nut.) -Set up demonstration on new rice variety - Open training course on IPM for farmers
2. Animal production (1,64 cattles, 1,6 pigs, 1.44 fattening pigs, 16 chickens)	- Abundant labour - Large land area for animal raising	-Disease epidemic -Unstable market - Inbred variety - Lack of technology - Lack of capital	- Lack of disease control. - Do not grasp market demand - Farmers have not paid attention to breeding - Less opportunity to train	- Pay attention to diseases control - Provide information in market demand - Set up models on crossing Cattle and lean meat pig raising - Open training course and field visit - Support capital
3. Forestry (0.14 ha/hh) (allocated 67 ha for hhs)		- Soil erosion and leaching		- Intercrop rubber with legume crops or cassava
4. Off farm activity (carpentry, small business, hired labour)	Abundant labour	Less developed off farm activity	-Have not traditional off farm activity	- Train carpentry and sewing -Set up processing group of rubber latex
5. Fishery	Abundant labour	- Drought and flood	- Depend on climate condition	- Utilize pond and river to raise fresh fish
<b>VIII. SON TRUNG COMMUNE - SON HA DISTRICT</b>				
1. Crop production (0.57ha/hh)	-Abundant labour -Diverse crop	- Lack of water - Lack of technology and backward - Lack of new variety - Do not identify suitable cropping pattern - Soil erosion - Unstable price	-No irrigation system - Low education, less opportunity to train - Have not paid attention to variety selection - Backward management practices	- Construct irrigation system - Anti - illiteracy, train technology and field visit - Improve crop variety - Crop diversification - Set up demonstration in sloping land

Item	Advantages	Constraints	Reasons	Solutions
2. Animal production (1 fattening pig, 2 piglets, 10 chickens, 1 cattle, 0.5 buffalo/hh)	- Abundant labour - Large land area for animal raising	- Lack of technology -Lack of veterinarian - Lack of good Cattle and pig breeding - Disease epidemic - Lack of capital	- Low education, less opportunity to train - Have not paid attention to variety selection - Have not good raising house and injected	- Train technology, set up demonstration and field visit - Training for commune vets - Support good animal breeding - Set up demonstration on hybrid Cattle and pig -Doing raising house and injecting - Loan capital
3. Forestry (0.54ha/hh), (allocated 8.5 ha for hhs)	Large bare land area	- Have not allocated land for household - Low economic efficiency of tree planting	- Depend on Land Management Department - Have not selected suitable trees	- Forest land allocation for household - Change to grow bamboo for shoot, bamboo
4. Off farm activity (hired labour)	-Abundant labour	- Have not by trade -Lack of knowledge	- Low education	-Set up off farm activity group - Train by trade for local people
<b>IX. SON GIANG COMMUNE - SON HA DISTRICT</b>				
1. Crop production (0.33 ha/hh)	-Abundant labour	- Lack of water - Lack of technology knowledge, backward practice management - Lack of new variety - Soil erosion and leaching	-No irrigation system - Low education, less opportunity to train - Do not pay attention to variety selection	- Build canal and trenches for irrigation - Anti - illiteracy, train technology and field visit - Train extension staff - Improve crop variety - Set up demonstration in sloping land (SALT)
2. Animal production (2 fattening pigs, 2 piglets, 5 chickens, 1 cattles, 0,2 buffaloes)	- Abundant labour - Large land area for animal raising	- Lack of technology -Lack of veterinarian - Lack of good Cattle and pig breeding - Disease epidemic - Lack of capital	- Low education, less opportunity to train - Have not paid attention to variety selection - Have not good raising house and injected	- Train technology, set up demonstration and field visit - Train commune veterinarian - Support good animal breeding - Set up demonstration on hybrid Cattle and pig -Doing raising house and injecting - Loan capital
3. Forestry (1.19ha/hh) (allocated 30 ha for hhs)		- Have not allocated land for household - Land erosion and leaching, difficult transportation	- Depend on Land management department - Sloping topography, far road	- Forest land allocation for household - Support high value tree variety
4. Off farm activity (hired labour, small business)	-Abundant labour -Materials available	- Have not by trade -Lack of knowledge	- Low education	-Set up off farm activity group - Train by trade for local people

Note: (1) income is calculated from household interview

(2) Average data is calculated from official data of commune

### 3.2.2 Evaluation on current situation of household farming systems

**Table 2: Economic Efficiency of Household Farming Systems**

Type of Household Farming Systems	% hh Applied	Income (VND/household/year)					Total Revenue (VND)	Total Variable Costs (VND)	Gross Margin (VND)
		Crop Production	Animal Production	Forestry	Aquaculture	Off Farm Activity			
<b>1. NGHIA THO COMMUE - TU NGHIA DISTRICT</b>									
Crop production - animal production	48	4,072,875	2,433,333				6,506,208	3,167,752	3,338,456
Crop production - animal production- Forestry	34	4,072,875	2,433,333	1,200,000			7,706,208	3,767,752	3,938,456
Crop production - Fire wood making	18	4,072,875				1,800,000	5,872,875	2,395,375	3,477,500
<b>2. HANH PHUOC COMMUNE - NGHIA HANH DISTRICT</b>									
Crop production - animal production	76	11,485,213	9,088,889				20,574,102	10,741,532	9,842,570
Crop production - animal production- Forestry	5	11,485,213	9,088,889	0 (not harvested yet)			20,574,102	10,741,532	9,842,570
Crop production - animal production- Noodle making	15	11,485,213	9,088,889			36,000,000	56,574,102	34,731,532	21,842,570
Crop production - animal production - brick making	1	11,485,213	9,088,889			41,994,000	62,568,102	38,727,532	23,840,570
Crop production - animal production - silk worm raising	1	11,485,213	9,088,889			4,590,000	25,164,102	12,711,845	12,452,257

Type of Household Farming Systems	% hh Applied	Income (VND/household/year)					Total Revenue (VND)	Total Variable Costs (VND)	Gross Margin (VND)
		Crop Production	Animal Production	Forestry	Aquaculture	Off Farm Activity			
Off farm activity (brick, noodle and cake making)	2					38,997,000	38,997,000	23,574,000	15,423,000
<b>3. PHO CHAU COMMUNE - DUC PHO DISTRICT</b>									
Crop production - animal production	65	6,357,709	7,804,977				14,162,686	7,378,286	6,784,400
Crop production - animal production- Forestry	20	6,357,709	7,804,977	2,000,000			16,162,686	8,378,686	7,784,000
Crop production - animal production- Fishing	10	6,357,709	7,804,977			3,083,335	17,246,021	7,879,021	9,367,000
Crop production - animal production - small business	3	6,357,709	7,804,977			5,556,000	19,718,686	9,667,619	10,051,067
Off farm activity (Fishing, small business)	2					8,639,335	8,639,335	2,790,068	5,849,267
<b>4. TINH THO COMMUNE - SON TINH DISTRICT</b>									
Crop production - animal production	80	7,907,144	16,866,667				24,773,811	13,298,976	11,474,835
Crop production - animal production- Forestry	10	7,907,144	16,866,667	0 (not harvested yet)			24,773,811	13,298,976	11,474,835
Crop production - animal production- Off farm activity	8	7,907,144	16,866,667			1,500,000	26,273,811	14,298,976	11,974,835

Type of Household Farming Systems	% hh Applied	Income (VND/household/year)					Total Revenue (VND)	Total Variable Costs (VND)	Gross Margin (VND)
		Crop Production	Animal Production	Forestry	Aquaculture	Off Farm Activity			
Off farm activity (hired labour)	2					1,500,000	1,500,000	1,000,000	500,000
<b>5. DUC PHONG COMMUNE - MO DUC DISTRICT</b>									
Crop production	5	5,344,646					5,344,646	3,545,000	1,799,646
Crop production - animal production	80	5,344,646	7,946,083				13,290,729	7,989,944	5,300,785
Crop production - animal production- Forestry	4	5,344,646	7,946,083	0			13,290,729	7,989,944	5,300,785
Crop production - animal production - shrimp raising	3	5,344,646	7,946,083		26,000,000		39,290,729	31,989,944	7,300,785
Crop production - animal production - dry pancake making	7,5	5,344,646	7,946,083			6,000,000	19,290,729	11,189,944	8,100,785
Off farm activity (hired labour, wine cooking, small business)	0.5					21,700,000	21,700,000	15,500,000	6,200,000
<b>6. SON HAI COMMUNE - SON HA DISTRICT</b>									
Crop production	15	3,029,135					3,029,135	1,035,604	1,993,531
Crop production - animal production	80	3,029,135	4,903,034				7,932,169	3,597,701	4,334,468
Crop production - animal production- Forestry	2	3,029,135	4,903,034	0			7,932,169	3,597,701	4,334,468

Type of Household Farming Systems	% hh Applied	Income (VND/household/year)					Total Revenue (VND)	Total Variable Costs (VND)	Gross Margin (VND)
		Crop Production	Animal Production	Forestry	Aquaculture	Off Farm Activity			
Crop production - Wood exploitation	3	3,029,135			1,200,000		4,229,135	1,035,604	3,193,531
<b>7. SON TRUNG COMMUNE - SON HA DISTRICT</b>									
Crop production - forestry	4	5,232,632					5,232,632	2,919,387	2,313,245
Crop production - animal production	60	5,232,632	6,123,267				11,355,899	4,354,199	7,001,700
Crop production - animal production- Forestry	25	5,232,632	6,123,267	0			11,355,899	4,354,199	7,001,700
Crop production - off farm (hired labour +by trade)	11	5,232,632				1,973,333	7,205,965	4,319,387	2,886,578
<b>8. SON GIANG COMMUNE - SON HA DISTRICT</b>									
Crop production - hired labour	16	5,021,213				1,200,000	6,221,213	2,854,104	3,367,109
Crop production - animal production	75	5,021,213	6,541,663				11,562,876	3,974,104	7,588,772
Crop production - animal production- Forestry	5	5,021,213	6,541,663	0			11,562,876	3,974,104	7,588,772
Animal production - hired labour, small business	4		6,541,663			3,371,429	9,913,092	3,119,036	6,794,056
<b>9. BINH MINH COMMUNE - BINH SON DISTRICT</b>									
Crop production - animal production	54	5,630,974	11,127,778				16,758,752	8,186,952	8,571,801

Type of Household Farming Systems	% hh Applied	Income (VND/household/year)					Total Revenue (VND)	Total Variable Costs (VND)	Gross Margin (VND)
		Crop Production	Animal Production	Forestry	Aquaculture	Off Farm Activity			
Crop production - animal production- Forestry	40	5,630,974	11,127,778	0			16,758,752	8,186,952	8,571,801
Crop production - animal production-off farm activity (capentery, small business)	1	5,630,974	11,127,778			5,116,000	21,874,752	11,187,752	10,687,000
Crop production - hired labour	5	5,630,974				3,540,000	9,170,974	4,351,000	4,819,974

Note: (3) Data is calculated from PRA work with groups in the commune

(4) Data is calculated from household interview

**Table 3: Advantages and Disadvantages of Farming Systems**

<b>Farming Systems</b>	<b>Advantages</b>	<b>Disadvantages</b>	<b>Solutions</b>
Crop production - animal production	<ul style="list-style-type: none"> <li>- Combination between crop production and animal production</li> <li>- Utilizing redundant labour in the household family and by product</li> <li>- Using manure</li> </ul>	Crude product, low efficiency	Open services on processing
Crop production - animal production - forestry	<ul style="list-style-type: none"> <li>- Combination between crop production and animal production</li> <li>- Utilizing redundant labour in the household family and by product</li> <li>- Using manure</li> <li>- Protecting environment</li> </ul>	Crude product, low efficiency	Open services on processing
Crop production - animal production - Off farm activity	<ul style="list-style-type: none"> <li>-Utilizing redundant labour in the household family and by product</li> <li>- High income</li> </ul>	<ul style="list-style-type: none"> <li>- Pollution environment (Noodle and brick making)</li> <li>- Unstable</li> </ul>	<ul style="list-style-type: none"> <li>- Improve technology</li> <li>- Set up production group</li> <li>- Look for market</li> </ul>
Crop production - animal production- aquaculture	<ul style="list-style-type: none"> <li>-Utilizing redundant labour in the household family and by product</li> <li>- High income</li> </ul>	<ul style="list-style-type: none"> <li>- High investment</li> <li>- Lack of technology</li> <li>- Unstable</li> </ul>	<ul style="list-style-type: none"> <li>- Support capital</li> <li>- Train technology</li> <li>- Open services of processing</li> </ul>
Crop production - wood exploitation	Less investment	<ul style="list-style-type: none"> <li>- Have not fertilizer</li> <li>- Low crop yield</li> <li>- Low income</li> </ul>	- Support capital, change farming systems
Off farm activity	<ul style="list-style-type: none"> <li>-Utilizing redundant labour in the household family and by product</li> <li>- High income</li> </ul>	<ul style="list-style-type: none"> <li>- Lack of capital</li> <li>- Depending on the market</li> <li>- Lack of combination with other activities, resulting in low efficiency</li> </ul>	<ul style="list-style-type: none"> <li>- Loaning capital</li> <li>- Combination with other activities</li> <li>- Setting up trade groups</li> </ul>

### 3.2.3 Assessment of current situation of cropping systems at surveyed communes

**Table 4: Area and Yield of Cropping Systems and Animals**

Crops	Area (m <sup>2</sup> /hh)	% hh applied	Yield (kg/500m <sup>2</sup> )	Animal	Number/ interviewed hh
<b>1. NGHIA THO COMMUNE - TU NGHIA DISTRICT</b>					
Rice (Winter-spring season)	1465	100	165	Buffalo	2.34
Rice (summer season)	1450	100	164	Cattle	0.3
Rice (third season)	1250	60	134	Fattening pig	1.5
Cassava	1250	60	400		
Sugarcane	1680	88	2550		
<b>2. HANH PHUOC COMMUNE - NGHIA HANH DISTRICT</b>					
Rice (Winter-spring season)	1280	100	282	Sown	1
Rice (summer season)	1230	100	267	Fattening pig	3
Rice (third season)	1160	80	242	Piglet	8
Corn (Winter-spring season)	1200	40	253	Cattle	2
Corn( Summer season)	700	40	228	Chicken	30
Sweet potato	400	12	350		
Peanut	500	4	170		
Cotton	2000	4	210		
Strawberry	1500	4	700		
<b>3. PHO CHAU COMMUNE - DUC PHO DISTRICT</b>					
Rice (Winter-spring season)	2205	100	157	Sown	1
Rice (summer season)	2225	68	155	Fattening pig	4
Rice (third season)	2085	48	144	Piglet	8
Watermelon (Winter-spring season)	500	8	825	Cattle	3
Watermelon (Summer season)	300	4	650	Chicken	25
Peanut	525	8	90		
<b>IV. TINH THO COMMUNE - SON TINH DISTRICT</b>					
Rice (Winter-spring season)	2062	100	220	Fattening pig	8
Rice (summer season)	1833	88	209	Sown	1.3
Rice (third season)	1750	40	120	Piglet	10
Peanut (Winter-spring season)	1355	68	109	Chicken	10
Corn (Summer season)	1165	28	153	Cattle	2.6
Upland rice	300	12	70	Cattle	1.2
Cassava	1355	68	1071	Small cattle	2
Sugarcane	500	12	2500	Buffalo	0.2
Watermelon (summer season)	700	20	1750	Duck	20
Sweet potato	200	20	400		
<b>V. DUC PHONG COMMUNE - MO DUC DISTRICT</b>					
Rice (Winter-spring season)	1365	100	274	Fattening pig	3
Rice (summer season)	1365	100	260	Sown	2.2
Peanut (Winter-spring season)	500	12	70	Piglet	23
Corn (summer season)	750	16	200	Chicken	18
Sweet potato	350	40	300	Cattle	0.93
Cotton	500	8	100		
Sugarcane	1435	52	2085		

Crops	Area (m <sup>2</sup> /hh)	% hh applied	Yield (kg/500m <sup>2</sup> )	Animal	Number/ interviewed hh
Watermelon	300	4	1800		
Cassava	920	64	744		
<b>VI. SON HAI COMMUNE - SON HA DISTRICT</b>					
Rice (Winter-spring season)	1250	92	150	Fattening pig	2
Rice (summer season)	1050	84	135	Sown	0.2
Upland rice	365	4	80	Piglet	2
Sugarcane	565	60	2167	Chicken	5
Cassava	742	100	1100	Cattle	0.5
Peanut (Spring season)	360	12	90	Buffalo	0.7
Peanut (Summer season)	265	8	75		
Corn (Spring season)	350	32	140		
Corn (Summer season)	350	26	100		
<b>VII. SON TRUNG COMMUNE - SON HA DISTRICT</b>					
Rice (Winter-spring season)	1400	100	112	Fattening pig	2
Rice (summer season)	1500	64	100	Sown	0.2
Sugarcane	4200	64	1511	Piglet	3
Cassava	3035	52	694	Chicken	9
Corn (Winter-spring season)	200	4	100	Cattle	2.6
Mungbean (Summer season)	150	4	40	Buffalo	1
Sweet potato	150	8	200		
Peanut (Winter-spring season)	100	4	60		
Peanut (Summer season)	100	4	40		
<b>VIII. SON GIANG COMMUNE - SON HA DISTRICT</b>					
Rice (Winter-spring season)	1815	100	116	Fattening pig	2.29
Rice (summer season)	1770	80	95	Sown	0.5
Cassava	2100	56	563	Piglet	2
Peanut (Winter-spring season)	750	20	167	Chicken	10
Corn (summer season)	750	20	103	Cattle	1
Corn (winter - spring season)	300	4	150	Cattle	1
Mungbean	500	4	60	Small cattle	1
Sweet potato	500	12	290	Buffalo	0.2
Sugarcane	600	4	1600	Draught cattle	0.7
<b>VIII. BINH MINH COMMUNE - BINH SON DISTRICT</b>					
Rice (Winter-spring season)	1490	100	198	Fattening pig	2
Rice (summer season)	1490	88	179	Sown	0.2
Rice (third season)	1265	44	106	Piglet	2.9
Peanut (Winter-spring season)	800	64	86	Chicken	19
Corn (Winter-spring season)	500	28	183	Cattle	0.9
Corn (Summer season)	750	64	124	Cattle	0.4
Cassava	2000	28	675	Small cattle	0.3
Sugarcane	1000	16	1500	Duck	1.4
Cotton	500	8	160	Draught cattle	1.2

*Note:* - average data of area and yield of crop and number of animal are from interviewed household  
- % household applied is calculated from number of interviewed household

**Table 5: Economic Efficiency of Cropping Systems**

Cropping systems	Area (ha)	1% hh applied		Total revenue (VND/500m <sup>2</sup> /year)	Total expenditures (VND/500m <sup>2</sup> /year)	Gross margin (VND/500m <sup>2</sup> /year)
		PRA in commune	Interviewed hh			
<b>1. NGHIA THO COMMUNE - TU NGHIA DISTRICT</b>						
<i>Rainfed banded paddy land</i>						
Rice - Rice	20	100	100	460,600	182,326	278,274
Rice-Rice-Rice	5	53	52	648,200	274,226	373,984
Rice	10	36	12	231,000	91,326	139,674
<i>Dry land</i>						
Sugarcane	35	100	92	510,000	256,786	253,214
Cassava	17	85	52	120,000	15,500	77,500
<i>Forest land</i>						
Eucalyptus and acacia	541	90	4	120,000	17,000	103,000
<b>2. HANH PHUOC COMMUNE - NGHIA HANH DISTRICT</b>						
<i>Irrigated paddy land</i>						
Rice - Rice	362.5	100	100	829,131	384,920	444,211
Rice - Rice -Rice	200	30	80	1,190,242	570,269	619,973
Rice	36	40	20	430,058	192,504	237,554
<i>Dry land</i>						
Corn -corn -sweet potato	250	50	44	1,295,792	422,177	873,615
Peanut -corn -sweet potato	14	15	12	1,613,136	647,500	965,636
Cotton-corn-sweet potato	9	1	4	1,855,136	554,500	1,300,636
Peanut -melon -sweet potato	14	5	4	1,850,000	500,000	1,350,000
Mulberry	35	1	4	700,000	550,000	150,000
<b>3. PHO CHAU COMMUNE - DUC PHO DISTRICT</b>						
<i>Rainfed banded paddy land</i>						
Rice -rice-rice	32	60	56	738,861	375,077	363,784
Rice-rice	60	30	76	494,061	233,514	260,547
Rice	163	90	52	261,561	124,611	136,951
<i>Dry land</i>						
Cassava	30	25	52	113,400	67,350	46,050
Watermelon - Watermelon	45	10	12	2,537,500	1,067,500	1,470,000
Cassava-peanut	7.5	5	24	563,400	148,303	415,097
Coconut	165	50	56	431,200	0	431,200
<i>Forest land</i>						
Eucalyptus	250	9	12	130,000	25,000	105,000
Cashew nut	15	1	4	90,000	10,000	80,000

Cropping systems	Area (ha)	1% hh applied		Total revenue (VND/500m <sup>2</sup> /year)	Total expenditures (VND/500m <sup>2</sup> /year)	Gross margin (VND/500m <sup>2</sup> /year)
		PRA in commune	Interviewed hh			
<b>4. TINH THO COMMUNE- SON TINH DISTRICT</b>						
<i>Irrigated paddy land</i>						
Rice -rice	285.35	100	92	729,111	340,178	388,932
Rice -rice -rice	369.61	50	40	933,111	406,203	526,907
Rice	98.14	70	4	374,000	168,890	205,110
<i>Dry land</i>						
Peanut -corn -sweet potato	70	30	32	926,429	267,266	659,163
Corn - upland rice	40	10	12	430,000	146,166	238,834
Cassava	300	90	72	296,429	35,571	260,875
Peanut - watermelon	80	5	20	1,271,429	664,100	607,329
Sugarcane	160	50	12	500,000	241,000	259,000
<b>5. DUC PHONG COMMUNE - MO DUC DISTRICT</b>						
<i>Irrigated paddy land</i>						
Rice -rice	635	90	100	906,142	490,328	415,814
<i>Dry land</i>						
Peanut -corn -sweet potato	20	7	12	1,020,000	470,000	550,000
Peanut - watermelon - sweet potato	10	5	12	1,350,000	690,000	660,000
Cotton +peanut -corn	5	1	4	1,170,000	470,000	700,000
Sugarcane	185	50	56	435,000	260,857	174,142
Cassava	168	60	64	190,555	73,077	140,200
<b>6. SON HAI COMMUNE - SON HA DISTRICT</b>						
<i>Rainfed paddy land</i>						
Rice -rice	247,4	90	96	484,500	182,000	302,000
<i>Dry land</i>						
Upland rice	5	5	4	136,000	0	136,000
Peanut -Peanut	11,5	10	4	825,000	265,000	560,000
Corn - corn	10,5	10	4	360,000	176,400	183,600
Sugarcane	22	10	8	650,100	289,134	360,966
Cassava	220	100	80	220,000	50,000	170,000
<b>7. SON TRUNG COMMUNE - SON HA DISTRICT</b>						
<i>Rainfed banded paddy land</i>						
Rice - Rice	107	70	64	360,541	154,166	206,374
Rice	10	40	20	190,541	77,833	112,708
<i>Dry land</i>						
Corn - mungbean - sweet potato	6	5	4	650,000	270,000	380,000
Peanut - peanut	2	2	4	500,000	245,000	265,000
Sugarcane	121	80	64	302,200	205,550	96,650
Cassava	154	80	52	186,828	26,285	160,542
<b>8. SON GIANG COMMUNE - SON HA DISTRICT</b>						
<i>Rainfed banded paddy land</i>						
Rice - rice	177	90	80	358,296	192,145	166,151

Cropping systems	Area (ha)	1% hh applied		Total revenue (VND/500m <sup>2</sup> /year)	Total expenditures (VND/500m <sup>2</sup> /year)	Gross margin (VND/500m <sup>2</sup> /year)
		PRA in commune	Interviewed hh			
Rice	107,8	50	12	196,142	93,107	103,035
<i>Dry land</i>						
Corn - mungbean - sweet potato	5	5	8	905,000	325,000	580,000
Peanut - corn/peanut	9	10	20	921,000	254,733	666,267
Corn - corn	10	15	12	353,000	199,033	153,967
Sugarcane	10	15	12	320,000	214,654	105,346
Cassava	265	100	56	149,655	18,133	131,522
<b>9. BINH MINH COMMUNE - BINH SON DISTRICT</b>						
<i>Rainfed banded paddy land</i>						
Rice - rice -rice	50	25	52	776,865	444,479	332,386
Rice - Rice	205	50	84	603,615	334,646	268,968
Rice	195	50	16	316,615	169,592	147,023
<i>Dry land</i>						
Peanut - corn	73	70	64	590,999	269,682	281,317
Cotton +peanut -corn	12	5	8	1,422,999	394,182	1,028,817
Corn -corn	40	30	28	458,222	220,825	237,397
Sugarcane	115	10	16	300,000	225,000	75,000
Cassava	295	55	28	135,000	53,025	81,975
<b>Rubber +peanut/cassava *</b>	200	40	12	402,777	136,774	266,003

*Note: \* Rubber has not been harvested yet*

*Area from official data of communes*

**Table 6: Economic Efficiency of Livestock Husbandry at Program Communes**

Type of animals	Quantity (animal/hh/year)	Total revenue (VND/hh/year)	Total cost (VND/hh/year)	Gross margin (VND/hh/year)
<b>1. NGHIA THO COMMUNE - TU NGHIA DISTRICT</b>				
Buffalo	2.34	1,700,000	200,000	1,500,000
Fattening cow	0.3	312,112	102,108	210,004
Fattening pig	1.5	421,221	204,483	216,738
<i>Total</i>		<i>2,433,333</i>	<i>506,591</i>	<i>1,926,742</i>
<b>2. HANH PHUOC COMMUNE - NGHIA HANH DISTRICT</b>				
Breeding pig	1	978,326	358,500	619,826
Fattening pig	3	1,960,235	932,125	1,028,110
Fattening cow	2	5,900,000	4,100,000	1,800,000
Chicken	30	250,328	29,586	220,742
<i>Total</i>		<i>9,088,889</i>	<i>5,420,211</i>	<i>3,668,678</i>
<b>3. PHO CHAU - DUC PHO DISTRICT</b>				
Breeding pig	1	820,347	326,732	493,615
Fattening pig	4	1,890,450	970,285	920,165
Fattening cow	3	4,950,000	3,100,000	1,850,000
Chicken	25	144,180	15,725	128,455
<i>Total</i>		<i>7,804,977</i>	<i>4,812,742</i>	<i>2,992,235</i>
<b>4. TINH THO COMMUNE - SON TINH DISTRICT</b>				
Fattening pig	8	5,632,542	4,072,740	1,559,820
Breeding pig	1.3	1,248,320	978,450	269,870
Chicken	10	180,450	15,000	165,450
Fattening cow	2.6	6,034,589	3,500,000	2,534,589
Breeding cow	1.2	2,500,000	700,000	1,800,000
Buffalo	0.2	850,420	363,671	486,749
Duck	20	420,346	120,420	299,926
<i>Total</i>		<i>16,866,667</i>	<i>9,750,281</i>	<i>7,116,386</i>
<b>5. DUC PHONG COMMUNE - MO DUC DISTRICT</b>				
Fattening pig	3	2,150,565	1,503,355	647,210
Breeding pig	2.2	2,370,878	1,474,464	896,414
Chicken	17.5	215,484	28,742	186,742
Breeding cow	0.93	3,209,156	1,666,667	1,542,489
<i>Total</i>		<i>7,946,083</i>	<i>4,673,228</i>	<i>3,272,855</i>
<b>6. SON HAI COMMUNE - SON HA DISTRICT</b>				
Fattening pig	2	650,580	389,780	260,800
Breeding pig	0.2	128,460	84,567	43,893
Chicken	5	50,000	15,650	34,350
Cow	0.5	1,728,425	680,678	1,047,747
Buffalo	0.7	2,345,569	765,475	1,580,094
<i>Total</i>		<i>4,903,034</i>	<i>1,936,150</i>	<i>2,966,884</i>
<b>7. SON TRUNG COMMUNE - SON HA DISTRICT</b>				
Fattening pig	2	682,642	382,672	299,970

Type of animals	Quantity (animal/hh/year)	Total revenue (VND/hh/year)	Total cost (VND/hh/year)	Gross margin (VND/hh/year)
Breeding pig	0.2	186,345	114,540	71,805
Chicken	9	75,500	12,487	63,013
Cow	2.6	2,938,432	723,485	2,214,947
Buffalo	1	2,240,348	643,824	1,596,524
<i>Total</i>		<i>6,123,267</i>	<i>1,877,008</i>	<i>4,246,259</i>
<b>8. SON GIANG COMMUNE - SON HA DISTRICT</b>				
Fattening pig	2.29	887,454	438,432	449,022
Breeding pig	0.5	174,480	89,745	84,735
Chicken	10	98,582	15,349	83,233
Cow	1	1,748,327	442,854	1,305,473
Breeding cow	1	1,632,820	232,656	1,400,164
Buffalo	0.2	748,234	123,458	624,776
Draught cattle	0.7	1,251,766	276,542	975,224
<i>Total</i>		<i>6,541,663</i>	<i>1,619,036</i>	<i>4,922,627</i>
<b>9. BINH MINH - BINH SON DISTRICT</b>				
Fattening pig	2	1,448,632	832,684	615,948
Breeding pig	0.2	312,468	164,732	147,736
Chicken	19	428,546	85,642	342,904
Cow	0.9	3,206,732	1,638,424	1,568,308
Breeding cow	0.4	1,436,718	534,642	902,073
Duck	1.4	30,000	6,434	23,566
Draught cow	1.2	4,264,685	2,847,346	1,417,339
<i>Total</i>		<i>11,127,778</i>	<i>6,109,904</i>	<i>5,017,874</i>

**Table 7: Advantages and Disadvantages of Cropping Systems**

<b>Cropping Systems</b>	<b>Advantages</b>	<b>Disadvantages</b>	<b>Solutions</b>
<b><i>Paddy land</i></b>			
Rice -Rice	Stable yield	- Difficult to select medium duration variety (120 -140 days) with high yield -Often occur pest and disease	- Select high yielding variety -Organize training course on rice intensification and IPM techniques
Rice - Rice - Rice	- Increase income per area unit - Utilize land and labour	- Unstable yield in Autumn summer season - High investment - Pests and diseases	- Change to 2 rice crops or 2 rice crops -1 cash crop Organize training course on rice intensification and IPM techniques
Rice	Less investment	- Less efficiency	- Change to 2 cash crops in dry land - Set up demonstration on rice and fish in submergence land
<b><i>Dry land</i></b>			
Sugarcane	- Easy to grow, suitable with soil	- Fluctuated price, depend on factory -Low yield and economic efficiency (high costs and low price)	-Making contract of product collecting - Change to grow peanut/corn in some area
Cassava	Easy to grow, less labour working to take care	- Low economic efficiency - Soil exploitation	Change flat land to grow peanut/corn
Corn -corn - sweet potato	- Easy to grow, suitable with soil	- Unstable price for corn - Can not reclaim soil	- Intercropping and rotation with peanut
Peanut - corn - sweet potato	- High economic efficiency - Soil improvement	- Difficult to grow, spend a lot of working labour	- Training techniques of production - Set up demonstration for field visit of farmers
Cotton - corn - sweet potato	High efficiency	Have not custom	- Training techniques of production - Set up demonstration for field visit of farmers
Peanut - watermelon - sweet potato	- High efficiency - Soil reclamation	- Unstable price - Difficult to grow, spend a lot of working labour	- Training techniques of production - Set up demonstration for field visit of farmers
Mulberry	Low efficiency	Unstable price	Change to grow peanut/corn
Watermelon - watermelon	- Suitable with low fertility sandy soil - High income	- Unstable price	- Looking for the market - Select good quality variety
Corn - upland rice		Low economic efficiency	Change to grow peanut/ bean and corn
Upland rice - peanut/bean	- Improve soil - High economic efficiency	- Have not water enough	Select drought tolerant variety
Upland rice	Less investment	Low efficiency	Change to grow peanut and corn
<b><i>Forest land</i></b>			
Eucalyptus and acacia	Easy to grow, strong generation	Low efficiency Decrease soil fertility	Planting high value tree or acacia
Cinnamon	High economic efficiency	Long time to harvest Unstable price	Select good cinnamon variety
Cashew nut	Suitable with sandy soil	Unstable price Low efficiency	Select graft cashew nut

## 4 Orientation in Developing Sustainable Farming Systems

### 4.1 Development of household systems

The household is considered as the basic production unit in Vietnam rural areas. However, the household is not independent, it exists in a village or cooperative. But the household is a closed production system, and therefore, research and development of farming systems must concentrate on the household.

Building models about household production systems base on following components:

- Increasing input to improve crop yield.
- Increasing rate of cash crop growing to provide food for animal raising.
- Balance between revenue and expenditure in the system.

In the future, from the above study, it is recommended that household production systems in three survey communes should be as follows:

Household system	Applicable communes
1. Crop production (Rice - Rice, cash crop) - Animal production	Nghia Tho, Hanh Phuoc, Pho Chau, Duc Phong, Tinh Tho
2. Crop production - Animal production - Forestry	Nghia Tho, Hanh Phuoc, Pho Chau, Tinh Tho, Son Hai, Son Giang, Son Trung, Binh Minh
3. Crop production - Animal production - Aquaculture (Fishery)	Pho Chau, Duc Phong
4. Crop production - Animal production - Off farm activity	Nghia Tho, Hanh Phuoc, Pho Chau, Duc Phong, Tinh Tho, Binh Minh

With these production systems, households will improve production efficiency and products in the same natural resource especially to utilize abundant labour in the rural area.

### 4.2 Orientation in developing cropping systems

An advantageous farming system must be able to adapt to ecological and socio economic conditions through a harmonious combination of farming practices. To identify suitable cropping systems, we must note some matters:

- Cropping systems have high economic efficiency in three aspects: yield, output and total income.
- Cropping systems meet the development requirements of animal raising and close combination with forestry, aquaculture and are foundation for career development.

Therefore, it is necessary to select crops appropriate with characteristic of each soil type aiming at combining between using and protecting soil.

Cropping systems must be suited to the climatic conditions in the region, from that we will identify suitable variety and cropping pattern as rotation, intercropping or relay, to utilize time and space. In cropping pattern, we will apply management practices to increase yield of crop. Finally, these cropping systems depend on the requirement of producers. Based on these considerations, we propose new cropping systems as follows:

No.	Old cropping systems	New cropping systems
<b>1. NGHIA THO COMMUNE – TU NGHIA DISTRICT</b>		
<i>I</i>	<i>Rainfed bunded paddy land</i>	
1	Rice - rice	Rice -rice, using high yielding variety, intensification, IPM application
2	Rice - rice - rice	Rice - rice, with intensification, IPM application
3	Rice	Peanut - mungbean Corn - mungbean
<i>II</i>	<i>Dry land</i>	
1	Sugarcane	Intercrop sugarcane + peanut (fertilizer, IPM, integration with livestock)
2	Cassava	Peanut -corn Cassava + Peanut
<i>III</i>	<i>Forestry land</i>	
1	Reforestation	Selecting suitable tree (fruit trees, integrated practices: trees and livestock raising)
<b>2. HANH PHUOC COMMUNE - NGHIA HANH DISTRICT</b>		
<i>I</i>	<i>Irrigated land</i>	
1	Rice - Rice	- Rice - rice with intensification, IPM application - Selecting high yielding variety - FYM processing, green manure processing
2	Rice - rice - rice	Rice - rice, selecting high yielding variety and applying FYM
3	Rice	In submergence land using model of rice +fish raising
<i>II</i>	<i>Dry land</i>	
1	Corn - corn - sweet potato	Cotton + soybean - corn - sweet potato
2	Peanut - corn - sweet potato	Peanut- Corn - Corn/ soybean (intercrop or rotation with legume, and livestock)
3	Cotton - corn - sweet potato	Cotton soybean - Corn- sweet potato
4	Peanut - watermelon - sweet potato	Peanut - watermelon - corn/soybean
5	Mulberry	Introduction of high yield mulberry and develop traditional silk textile
<b>3. PHO CHAU COMMUNE – DUC PHO DISTRICT</b>		
<i>I</i>	<i>Rainfed bunded paddy land</i>	
1	Rice - rice - rice	Rice - rice, rice - rice - mungbean, watermelon, rice - watermelon (with intensification, IPM application)
2	Rice - rice	- Rice - rice (using new variety) with intensification, IPM application - Rice - watermelon

No.	Old cropping systems	New cropping systems
3	Rice	- Rice -watermelon, peanut, sweet potato
<i>II Dry land</i>		
1	Cassava	Cassava + peanut, mungbean, soybean Cassava - peanut, sweet potato
2	Watermelon - watermelon	Watermelon - watermelon, using suitable techniques
3	Peanut - peanut, sweet potato	Peanut - peanut, sweet potato
4	Coconut	Coconut + pineapple (combined livestock raising) Cashew nut + pineapple
<i>III Forestry land</i>		
1	Eucalyptus	Acacia combined with livestock, goat, cattle raising
2	Cashew nut	Cashew nut, replacing by high yielding variety, combined with livestock raising
<b>4. TINH THO COMMUNE- SON TINH DISTRICT</b>		
<i>I Rainfed banded paddy land</i>		
1	Rice - rice - rice	Change to 2 rice crops, or 2 rice crops - 1 cash crop
2	Rice - rice	Introduce high yielding variety, intensification, IPM
3	Rice	Change to 1 rice crop - 1 cash crop or 2 cash crops (watermelon, peanut, corn) in dry land. Set up demonstration on rice and fish raising and rice and duck raising
<i>II Dry land</i>		
1	Peanut - corn - sweet potato	Change to peanut - Corn - Corn / peanut
2	Corn - upland rice	Change to peanut - corn - corn/ soybean
3	Cassava	Change to peanut - mungbean/soybean or cassava intercropping with peanut, mungbean and soybean
4	Sugarcane	Change to intercropping sugarcane with peanut
<i>III Forest land</i>		
	Eucalyptus and acacia	Change to plant high value tree, combined with livestock raising
<b>5. DUC PHONG COMMUNE – MO DUC DISTRICT</b>		
<i>I Irrigated rice land</i>		
1	Rice -rice -rice	- Change to grow 2 rice crops
2	Rice -rice	- Introduce high yielding varieties, fertilizer, IPM
3	Rice	- Set up demonstration on rice growing and fish raising or rice growing and duck raising
<i>II Dry land</i>		
1	Peanut - corn - sweet potato	Change to peanut -corn - corn/soybean

No.	Old cropping systems	New cropping systems
2	Peanut - watermelon - sweet potato	Change to peanut - watermelon -corn/soybean
3	Watermelon - Peanut - rice	Change to watermelon -peanut -soybean
4	Sugarcane	Change to intercropping sugarcane with peanut/mungbean
5	Cassava	Change to peanut -mungbean/soybean or intercropping cassava with peanut, mungbean, soybean
III	<i>Forest land</i>	
1	Eucalyptus	Change to plant high economic tree, livestock raising
2	Cashew nut	Select grafting cashew nut with high yield and short duration, livestock raising
<b>6. SON HAI COMMUNE - SON HA DISTRICT</b>		
<i>I</i>	<b><i>Rainfed banded paddy land</i></b>	
1	Rice - rice	- Change to high yielding variety, with intensification, IPM application
2	Rice	- Change to grow peanut - corn/soybean - sweet potato/soybean
<i>II</i>	<b><i>Dry land</i></b>	
1	Dry land	Change to rice - peanut/mungbean (select drought tolerant rice variety with high yield)
2	Upland rice - bean	Change to peanut/corn -mungbean/soybean
3	Peanut - corn	Change to peanut - corn -sweet potato/soybean
4	Sugarcane	Change to intercropping sugarcane with peanut/mungbean
5	Cassava	Change to peanut -mungbean/soybean or intercropping cassava with peanut, mungbean and soybean
6	Coffee	- Select good variety and intensification - Change to peanut - corn - sweet potato/soybean
III	<b><i>Forest land</i></b>	
1	Cinnamon	- Select cinnamon variety with high quality
2	Eucalyptus and acacia	- Change to trees with high value, livestock raising
<b>7. SON GIANG COMMUNE - SON HA DISTRICT</b>		
<i>I</i>	<b><i>Rainfed banded paddy land</i></b>	
1	Rice -rice	- Introducing new high yielding variety of rice, with intensification, IPM application
2	Rice	- Change into peanut - mungbean/corn or cotton +peanut - corn - sweet potato
<i>II</i>	<b><i>Dry land</i></b>	
1	Sugarcane	Change into sugarcane + peanut/soybean and introduce new high yielding varieties

No.	Old cropping systems	New cropping systems
2	Cassava	Change into peanut/corn - mungbean/soybean (if water enough) or cassava + peanut, mungbean, soybean
3	Corn - corn	Change into corn + peanut - corn - sweet potato/soybean Or cotton +peanut - corn (if water enough)
4	Peanut - corn/peanut	Peanut - corn - corn/sweet potato
5	Watermelon -corn/peanut	Watermelon - peanut - corn/sweet potato
<i>III</i>	<i>Garden land</i>	Mixed garden reclamation, set up demonstration on vegetable or fruit, combined with livestock raising
<i>IV</i>	<i>Forest land</i>	
1	Eucalyptus and acacia	- Change into plant high value trees, livestock raising
2	Bare land	- Change into plant high value trees, livestock raising
<b>8. SON TRUNG COMMUNE - SON HA DISTRICT</b>		
<i>I</i>	<b><i>Rainfed banded paddy land</i></b>	
1	Rice -rice	- Introducing new high yielding variety of rice, fertilizer, IPM
2	Rice	- Change into rice - mungbean/corn (if water enough)
<i>II</i>	<b><i>Dry land</i></b>	
1	Sugarcane	Change into peanut - corn - sweet potato/soybean in flat land Intercropping sugarcane + peanut/soybean, and introducing new high yielding variety in highland
2	Cassava	Change into peanut/corn - mungbean/soybean (if water enough) or cassava + peanut, mungbean, soybean
3	Corn - mungbean - sweet potato	Change into corn +peanut - peanut/mungbean - sweet potato/soybean
4	Peanut - peanut	Peanut - peanut - corn/sweet potato
<i>III</i>	<b><i>Forest land</i></b>	
1	Eucalyptus and acacia	- Change into plant high value trees such as cinnamon, livestock raising
2	Bare land	- Change into plant bamboo for shoot product, acacia
<b>9. BINH MINH COMMUNE - BINH SON DISTRICT</b>		
<i>I</i>	<b><i>Rainfed banded paddy land</i></b>	
1	Rice - rice - rice	- Change into rice -rice, fertilizer, IPM
2	Rice -rice	- Submergence land: rice - rice but introduce new variety with high yield - Terrace land: change into rice -corn/peanut or cotton + peanut - corn - sweet potato (if water enough)
3	Rice	- Change into peanut - corn (if water enough)

No.	Old cropping systems	New cropping systems
II	<i>Dry land</i>	
1	Cotton + peanut -corn	Cotton +peanut - corn -soybean/sweet potato
2	Corn -corn	Cotton +peanut - corn or : corn +peanut -corn -soybean/sweet potato
3	Watermelon - cassava	Watermelon - peanut/soybean (if water enough)
4	Sugarcane	Sugarcane +peanut/mungbean
5	Cassava	- Change into sesame or cassava + peanut/mungbean/soybean - or Rubber, grafting cashew nut + livestock raising
III	<i>Garden land</i>	Mixed garden reclamation + livestock raising
IV	<i>Forest land</i>	
1	Eucalyptus and acacia	- Change into plant rubber + peanut intercropping in lowland
2	Bare land	- Planting rubber and cashew nut + peanut intercropping

### 4.3 Orientation in animal production development

When selecting the type of livestock, we must base this on:

- Available food from natural source and product of crop production
- Requirement about products of society
- Investment capacity of farmers

#### 4.3.1 Pig raising

Pig raising is a traditional work in rice growing region. Pig raising plays an important role in income source of many households and also supports manure for crop production. Pig raising development will meet the requirement of meat of the society. But development of pig raising overcame food production resulting to market confusion of food, and in turn it will impact upon the number of pig raising.

Due to unstable market prices, pig raising has problems, but export requirement is increasing. If pig raising is still like in the past with degraded variety, pig raising can not meet the need of the market. Therefore, pig-raising development must improve the old pig variety. Beside traditional pig raising area, it is necessary to develop pig raising in area of growing industrial crops with byproducts which can be used for pigs - like peanuts, sugarcane, vegetables etc. Development orientations in pig raising in the future are below:

- Raising fattening pig for lean meat
- Multiplication of hybrid breeding from available pig source in the local area
- Loaning credit capital for pig raising
- Organizing training courses about techniques of pig raising and disease control for pig
- Have suitable investment policy and price insurance to encourage pig-raising
- Providing market information for farmers

### 4.3.2 Cattle raising

A cattle raising development has difficulty in raising capital to buy breeding cattle and to build cattle house, but it has advantage in utilizing by residues from crop production and grass. According to the survey result, communes in Quang Ngai province have potential in cattle raising development and farmers want to develop cattle raising very much. At present, cattle breeding here is only local breeding (Bo vang), therefore direction in cattle raising in the future are:

- Loaning credit capital to buy breeding cattle and food
- Raising beef cattle (at where has not area of pasture)
- Raising natural cattle (in mountain area of Pho Chau commune)
- Using Sind hybrid cattle breeding
- Have suitable investment policy and price insurance to encourage cattle-raising people
- Training for local vets

### 4.3.3 Chicken raising

- Local chicken breeding/raising
- Loaning credit capital
- Organizing training courses about techniques of chicken raising and disease control for chickens

## 4.4 Orientation of off farm activity development

No	Off Farm Activity	Orientation
<b>I</b>	<b><i>Hanh phuoc commune - Nghia Hanh district</i></b>	
1	Brick making	- Designing production area - Using burning method
2	Noodle and mungbean cake making	- Improving production process - Formulating group of production, increasing quality of product to serve for export
3	Small business	Formulating group of product consumption
4.	Handicraft	Restore traditional silk textile
<b>II</b>	<b><i>Pho Chau commune - Duc Pho district</i></b>	
1	Processing of coconut coir	- Training about technique of coconut coir processing - Visiting other provinces
<b>IV</b>	<b><i>Duc Phong commune - Mo duc district</i></b>	
1	Dry pancake making	- Improving production process - Formulating group of production, increasing quality of product to serve for export

## 5 Conclusion and Recommendations

### 5.1 Mountainous zone (Son Hai, Son Trung, Son Giang, Nghia Tho Communes)

Household farming systems mainly involves crop production - animal production - forestry - off farm activity. Major objective of these systems is themselves supplying leading to low efficiency:

- Crop production: farmers grow rice, cassava, peanut, sugarcane and some industrial crops. Agricultural land is only highland and paddy land. Soil in this zone is high fertility, which can be grown many crops, but due to lack of water, sloping topography, and backward practice management resulting low yield of crops.
- Animal production: including buffalo, Cattle and pig. Pig breeding is mainly local variety occupying 70%, raising natural and using simple food, therefore pig yield is very low. Sown raising is less developed. Veterinary and inject for animal have not paid attention, diseases epidemic often occurs. An advantage characteristic in this zone is large area of grass, so that Cattle and buffalo raising developed (Son Hai commune has 574 households in which there are 473 buffaloes and 840 Cattles). But, buffalo and Cattle are only local varieties, applied backward raising practice therefore, animal raising efficiency is low.
- Forestry: Mountainous zone has big area of forest land, due to difficult in budget, rate of bare land in this zone is still high (173,538.9 ha occupying 58% total natural area of the zone).
- Orientation:
  - + Allocate land and forestry for household to manage. Enhance to plant forest especially with high economic trees including cinnamon and material forestry for processing industry. Design industrial plant development region in hilly land.
  - + Set up demonstrations including VAC (Garden - Pond - animal raising), VACR (Garden - pond - animal raising - crop field)
  - + Setting up model for upland (SALT model)
  - + Intensification for annual crops as rice, corn, cassava, peanut by introducing new varieties suitable with soil condition
  - + Improve cattle and pig varieties by replacing crossing breeding
  - + Enhance extension work to train on crop production and animal production techniques, set up demonstrations on crop and animal varieties where farmers can visit and exchange
  - + Organize extension services such as providing new varieties of crop and animal
  - + Support capital for farmers to develop production

### 5.2 Lowland and coastal land zones (Pho Chau, Hanh Phuoc, Duc Pho, Duc Phong Communes, Binh Minh Communes)

- **Lowland zone**
  - Household farming systems are crop production - animal production or crop production - animal production - off farm activity.
  - Crop production: cropping systems are rice, sugarcane, peanut, cassava, and watermelon. Soil texture is mainly sandy and loamy soil, low fertility, low buffering capacity and lack of water in some areas. Rice is main crop in this zone, growing 2 -3 crops per year. Average yield is higher than mountainous zone, yield can achieve 3.96 tons/ha, 43,2

tons/ha and 25.9 tons/ha in Winter -spring, Summer and third seasons. Yield of other crops (corn, sugarcane) has still not high, but better than mountainous zone. In general, production efficiency of this zone is still low because land for 3 crops occupies a high rate, while growing 3 crops per year require high investment, unstable yield. Peanut crop has high yield and stable price in the market, growing 3 crops per year and it can improve soil fertility.

- Animal production: Animal systems include pig- buffalo (Cattle)- chicken -duck. Pig raising develops well. Farmers applied progress technology in the production. However, price is unstable, farmers do not want to extend raising scale. Cattle raising has high economic efficiency because of stable price, but low potential due to lack of grass area.
- Orientation:
  - + Improve irrigation systems
  - + Increase to use organic fertilizer
  - + Intercrop and rotation legume crops
  - + Train techniques and provide extension services
  - + Set up integrated farming systems
  - + Improve crop and animal variety with high yield and good quality, suitable with market demand
  - + Develop sub trade to attract redundant labour

- **Coastal zone**

- Household farming systems are crop production - animal production - fishery - off farm
- Crop production: cropping systems are rice -sugarcane-peanut- cassava. Rice is main crop in this zone, growing 2 -3 crops per year. Corn and peanut have high yield and stable price, growing 2 crops per year and peanut can improve soil fertility.
- Animal production: Animal systems include pig- buffalo (Cattle) - chicken -duck. Pig raising develops well. Farmers applied progress technology in the production. However, price is unstable, farmers do not want to extend raising scale. Cattle raising has high economic efficiency because of stable price, but low potential due to lack of grass area.

Orientation:

- + Improve irrigation systems
- + Increase to use organic fertilizer
- + Intercrop and rotation legume crops
- + Setting up VAC model or VACR model where it is suitable
- + Train techniques and provide extension services

## **Annex 1**

---

### **Transect of Communes**

## Annex 1: Transect of Communes

### Transect of Duc Phong Commune - Mo Duc District

Status	Forest Planting	Crop Field	Residential Land	Rice Field	Tieu River	Rice Field	Sand Cavern	Residential Land	Crop Field	Sand dune	Sea
<i>Soil types</i>	- Gravel mixing heavy soil	- Sand mixing heavy soil	Light heavy soil	Light heavy soil		Light heavy soil	Sandy	Soil sandy	Mixing sand	Sandy	
<i>Trees and livestock</i>	- Pine, cashew, eucalyptus - Buffalo, cow, goat	- Sugar, rice, cassava, maize, water melon - Buffalo, cow	- Fruit trees and crops - Pig, cow, duck	- Rice - Buffalo, cow, duck	<i>Fish - Shrimps</i>	- Rice - Buffalo, cow, duck	- Cashew - Cemetery	- Fruit trees and crops - Pig, chicken, duck	- Sugar cane Sweet potato - Vegetable	- Casuarina	Shrimps, fish, cuttle
<i>Crops system (using land)</i>	- Forestry planting - Planting cashew and fruit trees.	- <b>Water melon-maize- rice</b> - Water melon - water melon-rice - Water melon - peanut - rice - Sugar, cassava	- House - Mixed garden (guava, sugar apple) - Vegetable	- Rice - rice - Rice- rice -rice	<i>Provide water</i>	- Rice- rice - Rice-rice- rice	- Plating cashew and forestry trees	- Mixed garden and vegetable	- Sugar cane - Peanut - water melon - sweet potato - Vegetable - sweet potato - Water melon - sweet potato - Cassava - sweet potato	- Planting casuaruna - Shrimps raising	- Catching seafood
<i>Potential</i>	- Much barren land, be able to plant fruit trees, forestry - Develop cow & buffalo raising	- Rich & large soil,	- Large labour force	- Rich soil		- Rich soil	- Many barren lands	- Large labour force	- Large land	- Near sea, be able to raise shrimps on sand	- Large fishing area
<i>Problems</i>	- Lack of water - Difficult transportation	- Lack of water - Lack of technology - Lack of good seeds	- Lack of fund - Lack of works - Lack of clean water	- Regular flooded - Lack of science technology - Much insects - lack of good seeds	Flood	- Flooded regularly - Lack of science technology - Epidemic diseases - Lack of good seeds	- Poor soil - Lack of water - Graves, tombs	- Lack of fund - Lack of works	- Lack of water - Lack of science technology - Lack of good seeds	- Lack of science technology - Lack of fund - Lack of good seeds	- Lack of fund - Primitive fishing equipment
<i>Solutions</i>	- Construction irrigation system - Forest planting - Residents concentration, farming construction	- Construction irrigation system - Technical training - Using good seeds - Loan fund	- Garden improvement - Loan fund - Construction of filter reservoir - Opening branches in -place	- Drain water - Technical training - Training IPM - Support good seeds	Improve irrigation system	- Drain water - Technical training - Training IPM - Support seeds	- Forestry planting - Planting cashew - Concentration of cemetery area	- Loan fund - Develop sub-branches - Garden improvement	- Provide electric for pumping water - Technical training	- Design, concentrate shrimp raising areas - Loan fund - Technical training - Models demonstration	- Loan fund

### Transect of Tinh Tho Commune - Son Tinh District

Status	Forest Planting	Transition Hill	Residential Land	Crop - Rice Field	Residential Land	Low Hill	Crop - Rice Field
<b>Soil types</b>	- Gravel - Gravel mixing sand	- Sand mixing clay	- Sand mixing	- Light heavy soil	- Sandy soil	- Gravel	- Interfile sandy soil
<b>Trees and Livestock</b>	- Industrial trees (eucalyptus, acacia) - Cow, goat	- Cassava, sweet potato, sugar cane, bean - Cow, buffalo	- Cashew - jack, guava, sugar apple - Vegetable - Pigs, chicken, duck	- Rice - Sugar cane, bean - Peanut, water melon - Cow, buffalo, duck	- House - Mixed garden - Fruit trees, vegetable - Pigs, chicken	- Eucalyptus, acacia	- Rice - Peanut, sweet potato - Peanut, maize, sweet potato - Sugar cane
<b>Crops system (using land)</b>	- Forestry trees - Industrial trees (cashew)	- Sugar cane - Maize - Peanut, sweet potato - Watermelon, bean. Sweet potato	- House - Mixed garden - Vegetable	-Rice - rice - Rice - maize -sweet potato - Sugar cane - Water melon - bean - sweet potato	- House - Mixed garden	- Planting industrial trees: eucalyptus, acacia	- Rice - rice - Rice - rice - rice - Peanut - maize- sweet potato - Maize - peanut - sweet potato
<b>Potential</b>	- Existing barren land, bare hill can be used for forest planting and developed livestock	- Farm economic - Perennial industrial trees - Fruit trees	- Planting cashew - Fruit trees - Large labour force	- Have irrigation source - Have ability to diversify trees	- Large labour force	- Unused barren land, bare hill	- Existing barren land, be able to reclaim waste land - Be able to modelize rice-fish
<b>Difficulties</b>	- Eroded soil, difficult transportation, far from residential regions, difficult for protection. - Unmeasured land and hand-over to households	- Lack of water - Lack of science technology - Lack of good seeds	- Lack of electric - Lack of sanitation works - Lack of works	- Terrace rice - Lack of science technology knowledge - Degenerate - Pests	- Lack of electric - Lack of fund - Lack of works -	- Lack of fund - Eroded soil	- Lack of fund - Lack of science technical knowledge - Flooded - Pests
<b>Solutions</b>	- Hand-over land for forest planting households	- Construction of pump station	- Electricity support	- Improving the ground	- Electricity support	- Planting cover trees, improving soil	- Loan fund - Technical training
	- Loan fund for forest planting and developing livestock - Issue land user right status for each household - Establish forestry protection teams - Apply new technology (trees seeds)	- Opening technical training course - Improve seeds and sampling	- Construction of sanitation works - Loan fund for mixed garden improvement - Development of branches, creating works	- Opening training course - Improve old seeds, test new ones - Change trees structure and crops season - Apply IPM	- Loan fund for improving garden - Development of branches	- Hand-over land to households for forest planting - Loan fund for forest planting - Select proper trees and effective ( cashew)	- Construction of drain water system - Construction of models: rice-fish and rice -duck - Change trees structure and crops season - Drain water

### Transect of Son Hai Commune - Son Ha District

Status	Natural & planted forest	Milpa	Rice, crops field	Residential land	River	Coastal alluvial ground	Rice, crops field	Milpa	River
<b>Soil types</b>	- Gravel mixing heavy soil	- Mixed heavy soil - Gravel	- Light heavy soil - Sand mixing	- Heavy soil - Gravel mixing	River	- Heavy soil - Sand mixing	- Light heavy soil - Gravel mixing	- Heavy soil - Sand mixing	
<b>Trees &amp; livestock</b>	- Dãõu raõi - Acacia - Forest trees	- Maize, cassava, terrace rice, beans - Sugar cane - Buffalo, cow, goat	- Rice, peanut - Buffalo, cow	- Jack, banana, pineapple - Vegetable - Pig, chicken, duck	Fishes, shrimps	- Beans - Buffalo, cow	- Rice - Peanut, maize	- Maize, cassava, terrace rice, red beans, sugar cane, buffalo, cow, goat	
<b>Crops system (land-use)</b>	- Natural forest - Planted forest (acacia)	- Dry rice + bean - Maize + peanut - Maize - Sugar cane, coffee	- Winter-spring rice, summer-autumn rice - Peanut - maize - Maize - peanut - Excavation of pond for raising fishes	- House - Mixed garden	- Catching fishes	- Peanut, maize - Maize - peanut - Peanut - maize	- Rice - rice - Rice - rice - sweet potato - Maize - peanut - Peanut - maize - Peanut - maize- sweet potato	- Rice + bean - Maize + bean - Cassava - Sugar cane	Catching fishes
<b>Potential</b>	- Much unused land	- Rather rich soil - Be able to plant perennial trees industrial trees	- Rather fertility soil	- Be able to plant perennial industrial trees and fruit trees - Remain labour potentiality	Be able to raise cage fishes	- Rather fertility soil - Be able to plant short industrial trees ) soy-bean, peanut)	- Rather fertility soil	- Rather rich soil - Be able to plant perennial industrial trees	- Be able to raise cage fishes - Provide water
<b>Problems</b>	- Easy to be eroded - Low covered rate, not hand-over land to households yet - Destroyed forest	- High slope, difficult for cultivation - Lack of science technology knowledge - Lack of water - Shifting cultivation habits, burning off for cultivation	- Insects - Lack of irrigation resources - Lack of knowledge - Lack good seeds - Lack of fertilizer - Mainly extensive farming	- Lack of sanitation works - Lack of clean water - Low education - Lack of works - Lack of electric	Strong flow speed	- Lack of science technology knowledge - Lack of water - Lack of good seeds - Remain extensive farming	- Lack of water - Lack of fund - Lack of good seeds - Lack of science technology knowledge - Remain extensive farming	- High slope, difficult for cultivation - Lack of water - Lack of science technology knowledge - Shifting cultivation habits, burning off for cultivation	Strong flow speed
<b>Solutions</b>	- Handing over land - Planting forest trees - Concentration of raising area and forest protection - Prohibit cutting trees, destroy forest - Support fund, plant new forest	- Apply technical cultivation on slope land - Construction of agro-forest model combine - Technical training - Settle agriculture - Change trees structures	- Technical training, construction of pump station, seeds improvement - Fertilizer providing service - Technical training - Support good seeds	- Construction of clean-water well - Construction of sanitation works - Loan fund for production and electric installation - Development sub-branches - Increase education levels		- Technical training - Construction of demonstration models] - Improve seeds - Fertilizer providing service - Support good seeds	- Technical training, construction of pump station, seeds improvement - Fertilizer providing service - Technical training - Support good seeds	- Apply technical cultivation on slope land - Construction of agro-forest model combines - Settled agriculture - Change trees structures	

**Transect of Pho Chau Commune - Duc Pho District**

Status	Planted forest	Cash crop field	Rice and cash crop field	Residential land	Rice and cash crop field	Residential land	Rice and cash crop field	Residential land	Dune	Sea
<i>Soil types</i>	- Gravel, loamy soil	Sandy loam soil	Sandy loam soil	Sandy loam soil	Sandy loam soil	Sandy soil	Sandy soil	Sandy soil	Sand	
<i>Crops and animals</i>	- Acacia, cashew nut, eucalyptus  - Cow, goat	- Cassava, peanut, sweet potato  - Cowi	- Rice, watermelon, corn  - Cow	- Fruit trees, cash crops  - Pig, chicken, duck, cow	- Rice, watermelon, corn and sweet potato - Cow, duck	- Fruit trees, cash crops  - Pig, chicken, duck, cow	- Rice  - Cow, duck	- Fruit trees, cash crops  - Pig, chicken, duck, cow	Casuarina tree	Shrimp, fish, cuttle fish
<i>Cropping systems</i>	- Forestry land - Cashew nut and fruit trees	- Cassava - Cassava- sweet potato - Cassava - peanut	- Rice - watermelon - rice - Rice - watermelon - Rice - Rice - watermelon - corn	- House - Mixed garden (guava, custard - apple, coconut) - Vegetables	- Rice -rice - Rice -fallow - rice - Rice -rice -rice - Rice - watermelon-rice - Rice-corn -rice - Rice -rice -corn - Rice -rice - watermelon	- House - Mixed garden (guava, custard - apple, coconut) - Vegetables	- Rice-rice-rice - Rice-rice-watermelon - Rice - Rice -peanut, sweet potato - Rice -fallow -rice	- House - Mixed garden (guava, custard - apple, coconut) - Vegetables	Casuarina tree	Fishes catching
<i>Potentials</i>	- Large area of bare land to grow forestry plants and industrial trees - Cow and goat raising	Growing industrial crops and fruit trees  - Cow and goat raising	- Large area  Cow and duck raising	- Abundant labour  Cow, pig and chicken raising	- Diversification of crops  Cow and duck raising	- Abundant labour  Cow, pig and chicken raising	- Diversification of crops  Cow and duck raising	- Abundant labour  Cow, pig and chicken raising	Near sea, have ability to raise shrimp in the sandy soil  Shrimp raising	Large area of fishery
<i>Problems</i>	- Lack of water - Difficult transportation	- Lack of water - Lack of technology - Lack of capital	- Lack of water - Lack of technology - Lack of capital - Lack of new variety	- Lack of capital - Lack of works - Lack of water	- Lack of water - Lack of technology - Low soil fertility - Lack of new variety	- Lack of capital - Lack of works - Lack of water	- Lack of water - Lack of technology - Low soil fertility - Lack of new variety	- Lack of capital - Lack of works	- Lack of technology - Lack of capital - Lack of new variety	- Lack of capital - simple fishing tackle - Have not fishing means
<i>Solutions</i>	- Construction irrigation system - Planting forest - Construction farm models	- Construction irrigation system - Soil reclamation	- Construction irrigation system - Soil reclamation - Technical training - Using new variety - Loaning capital	- Garden improving - Loaning capital - Construction of water filter tank - Development of careers on the spot	- Construction irrigation system - Technical training - Soil reclamation - Supporting new variety	- Loaning capital - Development of sub careers - Construction irrigation system	- Construction irrigation system - Technical training - Soil reclamation - Supporting new variety	- Loaning capital - Development of sub careers - Garden improving	- Designing area of shrimp raising - Loaning capital - Technical training - Constructing demonstration models	- Loaning capital

### Transect of Hanh Phuoc Commune - Nghia Hainh District

Status	Planted forest	Rice field	Residential land	Rice field	Cash crop field	Rice field	Cash crop field	Residential land	Cash crop field	River
<b>Soil types</b>	Gravel, stone and loamy soil	Medium and heavy soil	Loamy soil	Clay and loamy soil	Loamy soil	Loamy soil	Sandy soil	Sandy soil	Sandy soil	
<b>Crops and animals</b>	- Acacia, eucalyptus  - Cow and goat	- Rice  - Cow	- Rice, corn, beans  - Cow, pig, chicken, duck	- Rice  - Cow	- Corn, melon, watermelon  - Cow	- Rice  - Cow	- Corn, bean, cotton, watermelon  - Cow	- Fruit trees and cash crops  - Cow, pig, chicken, duck	Strawberry, cassava, watermelon, corn  cow	Shrimp, fish, cuttle fish
<b>Cropping systems</b>	Forest plant	- Rice - rice - rice - Rice -rice	- Rice -rice - Peanut - corn	- Rice - rice - rice - Rice -rice	- Peanut - corn - Watermelon-watermelon-corn	- Rice-rice-rice -Rice-rice	-Peanut -corn - Peanut cotton	Mix garden and vegetable	- Straw berry - Corn - Cassava - Peanut -corn - Watermelon-watermelon-corn	fishing
<b>Potential</b>	Bare land can grow plant  Cow and goat raising	- Have irrigation - Good soil  Cow, duck and fish raising	- Large area - Abundant labour  Cow, pig and chicken raising	- Have irrigation - Good soil  Cow, duck and fish raising	Crop diversification  Cow raising	- Have irrigation - Abundant labour  Cow raising	Good soil  Cow raising	Abundant labour  Cow, pig, chicken raising	Near the river, good soil  Cow and cocoon raising	
<b>Problem</b>	- Lack of water  - Difficult in transportation	- Lack of technology  - Lack of capital  - Lack of new variety	- Lack of water  - Lack of new variety  - Lack of capital  - Lack of new variety	- Lack of capital  - Lack of new variety  - Lack of new variety	- Lack of water  - Lack of new variety  - Lack of new variety	- Lack of capital  - Lack of new variety  - Lack of new variety	- Lack of water  - Lack of new variety  - Lack of new variety	- Lack of capital  Lack of work	- Lack of new variety - Lack of capital  - Lack of new variety	Flood
<b>Solution</b>	- Irrigation - Plant forest  - Build farm model	- Train technology - Using new variety	- Irrigation - Train technology - Using new variety - Loan capital	- Loan capital - Train technology  - Using new variety	- Irrigation - Train technology  - Using new variety	- Loan capital - Train technology  - Using new variety	- Irrigation - Train technology - Using new variety	- Loan capital -Develop sub trade - Garden reclamation	- Grow cotton - Loan capital  - Train technology Demonstration	

### Transect of Nghia Tho Commune - Tu Nghia District

Status	Natural and planted forest	Planted forest	Cash crop field	Residential land	Rice field	Residential land	Rice field	Cash crop field	Planted forest	Natural forest
<i>Soil type</i>	-Stone, gravel and loamy soil	-Stone, gravel and loamy soil	Loamy soil	Loamy soil and gravel	Loamy soil	Loamy soil and gravel	Loamy soil	Sandy loamy soil		
									Stone, gravel and loamy soil	Stone, gravel and loamy soil
<i>Crops and animals</i>	- Forest plants	Eucalyptus, acacia	Cassava, corn, snap bean, peanut	- Jack fruit, banana, pineapple - Vegetable - pig, chicken, duck and cow	Rice, sugarcane	- Jack fruit, banana, pineapple - Vegetable - pig, chicken, duck and cow	Rice, sugarcane	Cassava, corn, snap bean, peanut	Eucalyptus, acacia	Forest plant
<i>Cropping systems</i>	Natural forest	Planted forest	- Cassava - Corn -corn - Peanut -corn	- Cassava - Sugarcane - Mix garden	- Rice - Rice-rice - Rice -rice -rice - Sugarcane	- Cassava - Sugarcane - Mix garden	- Rice - Rice-rice - Rice -rice -rice - Sugarcane	- Cassava - Corn -corn - Peanut -corn	Planted forest	Natural forest
<i>Potential</i>		Land area can plant forest	Abundant labour		Abundant labour				Land area can plant forest	
<i>Problem</i>	Forest is exploited illegally	Low soil fertility, many stone	Lack of water	Lack of capital	- Lack of water - Lack of new variety	Lack of clean water	- Lack of water - Lack of technology	Lack of water	Low soil fertility, many stone	Forest is exploited illegally
	Forest has not allocated for household management	Has not allocated for household	Lack of technology	Lack of clean water	Lack of technology	Lack of toilet	Lack of new variety	Lack of technology	Has not allocated for household	Forest has not allocated for household management
			Lack of new variety	Lack of toilet	Degradation soil	Lack of capital	Degradation soil	Lack of new variety		
<i>Solution</i>	Forest allocation	Land allocation	Training	- Supply clean water	- Build irrigation system	- Supply clean water	- Build irrigation system	Training	Land allocation	Forest allocation
	Forbid to cut forest plant	Plant forest	Support variety	- Create job	- Train technology	- Create job	- Train technology	Support variety	Plant forest	Forbid to cut forest plant
		Support capital to grow forest	Change new crops	- Loan capital	- Set up demonstration	- Loan capital	- Set up demonstration	Change new crops	Support capital to grow forest	
				- Set up demonstration	- Soil improvement		- Soil improvement	- Set up demonstration		

## **Annex 2**

---

# **Priority Ranking of Crops and Animals and Selecting Type of Income Generation**

## Annex 2: Priority Ranking of Crops and Animals and Selecting Type of Income Generation

### Duc Phong Commune

<b><u>Crops</u></b>	<b>Local people opinion</b>	<b>Workshop</b>	<b>Consultant</b>	<b>Synthesis</b>
Rice	2	1	After report	1
Corn	6	2		6
Sugarcane	5	2		3
Cassava	4	4		5
Peanut	1	4		2
Watermelon	3	-		3
<b><u>Animals</u></b>				
Cattle	1	1	1	1
Pig	2	2	3	2
Chicken	4	3	4	4
Duck	3	3	2	3
<b><u>Fishery</u></b>				
Shrimp raising on sand		1	2	1
Shrimp breeding production		2	1	1
Fishing		3	4	3
Fresh water fish raising		4	3	3
<b><u>Off farm</u></b>				
Noodle making		1	1	1
Carpentry		2	2	2
Sea food processing		3	4	3
Noodle cake making		4	3	3
<b><u>Proposed activity</u></b>				
Irrigation	1	1	1	1
Training	3	4	4	4
Loan capital	2	2	3	2
Improve variety	4	2	3	3

### Son Hai Commune

<b><u>Crops</u></b>	<b>Local people opinion</b>	<b>Workshop</b>	<b>Consultant</b>	<b>Synthesis</b>
Rice	2	1	1	1
Peanut	1	4	4	3
Cassava	2	2	2	2
Corn	4	5	5	5
Sugarcane	5	3	3	4
Fruti tree	6	6	6	6
Forest tree	7	7	7	7
<b><u>Animals</u></b>				
Cattle	1	1	1	1
Buffalo	2	2	2	2
Pig	3	3	3	3
Chicken	4	4	4	4
Goat	5	5	5	5
<b><u>Proposed activity</u></b>				
irrigation	1	1	1	1
Loan capital	2	4	2	2
Train	3	3	3	4
Improve variety	3	2	3	3
Plant forest	5	5	5	5

Source: Survey result, 2003

### Tinh Tho Commune

<b>Crops</b>	<b>Local people opinion</b>	<b>Workshop</b>	<b>Consultant</b>	<b>Synthesis</b>
Rice	2	1	1	1
Peanut	1	2	5	2
Cassava	3	3	4	3
Sugarcane	4	4	7	4
Vegetable	7	5	2	5
Corn	5	6	8	7
Watermelon	6	7	2	6
Beans	8	8	6	8
<b>Animals</b>				
Cattle	1	1	1	1
Pig	2	2	2	2
Chicken	4	3	3	4
Duck	3	4	4	3
Buffalo	4	5	5	5
Goat	5	6	6	6
<b>Proposed activity</b>				
Irrigation	1	1	1	1
Train	3	3	2	2
Improve variety	5	2	3	3
Loan capital	2	4	4	4

Source: Survey result, 2003

### Surveyed Communes

<u>Crops</u>	<b>Nghia Tho</b>	<b>Hanh Phuoc</b>	<b>Pho Chau</b>	<b>Note</b>
Rice	1	4	3	
Peanut	4	2	1	
Cassava	5	10	8	
Sugarcane	2	5	5	
Vegetable	"	9	7	Few household grow
Corn	3	1	4	
Watermelon	"	6	2	
Beans	6	7	6	
Cotton	"	3	"	Have never grown
Strawberry	"	8	"	Do not grow
<u>Animal</u>				
Cattle	2	1	1	
Pig	4	2	2	
Chicken	5	3	3	
Duck	6	4	4	
Buffalo	1	5	5	
Goat	3	6	6	
<u>Proposed activity</u>				
Irrigation	1	3	1	
Train	2	4	2	
Improve variety	3	1	3	
Loan capital	4	2	4	

Source: Survey result, 2003

## **Annex 3**

---

# **Crops and Animal Production in Two Agroecological Zones**

## Annex 3: Crops and Animal Production in Two Agroecological Zones

### Area and Yield of Main Crops in 2 Agroecological Zones

Crops	Lowland zone			Mountainous zone		
	Area (ha)	Yield (quintal/ha)	Output (quintal/ha)	Area (ha)	Yield (quintal/ha)	Output (quintal/ha)
Rice (Spring season)	27.604	43,5	120.212	6.319	26,9	16.978
Rice (Summer season)	24.035	42,0	101.066	602	29,9	1.802
Rice (Autumn season)	19.737	25,9	51.147	8.305	24,6	20.467
Corn	6.401	34,2	21.866	1.005	16,3	1.634
Cassava	5.111	77,4	39.568	6.070	84,2	51.090
Sugarcane	7.564	535,3	404.906	2.265	437,4	98.458
Peanut	4.261	14,3	6.215	1.324	13,2	1.749
Soybean	201	16,9	340	-	-	-
Sweet potato	3.433	46,9	16.095	499	37,5	1.869

Source: Quang Ngai Statistical Book, 2002.

### Animal Production of Agroecological Zones in Quang Ngai

Unit	Buffalo		Cattle		Pig	
	Total	Buffalo	Total	Cattle	Total	Fat. pig
Lowland	10.358	5.343	190.729	58.668	321.505	256.905
Q.Ngai town	362	180	5.623	128	21.550	18.676
Bçnh Sãn	681	455	53.322	27.426	54.028	49.393
Sãn Tẽnh	1.630	1.187	41.025	12.361	60.797	45.939
Tæ Nghéa	3.070	1.624	21.335	3.325	54.903	36.182
Ng. Hainh	1.845	1.022	18.938	4.758	30.524	28.454
Mãü Âæïc	1.166	200	24.616	83	52.490	33.330
Âæïc Phãø	1.604	875	25.869	10.587	47.213	45.850
Lyĩ Sãn	18	18	666	-	7.327	7.327
Mountain	33.181	21.065	32.760	12.002	73.830	54.817
Traì Bãøng	195	38	8.110	2.814	19.726	17.015
Sãn hai	9.413	5.415	16.894	6.189	24.714	17.409
Sãn Táy	1.585	869	2.967	897	4.842	3.951
M. Long	3.487	2.176	1.282	468	3.823	3.147
Ba Tã	18.501	12.567	3.507	1.634	20.725	13.295
Whole province	43.557	26.608	224.155	70.670	402.706	319.063

## **Annex 4**

---

# **Forest Land Use of Quang Ngai Province**

### Annex 4: Forest Land Use of Quang Ngai Province

Item	Natural Land Area	Forest Area (ha)	Natural Forest Area	Planted Forest	Bare Land Area	Cover Degree
Lowland						
Q. Ngai town	<b>3.713</b>	13	-	13	-	0,35
Bçnh Sãn	<b>46.438</b>	10.000,8	1.054	8946,8	7313,2	21,53
Sãn Tẽnh	<b>33.905</b>	4.638,2	173,8	4.464,2	2.243,1	13,68
Tæ Nghæa	<b>22.760</b>	1.901	-	1.901	4.681,4	8,35
Ng. Hainh	<b>23.397</b>	1.203,6	-	1.203,6	7.931,2	5,14
Mãu Åæic	<b>21.223</b>	3.098,1	180,7	2.917,4	3.604,6	14,54
Åæic Phæo	<b>38.186</b>	6.044	1.494,5	4.549,5	12.088	15,83
Lyi Sãn	<b>997</b>	57,6	-	57,6	223,9	5,7
Moutain						
Trai Bæong	<b>75.555</b>	21.750,9	-	1.958,9	44.471,9	28,79
Sãn hai	<b>75.031</b>	21.607	16.479	5.128	32.746,1	28,80
Sãn Táy	38.074	11.740,2	11.350,2	390	22.405,9	30,83
M. Long	21.637	6.812,2	6.099,9	712,3	11.270,4	32,48
Ba Tã	112.235	37.751,6	35.309,3	2.442,3	62.644,6	33,64
Whole province	513.151	126.604,9	91.933,4	34.671,5	209.850,9	24,67

*Source: Result on forest examine of Quang Ngai province, Department of Agriculture and Rural development*

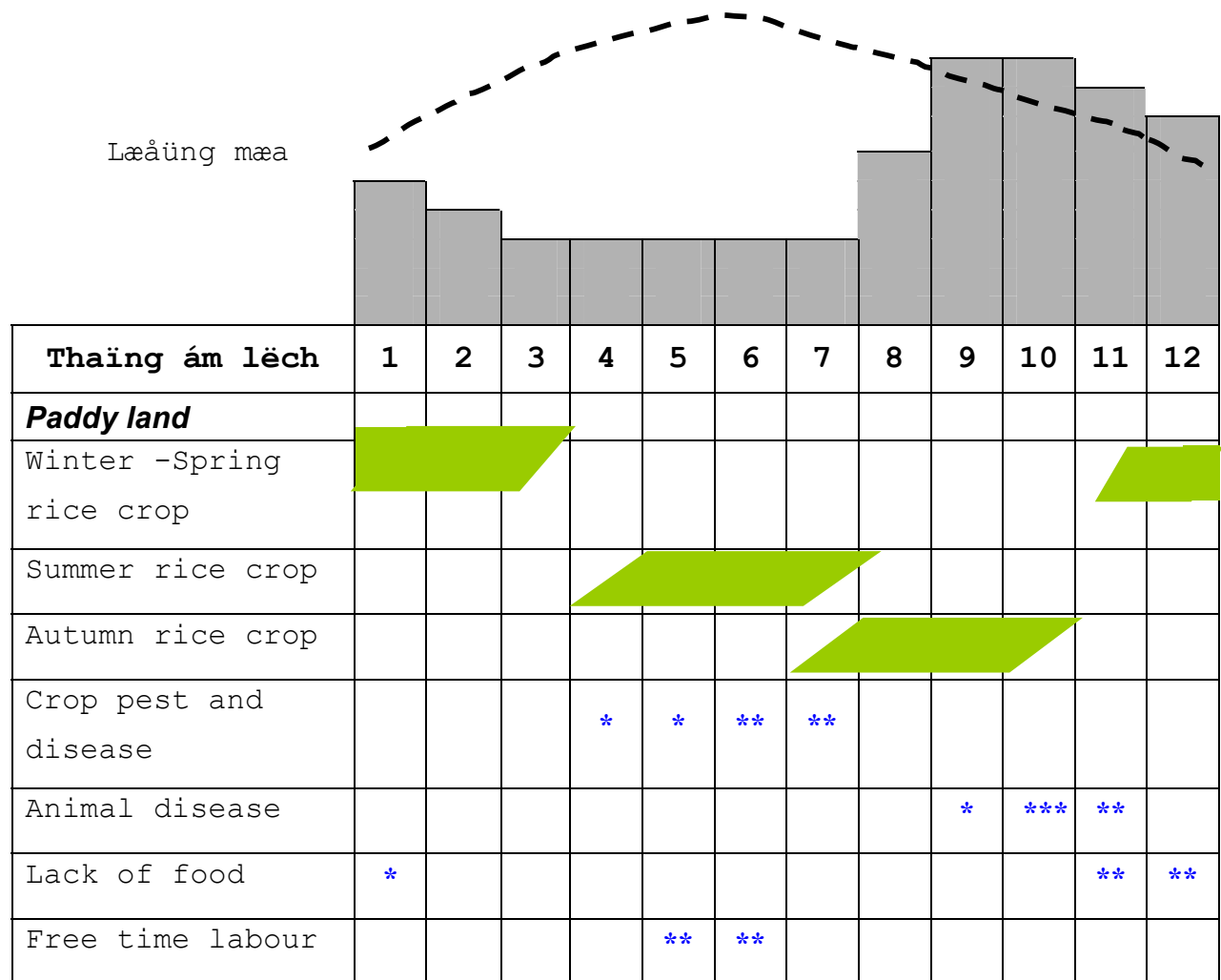
## **Annex 5**

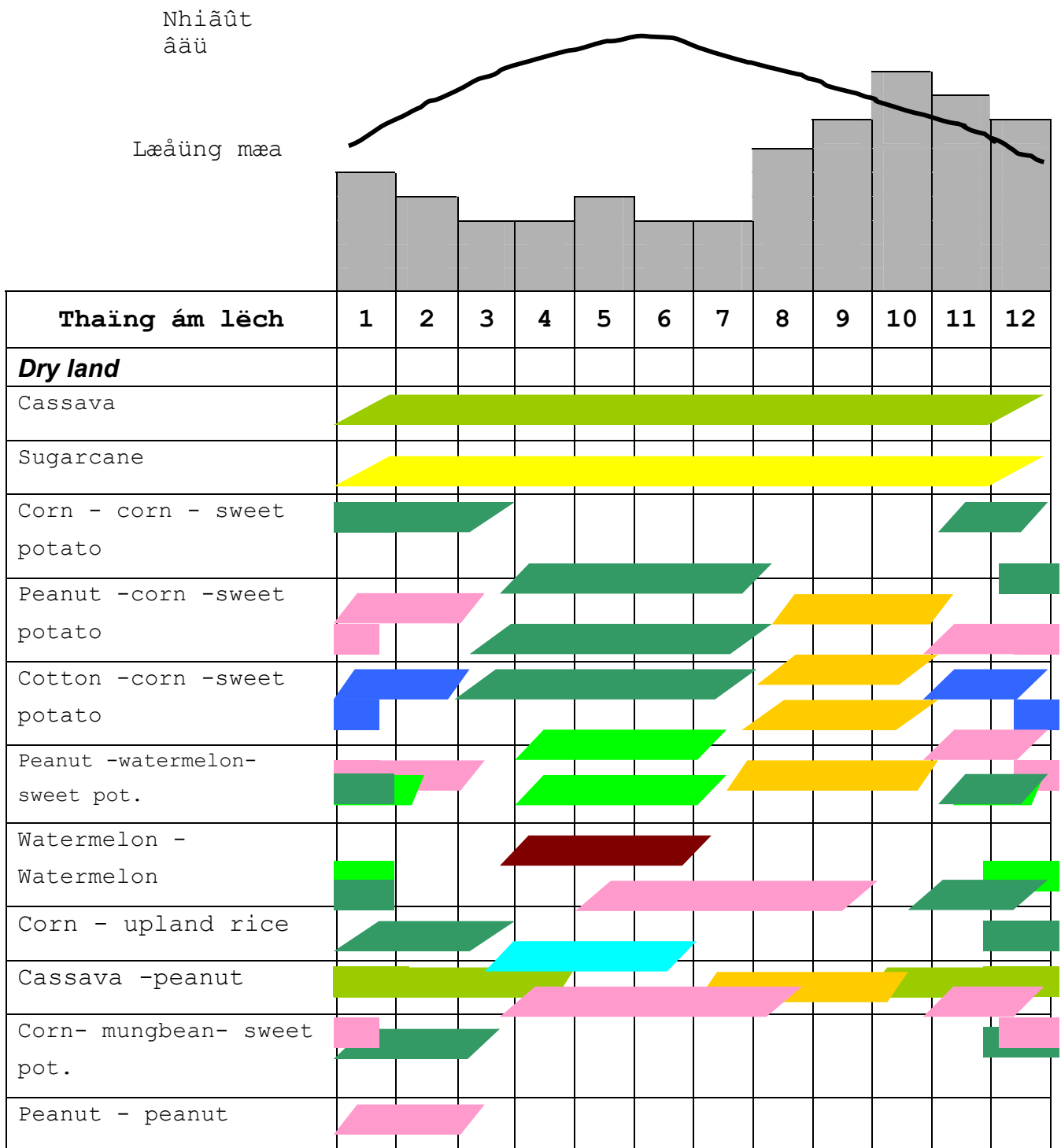
---

# **Seasonal Calendars in Quang Ngai Province**

## Annex 5: Seasonal Calendars in Quang Ngai Province

### Surveyed Communes in Quang Ngai Province





## **Annex 6**

---

# **Workshop on Farming Systems in Quang Ngai Province**

## Annex 6: Workshop on Farming Systems in Quang Ngai Province

10 March 2004

### Workshop Agenda

Time	Content	Speaker
8.00 - 8.15 am	Opening ceremony	RUDEP
8.15 - 8.45	Overview on Farming System	Ms. Nguyen Thi Lan (HUAF)
8.45 - 9.15	Objectives and Research Methodology and Research Process	Ms. Hoang TT Hoa (HUAF)
9.15 - 9.30	Research results: Overview on Quang Ngai	Ms. Nguyen Thi Lan (HUAF)
9.30 - 9.45	Coffee break	
9.45 - 10.00	Research results: The Current Farming Systems in 9 Program Communes	Ms. Hoang TT Hoa (HUAF)
10.00 - 11.00	Research results: Economic Efficiency of Cropping System, Husbandry and Farming Systems	Mr. Nguyen Dang Hao (HUE)
11.00 - 11.30	Solutions and Directions for Farming System Development	Ms. Nguyen Thi Lan (HUAF)
11.30 - 13.30	Lunch	
13.30 - 14.00	Group discussion: Assessment on Farming System Research Results at Program Communes: Constraints, Advantages and Solutions	Three Groups with facilitators (Ms.Lan, Ms. Hoa, Mr.Hao)
14.00 - 14.30	Group Presentation	Each group
14.30 - 15.30	Group discussion: Selection of Suitable Farming Systems: Activities and Solutions	Three Groups with facilitators (Ms. Lan, Ms. Hoa, Mr.Hao)
15.30 - 15.45	Coffee break	
15.45 - 16.30	Group Presentation	Each group
16.30	Comments, Workshop Assessment and Closing	

## List of Participants in the FS Workshop

10 March 2004

No.	Name of participants	Unit	Position
1	Phạm Thị Lệ Quyên	Province Extension Center	Agro-Engineer
2	Trần Thị Lan Hương	Province Extension Center	Forestry Engineer
3	Nguyễn Đức	Pho Chau CCG	Commune Officier
4	Nguyễn Đình Long	Duc phong CCG	Vice chairman
5	Phạm Đăng Đồng	Tu Nghia Extension Center	Specialist
6	Phạm Lai	Nghia Tho CCG	Commune Officier
7	Lương Thanh	Ng.Hanh Extension Center	Deputy Head of Center
8	Lê Văn Đoạt	Hanh Phuoc CCG	Commune Officier
9	Lương Văn Mùi	Son Tinh Extension Center	Specialist
10	Nguyễn Hữu Thọ	Tinh Tho CCG	Chairman of FU
11	Nguyễn Hữu Dương	Son Ha Extension Center	Head of Center
12	Đình Văn Hải	Son Hai CCG	Chairman
13	Phạm Quang Đức	Binh Minh CCG	Commune Finance
14	Đình Công Bôn	Son Trung CCG	Commune Officier
15	Nguyễn Văn Đức	Son Giang CCG	Land administration
16	Nguyễn Thị Thương Huyền	AMC staff	DDO
17	Trịnh Công Vũ	AMC staff	DDO
18	Tôn Nguyễn Nữ An Khang	AMC staff	DDO
19	Nguyễn Thị Bích Thủy	AMC staff	DDO
20	Nguyễn Thị Mai Hoa	AMC staff	DDO
21	Đình Kim Cương	AMC staff	DDO
22	Huỳnh Thị Hồng Thái	AMC staff	DDO
23	Nguyễn Thị Bích Thu	AMC staff	DDO
24	Từ Thanh Phong	AMC staff	DDO
25	Ngô Hữu Phước	PMU	VPDA
26	Phạm Ngọc Huy	PMU	VPDA
27	Nguyễn Đăng Thuận	AMC	Translator
28	Trevor	AMC	ATL
29	Mark	AMC	APDA
30	Nguyễn Thị Lan	Hue Uni.	FS Consultant
31	Nguyễn Đăng Hào	Hue Uni.	FS Consultant
32	Hoàng Thị Thái Hoà	Hue Uni.	FS Consultant
33	Phạm Văn Quang	AMC	MEGO
34	Trần Thị Lệ Tuyền	AMC	CBO

## List of Group Discussion Participants

GROUP 1: Mountainous Communes: Son Hai, Son Trung, Son Giang and Nghia Tho

Name	Organization
1. Lan Huong	Provincial Extension Center
2. Dinh Kim Cuong	DDO
3. Huynh Thi Hong Thai	DDO
4. Nguyen Thi Bich Thu	DDO
5. Mr.Phong	DDO
6. Dinh Van Hai	Son Hai CCG
7. Dinh Cong Bon	Son Trung CCG
8. Nguyen Van Duc	Son Giang CCG
9. Pham Dua	Nghia Tho CCG
10. Nguyen Huu Duong	Son Ha Extension Center
11. Pham Van Dong	Tu Nghia Extension Center

GROUP 2: Lowland Communes: Tinh Tho, Hanh Phuoc, Binh Minh

Name	Organization
1. Le Quyen	Provincial Extension Center
2. Nguyen Thi Thuong Huyen	DDO
3. Nguyen Thi Mai Hoa	DDO
4. Nguyen Thi Bich Thuy	DDO
5. Le Van Doat	Hanh Phuoc CCG
6. Pham Quang Duc	Binh Minh CCG
7. Nguyen Huu Tho	Tinh Tho CCG
8. Luong Thanh	Nghia Hanh Extension Center
9. Le Van Minh	Son Tinh Extension Center
10.	Binh Son Extension Center

GROUP 3: Coastal Communes: Duc Phong, Pho Chau

Name	Organization
1. Ngo Huu Phuoc	Program office
2. Trinh Cong Vu	DDO
3. Ton Nu An Khang	DDO
4. Nguyen Dinh Long	Duc Phong CCG
5. Nguyen Duc	Pho Chau CCG
6. Mr.Vinh	Mo Duc Extension Center
7. Nguyen Van Thanh	Duc Pho Extension Center

## **Summaries of the Conclusions of the Type of Farming System Required from each of the Three Agro-Ecological Group Discussions**

### **GROUP 1: MOUNTAINOUS REGION**

Traditionally, a major farming system called crop – animal productions farming system has been carried out under the subsistence farming in the mountainous region. In the crop production, the popular staple crops are cassava, rice and corn. Besides, there are some other crops such as sugar cane, peanut. Generally, these crops are low yield due to lack of technology, lack of water and low investment of fertilizer and good varieties. Households in this region raise cattle in which pig, cow and buffalo are the most popular. But animal production is less developed, animal yield is very low due to lack of technology (local breed, low investment of animal feed, limited knowledge of animal care and veterinary), and unstable market.

The farming system in which crop – animal and forestry are cooperated are the less popular while this region is considered as the most potential one for this system because of a big area of forest land. Traditionally, farmers have mainly relied on natural forest exploitation, they are unfamiliar with forestry. Besides, most of the forest land are not allocated to farmers.

In summary, most of the farming systems in the mountainous region are subsistence. These farming systems are less sustainable and low efficiency.

### **Constraints**

There are some main constraints in the farming system in the mountainous region. For crop production, these constraints are lack of water, lack of technology, market fluctuation, lack of new varieties, low soil fertility, many stones.

For animal production, these constraints include lack of technology, good breeding, and capital; unstable market, many diseases.

The constraints in forestry identified are low soil fertility, many stones, high slope, difficult for exploitation and transportation, lack of technology, lack of tree variety, not allocate land for household yet.

Besides, there are other constraints including imbalance of gender, limited knowledge of local officers, passive dependence of local people, lack of support services, disadvantage of production area, high rate of poverty, poor infrastructure (road, market, irrigation).

### **Direction**

Most participants agreed that agro-forestry farming system or tree crop mixed farming system considering as the most important one in the mountainous region. Major changes in agricultural production in this system are expected to come from intensification and diversification of crop production, and improved productivity of livestock and tree crops to produce agricultural products with higher value. Increasing diversification would integrate with an expansion of perennial crops and annual cash crops (as opposed to food crops) and intensification of livestock production. For crop production, it is necessary to develop forwards intensification through introduction and provision of new varieties with high resistance, setting up small irrigations, making master plan and applying sustainable model for cassava production. For animal production, adopting new technology such as replacement of local breed with high yield ones (hybrid of Sind cow, hybrid of pig), changing certain area of land to grow and expand grass fields. Enhance to plant forest especially with high economic trees including cinnamon, growing bamboo to produce baby bamboo and material forestry.

In order to approach these farming systems, there are four major thrusts. Firstly, promotion and introduction of technologies that provide a holistic and integrated approach to the sustainability and productivity of natural resources and the protection of the environment through introduction of demonstration models in which crop, animal and forestry production are integrated such as VAC, VACR models (V stands for vegetation, A for aquaculture and C for cage of animal and R for forestry), SALT model for upland system.

Secondly, establishment of information and knowledge networks, the activities to raise farmer's farming knowledge should be carried out such as on work, and inter - trainings on technology and marketing and study tours that promote general farmer capacity building.

Thirdly, enactment of policies and conditions that enable and enhance the provision of production inputs such as new varieties, fertilizer, technologies and services. Finally, improved stakeholder security to land by given a right land use to farmers, land leasing arrangements and rural credit.

## **GROUP 2: LOWLAND REGION**

Although current farming systems (crop production – animal production and crop production – animal production – off farm activities) in the lowland region are more diverse than mountainous region, the traditional farming system called crop– animal or rice - based system is the most popular.

Rice is the major food crop, depending on crop pattern and supplementary irrigation availability, the number of crops varying from 1-3 per year. In this region, although rice yield is higher than mountainous region, the economic efficiency is still low due to small farm size causing subsistence production, even farmer grow 3 crops per year but total income per area unit is low.

Other crops grown in the system include sugarcane, maize, peanut, cotton, sweet potato and cassava, watermelon and vegetables. Some of these crops bring a higher income to growers but product prices are very unstable.

Livestock production is an important component of the this system, ruminants (cow, buffalo), pigs and poultry are important source of income generation being used for asset value and cash income. However, livestock production systems in many communes are extensive, mainly using by – products available resulting in a low economic efficiency. A number of households which have intensive commercial cow, chicken and pig production are limited.

Although only few households in this region have off-farm activities, non-farm income which makes a significant contribution to the livelihoods of these families. The off-farm activities found out in this region are brick production, rice noodle production, and a little green bean cake production.

### **Constraints**

In this region a lot of constraints are identified. Firstly, household's land size is small and scattered. In some area there is lack of water due to poor irrigation or not available such as in Tinh Tho.

Secondly, farmer's technology knowledge is limited, a low rate of technology application, especially for a crops and livestock that are unfamiliar with farmers.

Thirdly, there are lack of suitable varieties for changing rice production from 3 crop to two crops, current seed production system weakly developed is a serious constraint to high crop yields and of good animal breeds and animal breed suppliers.

Besides, there are other constraints such as poor infrastructure, lack of access to information, market and credit and unstable market.

### **Direction**

The major future changes in the rice-based farming system are expected to be increased intensification and diversification of crop production integrated with intensification and diversification of livestock production and expansion of small-scale on farm aquaculture (ponds or rice-fish culture) to produce agricultural products with higher value.

In order to reach above farming system, it is necessary to intercrop and rotation crops by introduction and provision of new varieties and new technique, setting up integrated crop system to integrate food crop, industrial crops with leguminous plants, peanut in particular to improve soil fertility and avoid soil erosion, replacement of old cashew trees by new cashew variety.

For animal production, expansion of grass area to raise cattle, Sind hybrid cows in particular, and sweet water fish raising, improvement of pig breed with good quality and suitable with market demand.

There are some priorities activities given by participants such as improvement of irrigation system, set up seed production system at the local, provision of credit and organization of training courses and demonstration models.

### **GROUP 3: COASTAL REGION**

The most popular household farming system in this region is also crop production - animal production, following is a system of crop – animal production and fishery - off farm. Cropping systems are rice -sugarcane-peanut- watermelon - cassava. Rice is main crop in this zone, growing 2 -3 crops per year. Corn and peanut have high yield and stable price, growing 2 crops per year. Although unstable market, watermelon is important income source for many households in Pho Chau.

Animal systems include pig- buffalo, cow - chicken -duck. Most households have livestock with small size, in recent years farmers have applied progress technology in the production, but economic efficiency is low because of unstable market. Cattle raising, cow particular has high economic efficiency because of stable price, but low potential due to lack of grass area.

In comparison with other provinces, fishery in Program communes in Quang Ngai is less developed. Traditionally, fishers catch fish in the sea which is adjacent to the shore, the sea has been exhausted in recent years due to overexploitation. Most fishers lack of money to invest in a modern boat by which they can go further for fish catching. At present, some of fishers are hired by boat owners outside their communes, but their income is not stable and low.

### **Constraints**

There is considerable constraints in this region. The high population density and long history of resource degradation are the most characterized. Soils are generally less fertile, saline and acid sulfate water and more susceptible to erosion are generally depleted because of unsustainable farming practices.

Farms are generally small and fragmented. This hinders marketing, and also limits economies of scale in farm operations. The farmers' knowledge is limited whilst the services (extension, input and output services) are less developed.

The production in the region has been hampered by the lack of good quality seed, animal breeds, poor irrigation and unstable market.

## **Direction**

The main direction for farming system in this region is integrated crop and livestock husbandry, agro-forestry. By upgrading existing irrigation systems it is necessary to introduce cash crops such as peanut, cotton and vegetables. Development of livestock husbandry such as fattening and breeding cows, goat and local chicken production, where this can be accompanied by the introduction of aquaculture and off-farm enterprise.

The strategic priorities for farming development in this region include intensified research and extension, farmer training, particularly in better on-farm, improved post-harvest handling and milling. Improved flow of information to farmers and investments will be needed in support services providing technical, good varieties, market information, agricultural information, knowledge systems and credit programs.

### **Limitations**

URS Australia Pty Ltd (URS) has prepared this report for the use of AusAID Quang Ngai Rural Development Program in accordance with the usual care and thoroughness of the consulting profession. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Program Design Document.

The methodology adopted and sources of information used by URS are outlined in this report. URS has made no independent verification of this information beyond the agreed scope of works and URS assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to URS was false.

This report was prepared during April 2004 and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.