



STUDY REPORT

Needs assessment on sustainable livelihoods responding to climate change in Vietnam

The case of Quang Ninh Province

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1. SUMMARY

This needs assessment study aims to evaluate what is needed by poor rural populations in Quanh Ninh province to enable them to develop sustainable livelihoods that can cope with the impacts of climate change. Improvement of sustainable livelihoods in this area is a key to alleviating poverty, but remains challenging. Thus, an understanding of how livelihoods are conducted and sustained, how resources can be better accessed to meet basic needs and generate income, is a crucial step in attaining genuinely sustainable development in these areas. The challenge of developing and maintaining sustainable livelihoods, and lifting the local population out of poverty, is increasingly being compounded by the impacts of climate change. This study recognises that any efforts to support sustainable livelihoods will only be effective if they take into account the impacts of climate change, and build local communities' resilience to these emerging threats.

The purpose of this study is to: identify the risks that climate change poses to the rural poor in Quang Ninh; understand the role of access to natural resources (in particular land, water and mangroves) and access to markets in supporting their livelihoods and reducing their vulnerability; and to recommend adaptation actions that can help increase the resilience and sustainability of poor people's livelihoods in the face of climate change.

The research was divided into five themes which are closely interlinked: water supply, irrigation and sanitation; land access and management; value chains and access to markets; climate change; and mangroves. A report was produced for each of the five themes, and this synthesis report for Quang Ninh province brings those findings together. This report represents an innovative approach that integrates climate change adaptation within a sustainable livelihoods analysis with the aim of identifying strategies for reducing the poverty and vulnerabilities of poor people in rural areas.

2. Introduction

The impacts of climate change have been increasing in the form of droughts, floods, storms and sea level rise, and their consequences on the environment, natural resources and socio-economic conditions are also becoming more and more apparent.

The communities most vulnerable to climate change are the poorest, those involved in agricultural production and those whose livelihoods are considerably dependent on the natural environment. Poor people have few assets to help them avoid or recover from disasters and economic shocks. It is very difficult for people to rebuild their livelihoods after a disaster, if they have no capital to cover the costs and little influence over the institutions that control their access to resources. They are further hindered by poor access to knowledge and limited opportunities for learning new skills. Furthermore, heavy dependence on ecosystem services can place their welfare and survival at the mercy of fluctuating environmental conditions. As the availability and quality of natural resources decline due to natural and human-induced pressures, so does the viability and security of their livelihoods.

In Vietnam, climate change is already a challenge which people are facing in their daily lives, as well as a very real threat to Vietnam's continued socio-economic development (Chaudhry and Ruyschaert 2007). Increasingly erratic and variable rainfall, higher temperatures, more intense extreme weather events like typhoons, droughts and heavy rainfall causing floods and soil erosion, rising sea-levels and salt water intrusion, will all have significant impacts across many sectors, regions and income groups, and particularly on the livelihood security of the rural people whose livelihoods centre on agriculture.

2.1. Overall objective of the study

This study is designed with the overall objective of forming a comprehensive picture of the problems and needs of local people in maintaining sustainable livelihoods in the face of climate change, and recommending how their livelihoods can be improved in short term and sustained in the long term by developing adaptation responses to climate change in Quang Ninh.

Specifically, the research was divided into five themes which are closely interlinked: water, land, markets, mangroves and climate change. A report was produced for each of the five themes, and this synthesis report for Quang Ninh province brings those findings together.

The **key objectives** of the study are:

- A. Identifying past, current and likely future:** livelihoods activities of the local communities; land access and management arrangements; irrigation systems, access to clean water and sanitation; market opportunities of agricultural and forest products; and climate change impacts on the area.
- B. Assessing the awareness and existing capacity of local people on:** climate change and adaptation; land access and management; irrigation and clean water and sanitation systems; value chain channels for local products.
- C. Evaluating the efforts and interest of government authorities in addressing:** climate change and adaptation; land access and management; irrigation and clean water and sanitation systems; value chain channels for local products.

- D. Identifying constraints, challenges, and potential solutions for:** coping with the adverse impact of climate change; improving irrigation, access to clean water resources and sanitation; enhancing value chain awareness and market opportunities; and improving land issues access and management issues confronting poor people in these communes.
- E. Deriving recommendations** that can form a basis for future development intervention activities to promote sustainable livelihoods that can cope with climate change, and take into account challenges related to land, water and access to markets.

3. METHODOLOGY

The methodological approach chosen as the basis for this needs assessment study was participatory rural appraisal (PRA), because this approach allows the target stakeholders – poor farmers – to have an active role in identifying and explaining the challenges they face, their strengths and opportunities, and what they most need to support them to address climate change and build more sustainable livelihoods. It is also intended to encourage these stakeholders to feel ownership of the findings of the assessment and therefore be more likely to support and collaborate to implement the resulting projects.

3.1. Selection of study sites

The study areas are in Hoanh Bo district, Quang Ninh province. Hoanh Bo district was selected in order to focus on areas where mainly ethnic minorities are living, with high density of poverty, families who are heavily reliant on land and natural forest use for their livelihoods, and who may be becoming obliged to change their livelihoods to adapt to the impacts of climate change.

The three communes were chosen because they are assumed to represent a cross-section of the population, including two in remote areas with high natural forest cover and high percentage of poverty (Ky Thuong and Dong Son), and at the other end of the spectrum, one in an area of high agricultural land use, with a medium to low percentage of poverty (Thong Nhat).

3.2. Selection of target groups

The key stakeholders are local poor people. A range of groups were targeted, including farmers, the landless and those particularly vulnerable to natural disasters, and ensuring a representative range of ethnic minorities, ages and genders. Other important stakeholders were local government officials from commune, district and provincial levels, from relevant departments such as: Natural Resources and Environment; Planning and Investment; Agricultural and Rural Development; and Natural Disaster Prevention Committees. Representatives from mass organisations such as Womens' Associations and Veterans' Unions were also targeted.

3.3. Selection of tools

Besides initial desk study and in-depth interviews, a wide range of PRA tools were used, including focus group discussions, observation and transect walks, calendar and timeline activities, ranking exercises, case studies in target locations, and SWOT analysis. A feedback workshop was held following the field research, at which stakeholders were invited to comment on the accuracy of initial findings, how appropriate they considered the proposed recommendations, and any obstacles and opportunities they saw in implementing them. The purpose was to ensure the outputs of the needs assessment are as useful as possible, and to encourage the beneficiaries to take ownership of the success of future projects.

3.4. Data analysis and interpretation

The data collected during PRA activities was largely qualitative, but ranking exercises and calendars generated some quantitative data, allowing for quantitative comparisons. Qualitative analysis including discourse and textual analysis was a core method of data analysis. Secondary data provided a combination of quantitative and qualitative information, and an important part of the analysis is to compare the information gathered from stakeholders with the information contained in secondary documents.

4. MAIN FINDINGS

Hoanh Bo is a mountainous and coastal district of Quang Ninh province, where topographical conditions are dominated by 3 terrain types: mountainous, semi-mountainous and delta. While the majority of the province's income for is generated by the services sector (with income from agriculture only 5.1% GDP), in Hoanh Bo district the main income is from the agriculture sector.

Hoanh Bo district covers 84,365 ha and 12 communes, two of which (Ky Thuong anh Dong Son) have been included in Program 135, a major Government program that supports rural development and particularly targets the most disadvantaged communes. The population of Hoanh Bo as of January 2009 was 446,453 including six main ethnic groups (Tay, San Diu, Kinh, Dao, Hoa and Nung). Ethnic minorities comprise 34.6% of the population, and poor households make up 6.17% of the district's population (Hoanh Bo 2010). Remote locations, insufficient infrastructure, poor literacy and poor living conditions are common issues in this district, especially in the mountainous communes.

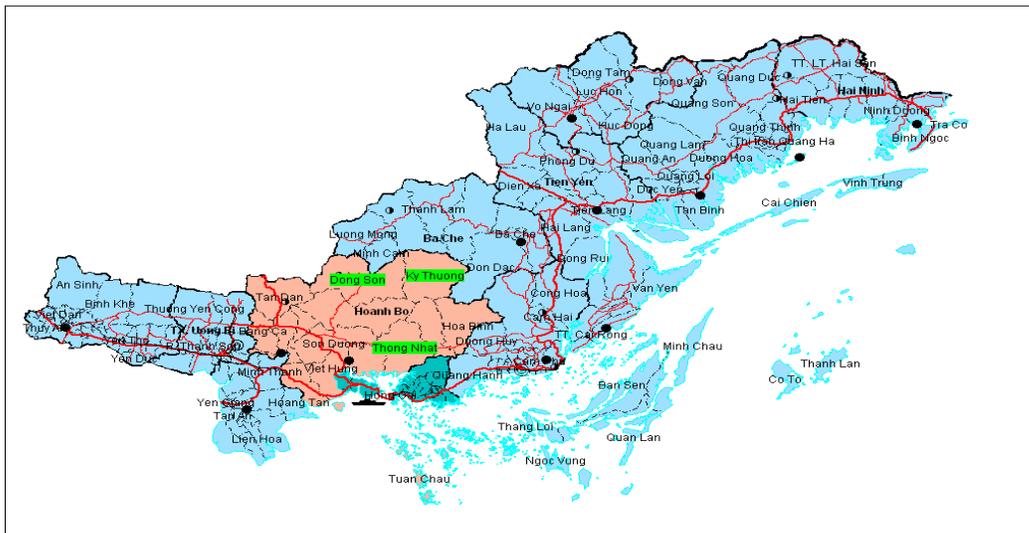


Figure 1. Map of Quang Ninh showing study sites (Source: Administrative Map of Quang Ninh)

The poverty rate in the two mountainous communes is high (40% in Ky Thuong and 30% in Dong Son). In Ky Thuong, the road that is passable by car only reaches as far as the commune centre, while the roads to the hamlets are just for motorbike, so transport to and around the commune is still very difficult. Both of these mountainous communes are thinly populated.

Thong Nhat, on the other hand, is a coastal commune with significant industrial development so the living conditions of local people are fairly high, with a poverty rate of only 1-2%. Thong Nhat is only 4-6 km from the district's centre and has asphalt road which is convenient for travel. However, since industry and services are developing fast, issues of irrigation, drainage, water supply and sanitation are more urgent than in Ky Thuong and Dong Son. The natural vegetation of this commune includes mangrove forests. A major problem for this area is the impact that urbanization is having on local people and the environment. This, combined with the impacts of climate change, is resulting in visible changes to the local flora and fauna, such as changes in the types of marine life to be found in coastal areas.

4.1. CLIMATE CHANGE

4.1.1. Climate change and its Impacts in Hoanh Bo district, Quang Ninh province

Statistical data from Hoanh Bo district shows that during last 5 years, total losses due to natural disasters cost around 30 billion VND including damage to houses, agricultural land, roads, irrigation systems, electricity and communication systems.

In 2005, annual rainfall was around 4 times higher than in the previous years. Storms and floods caused damage to irrigation systems, weirs, houses, roofs, roads, agricultural land and crops. In addition, heavy landslides and severe soil erosion were recorded in many areas.

On some days of July and August in 2006, rainfall was so heavy that it equalled the yearly average. As a result, rivers and streams broke their banks and strong floods and waterlogging caused great losses for paddy rice fields, irrigation systems, soil erosion and landslides. In addition, strong whirlwinds and hail in Dong Son commune caused significant damage to agricultural activities. The rainy season in 2007 started very late and finished earlier than usual, while rainfall dropped significantly.

In 2008, there were more storms and instances of tropical low pressure in Vietnam than other years. Hoanh Bo was affected by two heavy storms and a strong whirlwind. The rainy season came a month earlier than normal. Rainfall was much higher than in 2007. In that year, Hoanh Bo district suffered damage worth around VND 22 billion, the highest damage in recent years. In 2009, there were 5 storms in the district, and around 15 ha of forest were affected by fire.

Between 2005 and 2009, a significant increase in the instance of many human diseases was also recorded. Diarrhoea, tuberculosis, nervous system problems, respiratory disease, and high blood pressure were around 2-3 times higher than 2005.

4.1.2. Climate change events and their ranking in different selected communes

During the time conducting study, a high percentage of people said that they had heard about climate change on the television or radio, but none of them could explain "what is climate change?". The term "abnormal changing of weather or climate" was therefore used to replace the term "climate change".

Table 1 presents how local households described climate change related events in their communes and what changes they have experienced recently compared to the past 10-15 years.

Table 1 Climate change related phenomena and how they changed over the past 10-15 years

Event	Description in comparison to the past
Depleted water resources	Lower water levels, poorer quality, higher pollution levels, especially in the dry season
Drought	Higher intensity
Unpredictable high temperatures	Higher temperatures, no longer a clear difference between four seasons, difference between day and night very large
Cold outbreaks	Severe cold, high damage to crop and animal husbandry
Heavy, unpredictable rain	Heavy rain each time, abnormal style
Flash floods	Higher frequency, higher intensity, more serious damage, and they come more suddenly and unexpectedly

Landslides	Higher frequency, higher intensity, large areas
Thunder, lightning	Higher frequency
Whirlwinds	Stronger wind, more frequency
Rising sea level	Higher sea water level than before that often overflows over dykes
Salination	Larger paddy rice areas suffering salt water intrusion, and increasingly difficult to rehabilitate for cultivation afterwards
Pests in crops	High frequency, high intensity and more new diseases
Animal diseases	More frequency, higher intensity, more death,
Human diseases	More diseases, new diseases (H1N1), high frequency

Source: Group discussion

Table 2 shows the differences between the three communes in terms of how serious local farmers and authorities consider these different impacts to be in terms of local livelihoods. Indirect impacts potentially linked to climate change, such as increasing prevalence of pests and diseases, are considered by local people to have some of the most serious impacts on their livelihoods, along with drought and in some cases flash flooding. While rising sea levels and salt water intrusion are identified as problems in Thống Nhất, communities located in forest and uplands areas, do not suffer these problems.

Table 2. Climate change events and their first five ranking in different communes

Location	Upland Communes		Coastal Commune
	Kỳ Thượng	Đông Sơn	Thống Nhất
1	Flash flood	Human diseases	Human diseases
2	Pests in crops	Pests in crops	Depleted water resource
3	Cold outbreaks	Animal diseases	Pests in crops
4	Human diseases	Depleted water resource	Drought
5	Drought	Drought	Animal diseases
	Heavy, unpredictable rain	Flood, flash flood	Higher sea water level
	Animal diseases	Landslide	Salt intrusion
	Storm	Storm	Unexpected flood
	Flood	Whirlwind	Thunder, lightning
	Unpredictable high temperatures	Unpredictable high temperatures	Unpredictable high temperatures
			Cold outbreaks

Source: Group discussion

4.1.3. Seasonal changes

Local people in three communes also reported these different weather events are starting to happen at different times throughout the year compared to a decade ago.

Flash floods, droughts, unexpected bouts of high temperature and depleted water resources seem to take place over longer periods of time now than in the past. For example, the risk period for flash flooding now tends to last from May to July, whereas it used to take place only in June and July. Droughts seem to last about one month longer than they did 10 years ago.

Pests in crops, human ill-health and animal diseases were rarely recorded in the past, but now they are become more common. However, the change in the instances of crop diseases is partly related to the fact that, for the past several years, crops have been cultivated two seasons per year, and diseases occur in both crops (February-April and June-July). In 2010, drought has severely affected all three communes, which has caused farmers to change their first crop of the year due to very few rains and very little water

level. Similarly, depleted natural water resource occurs at the same time causing more serious droughts in the study sites.

Previously, the rainy season often lasted from May to July, but without very heavy and unpredictable rain storms. However in recent years, unpredictable heavy rain has occurred quite frequently. Storms and normal floods appear one month later than before (lasting from June to July rather than May to June). Unpredictable high temperatures start earlier and last longer than in previous times. In fact, such high temperatures as those experienced recently never used to happen in the past.

4.1.4. Social, economic and environmental dimensions of climate change impacts

Through group discussions, it became clear that the impacts of climate change pose serious destabilizing threats to sustainable development in terms of three pillars: social development, economic development and the environment.

Economic development

Given that their main livelihoods are agriculture-based, some of the most serious impacts of climate change for people living in these communes include failure of harvesting, diminishing crop yields, poor or slow plant growth due to disasters, cold outbreaks, severe drought, and increasing diseases in crops and animals.

Increasing disease and death among cattle and buffalo, for example in the severe cold outbreak of 2008, impacts on local livelihoods in terms of lower productivity, lower income and lack of draught power for agriculture and to access the markets. The impacts of climate change on crop production also results in lack of food available for animals. All of these impacts require farmers to make higher investments in animal feed, medicines and labour.

If land is damaged due to flooding, erosion or salt intrusion, many farmers are forced to leave their land fallow because they do not have the financial and human resources to rehabilitate them for cultivation. The human health impacts of climate change also affect the household and wider economy, since families have to pay for medicines and hospital fees and the capacity of their work force is reduced.

Social development

Despite the negative impacts of climate change events on society, local people reported that one of their strengths in dealing with these impacts is the support from their neighbours and villagers to recover from difficulties, for example collapsed houses, roofs blown away, landslides or water logging. Nevertheless, more negative impacts are recorded. Damage to infrastructure such as roads, electricity and irrigation causes traffic jams, inability to get to school, and affects agriculture activities.

In addition, shortages of water cause conflict among villagers in all three communes, who need water for daily household needs and irrigation. Many households have to move to new areas due to the risk of landslides, leaving the homes they have lived in for many years and moving to new areas where they do not really want to live, and which is an expensive option. Increasing ill-health results in a loss of labour available, affecting households and society at large. Children and old people are particularly at risk from diseases such as flu, bronchitis, and high blood pressure.

Environmental development

Climate change impacts quite seriously on the environment of local communities. In order to cope with crop diseases, farmers use more pesticides, herbicides and fertilizers. Generally, farmers use these chemicals without careful guidance or they do not follow necessary direction. These chemicals directly affect users' health, natural water resources, and indirectly affect consumers later. Using a high amount of chemicals also causes death of indigenous insects, which have positive impacts on crop production because they are an important component of the local ecosystem, for example feeding snakes that protect crops from other animals. Besides reduction in clean water for local people's daily use, polluted water and waste negatively impacts the environment and water resources in lower lands.

Poverty

The impacts of climate change on these three interlinked aspects of sustainable development – the economy, society and the environment – bring many challenges to poor people, including food insecurity, difficulty in rehabilitating the household economy, the risk of falling deeper into debt, and the need to migrate to other areas. In all these ways, climate change has the potential to exacerbate poverty.

4.1.5. Adaptation measures of local households

Local people mentioned a few measures that they are using to adapt to soil erosion and landslides such as cultivating bamboo and utilising stones and tree branches to redirect river flow, or increasingly, people tend to choose safer areas to build their house to avoid landslides. In case of drought and depleted natural water resources, farmers tend to change to a different crop or forest product. Varieties of crops with shorter cultivation time and high resistance to drought are used by local people. Changing of crops has become a common trend recently during drought season.

Overall, very few adaptation strategies are used by local people (table 3). In fact, many people do not know how to adapt to their vulnerable conditions. Many farmers still base their agricultural activities on the conditions that they have been used to in the past without considering current climate change related effects, let alone expected climate change issues in the future.

Table 3. Adaptation strategies of local people in selected communes

Adaptation measures of local households
- Planting bamboo to prevent floods, soil erosion and landfalls
- Using stones and tree branches to prevent soil erosion
- Redirecting river flow to avoid effects to rice-fields and houses by digging gullies
- Moving to safer areas or selecting safe areas to live
- Changing from maize to shorter-season crops (soybean, peanut, sweet potato or cucumber) or forest products (acacia, cinnamon, and canarium) to cope with water shortages
- Changing from wet rice to maize, and other cereals that require less water
- Changing sowing, planting and seedling transplanting time to skip cold outbreak times

Source: Group discussion

4.1.6. Support policies and strategies of the government

In general, the government of Vietnam has given a lot of support for dealing with natural disasters such as setting up natural disaster prevention and control committees at different provincial, district and communal levels, using existing resources to responding to emergency cases. In addition, the Vietnam government also provides some necessary equipment and materials to government staff and households

such as raincoats, protective clothing, flashlights, boats, etc. Irrigation systems, dams, dykes are built by the government in vulnerable areas in all selected communes, the district and the province. The government also provides funds or rice to some households who have suffered severely from natural disasters, for example those having to move house due to landslide, roof damage, or whose crops are severely damaged. For instance, one household in Ky Thuong received 25 million VND in 2009 to support them to move to an area less vulnerable to flash flooding and landslides. In 2010, 8 households in Dong Son commune are having to move and received support from the government.

However, this support, whether financial or in kind (often rice) is limited due to limited fund resources. Natural disaster prevention and control committees (NDPCC) at different levels often do not have specific fund resources for their official mission, but take a part of annual budget or use spare budget. No person works solely for NDPCC; they combine their role with many other duties and do not receive salary or compensation payment for their work with NDPCC. In Quang Ninh, no government officers have received any training in relation to climate change and most participants felt they lacked knowledge about its impacts and adaptation measures.

In relation to natural disasters in particular, information recording and communication systems at different levels are extremely poor, especially in the communes studied. Support for commune-level human resources and skills development to store data, and a desktop computer, should be provided to increase commune-level capacity in predicting and adapting to climate change.

4.1.7. SWOT analysis

The situation of local people and their ability to address climate change can be summarised with a ‘SWOT’ analysis of their strengths, weaknesses, opportunities and threats.

Local people have a number of **strengths** that should be built upon in designing adaptation measures. These include indigenous knowledge about their specific local condition and strong mutual support within communities. All the selected communes have been allocated forest land for reforestation and protection. Local people are beginning to gain an awareness about the impacts of deforestation on natural disasters.

Households need support to overcome many **weaknesses** in relation to adapting to climate change such as limited infrastructure (irrigation systems, roads, and electricity), lack of education and knowledge, lack of capacity to respond and adapt to climate change and natural disasters, high poverty rate, and a lack of resources. In addition, damage to human health, crop and livestock production causes a need for high investment in medicines, costs, and labour.

The limited number of **opportunities** that local people identified included support from government in terms of human resources, funding and materials as well as infrastructure such as building irrigation systems, dykes, weirs, roads etc. Local people have also received support from organisations such as FAO in providing technical trainings.

Many **threats** were identified that compound the threat of climate change, including deforestation, land clearance and destruction of mangroves, not only by local people but also due to industrialisation and natural disasters. At the same time, transmission of new diseases, pestilent insects and viruses from outside is causing major damage to crop and animal production as well as human health. Environmental pollution is getting progressively worse, especially due to poor rubbish collection, garbage stagnation and

industrialisation. Poor quality dykes can be damaged in heavy storms causing serious impacts to households living near coastal areas.

One particular category of threats is ‘maladaptation’, in other words, activities that aim to cope with the challenge of climate change but may actually make communities more vulnerable. Hybrid rice and maize varieties as well as livestock crossbreeds may fall into this category, where they appear to bring financial benefits in the short term but they actually have lower resilience to fluctuating local conditions than indigenous varieties, and higher input costs. The increased use of fertilizers and pesticides to cope with reduced productivity and increasing prevalence of disease is another example, since this can have serious impacts on environmental and human health.

As more people migrate to find job opportunities outside their villages or communes, especially those who lack of land and capital, and live in locations that are vulnerable to the threat of natural disasters, some of these people and their families will benefit, but many will face new challenges.

4.2. LAND AND LIVELIHOODS

Land use and management are extremely important issues for farmers’ livelihoods; the agriculture sector is dependent on the availability of land. Changes are being seen in the quantity and quality of arable soil available, due to erosion and leaching which can lead to or exacerbate drought and lack of irrigation water in upland areas, while in lowland areas it can cause worse flooding. Areas of natural forests are being lost, either converted to planted forests or from forest land to agricultural land.

Efforts are already being made to manage the land and share it out. Residents of Ky Thuong and Dong Son were found to have many experiences in common in relation to the problems they face and the livelihoods opportunities available to them in relation to land use and management. The responses of participants from these two communes are consolidated in Table 4.

Table 4: SWOT analysis on land and livelihoods in Ky Thuong and Dong Son:

<p>Strengths:</p> <ul style="list-style-type: none"> • Local knowledge about land use • Red books (certifying the right for people to use and manage their land) have been issued for most households. • Strong local regulations for land management • Rich natural resources. • Terrain in this area does not vary significantly so it is easy to manage • Both husband and wife appear on land certificates, supporting equality in access and decision-making (in Dong Son) 	<p>Weaknesses:</p> <ul style="list-style-type: none"> • Limited land available for rice cultivation for each family • Lack of functioning irrigation systems • Due to climate change, people are obliged to change to less familiar crops • There is no market in land entitlements • Low awareness about the causes and impacts of climate change on production • Conflicts over land entitlements due to unclear boundaries especially for forest.
<p>Opportunities:</p> <ul style="list-style-type: none"> • Existence of planning map and cadastral maps which facilitate land management. • Significant areas of land designated as protected 	<p>Threats:</p> <ul style="list-style-type: none"> • Impacts of climate change including extreme weather events are happening more frequently, reducing productivity of agricultural land and

<p>forest, which will help to preserve water and land resources.</p> <ul style="list-style-type: none"> • Support from NGOs and Government • Infrastructure is improving (roads, electricity) 	<p>obliging people to change to new crops and livelihoods.</p> <ul style="list-style-type: none"> • Damage to the environment due to lack of awareness • The conversion of forest land to construction land results in reduced area for agriculture • Most forest land is under reservation area so in the near future households will have to find alternative livelihoods.
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As discussed above, the environmental, economic and social characteristics of Thong Nhat commune differ significantly from those of Ky Thuong and Dong Son. Therefore the responses by participants from this commune regarding strengths, weaknesses, threats and opportunities related to land are presented separately in Table 5.

Table 5: SWOT analysis regarding land and livelihoods in Thong Nhat commune:

<p>Strengths:</p> <ul style="list-style-type: none"> • Residential land red books have been granted to 85% of households, naming both husband and wife. 100% of agricultural land red books granted. • A land use plan to 2010 with direction until 2020 has been written. • The local government has supported people to move from coastal areas and rivers, and set up disaster response team. • Local people demand continuing repair and building of concrete dams, canals and dikes to prevent salt intrusion. • Those with higher education find it easier to change to new methods. 	<p>Weaknesses:</p> <ul style="list-style-type: none"> • Cadastral maps and digital maps are still missing; boundary adjustment according to the plans is still difficult. • There are restrictions in the procedures for land allocation or lease of farms and family farms. Cultivated land is cheap while resettlement land is expensive. • Land area per capita is reducing • Red books have not been issued to 100% of the population so there are still some conflicts in land ownership • Abilities of government officials are still limited • Low education levels
<p>Opportunities:</p> <ul style="list-style-type: none"> • Increasing urbanization is creating many opportunities for people to change their land use and livelihoods • Government and NGO support 	<p>Threats:</p> <ul style="list-style-type: none"> • Urbanization has caused over 100 hectares of arable land to be lost. • Unsatisfactory compensation policies • Low employment levels • Increasing impacts of climate change including extreme weather events

4.2.1. Farmers’ needs in relation to different types of capital

Land resources come under the category of ‘natural capital’ which is a crucial input for farmers to ensure they are able to generate sustainable livelihoods. But the findings presented above show that natural capital alone is not enough; in order for farmers to benefit fully from the natural capital available to them, it needs to be combined with other types of assets or ‘capital’. The problems that people in these

communes are experiencing, and their opportunities to overcome them, may be described in terms of access to different types of capital:

1. Natural capital

- *Weaknesses/threats*: difficult terrain for cultivation and infrastructure, environmental change and soil degradation due to e.g. climate change and urbanization
- *Strengths/opportunities*: quantity and quality of land, water and other natural resources

2. Human capital

- *Weaknesses/threats*: low education levels, lack of awareness of climate change, low ability to negotiate, limited information
- *Strengths/opportunities*: local knowledge; training courses

3. Physical capital

- *Weaknesses/threats*: lack of infrastructure and local services
- *Strengths/opportunities*: support from Government e.g. Program 135

4. Social capital

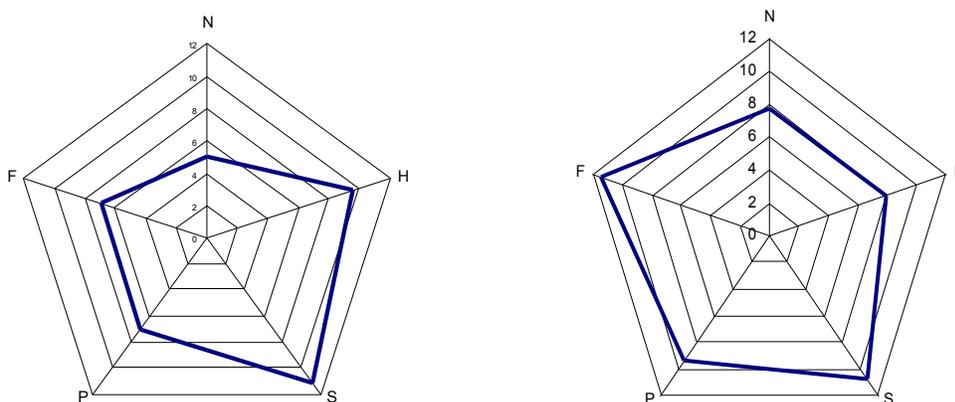
- *Weaknesses/threats*: lack of strong relationships with traders and other external parties
- *Strengths/opportunities*: relationships with Government, private sector and NGOs

5. Financial capital

- *Weaknesses/threats*: lack of spare income to invest, lack of ability to access markets
- *Strengths/opportunities*: services, trade and factories present new opportunities; improved infrastructure improves access to markets

The ‘distance approach’ was used to explore the respective importance of these different types of ‘capital’ to local farmers. Researchers compared how important farmers rate each type of capital, with their level of access to it. Where a particular type of capital is considered highly important for livelihoods but farmers have limited access to it, this highlights a key problem area that needs to be addressed.

In the diagrams (Figure 2), each spoke of the pentagon represents a different type of capital. For each type of capital, the bigger the difference between what farmers need and what they actually have, the nearer to the centre of the pentagon the point falls on that particular spoke. So problem areas are shown by the points that are nearest to the centre of the pentagon.



Ky Thuong

Dong Son

Figure 2: Comparison of need for different types of capital in two of the communes

Where: N is Natural capital; H is Human capital; S is Social capital; P is Physical capital; F is Financial capital; and the nearer to 0, the greater the gap between farmers' needs and what they actually have

Comparing the diagrams in Figure 2, we find that the Dao commune, Ky Thuong, is having particular problems with natural capital, financial capital and physical capital. Natural capital is being affected by the shrinking natural forests reducing quantity and quality of land and water available. The lack of financial capital is partly a result of a lack of agricultural land, and limits local people's investment in, and therefore productivity of, the forest land they have been allocated. The difficulties in terms of physical capital are mainly related to incomplete roads which mean accessing the market is difficult for these rural areas, particularly in the rainy season.

For the Dao people in Dong Son, the most significant challenges are related to natural capital and human capital. Natural resource problems related to degradation of natural forests seems to be leading to declining water reserves, floods and droughts. Water quality is also affected, for example water used to be colder and this was more appropriate for rice, but now even good quality rice varieties have been negatively impacted such that farmers are making the transition to new crop types. The challenges of human capital that local people identified were mainly related to their ability to access training opportunities in advanced production skills and in life.

Both these examples show that the different types of capital are often linked. This can create a vicious circle, reinforcing poverty. When analysing how to assist farmers to develop more sustainable livelihoods, we should not focus on just one area of need (e.g. land resources, or financial capital) but be aware of how supporting the provision of one type of capital may enhance people's access to another.

4.3. MANGROVES

Coastal mangrove forests not only facilitate the nurturing and reproduction of many aquatic species with high economic value such as shrimp, fish and seaworms; protection and development of coastal mangrove forests is also important for social and environmental reasons. Local people in Hoanh Bo district have exploited natural resources in the coastal mangrove areas for many years and their livelihoods depend on the mangrove resources to a certain extent. The mangroves also play an important role in helping minimize the impacts of natural disasters. In recent years, rapid economic development along the coast has contributed to improving living standards of the population including poor people, but this development also causes major pressure on the coastal, marine environment and ecosystems.

4.3.1. Status of mangrove management in Hoanh Bo District

The total area of mangroves in Hoanh Bo district before 2006 covered over 800 ha. In recent years, due to the development of aquaculture and fisheries, urban development and industrial development, the area of coastal mangroves in Hoanh Bo district has seriously declined, and is now estimated at about 50% compared to 2006. Mangrove forest quality has reduced, with trees mainly young and small. Mangrove degradation has created ecological imbalance, with the habitats of many rare species being damaged,

leading to a reduction in biodiversity. Although plans are in place for mangrove replantation, these plans do not adequately take into account topographical characteristics and protection effectiveness is still low.

Resource management in the coastal regions has inadequacies that cause unnecessary losses of natural resources. The problem of potential conflicts between the interests of conservation and the development of coastal communities' livelihoods has not been resolved satisfactorily, resulting in difficulties in management and conservation. In the context of climate change, which is leading to an increase in the intensity of natural disasters and sea level rise, good protection and management of mangrove forests is becoming an increasingly urgent problem.

4.3.2. Recent efforts to rehabilitate and manage the mangroves

In recent years, community participation in the wise use, management and conservation of coastal resources has been given increasing attention by Government agencies and NGOs. The research team analysed the roles that different stakeholders play in managing mangroves in this area.

Significant successes have been achieved in the past through mangrove rehabilitation projects. Mangrove afforestation projects implemented in the past (e.g. by the Vietnam Red Cross 1994-2005) created jobs for some families in mangrove planting and protection. After replanting mangroves, many species of marine life including crabs and fish moved to live and feed in the mangrove areas, creating a significant increase in seafood products that local people could collect and sell.

Although no local research data and statistics exist for Thong Nhat specifically or the mangrove areas of Hoanh Bo district in general, through preliminary investigations, field surveys and direct interviews with the people who regularly collect seafood in the mangrove areas, it has been found that 1 to 2 years after planting mangroves on the mud flats, young snails, clams, sea-worms and baby crabs have appeared, the bottom soil has been enhanced, and in the surrounding areas a number of local native species have appeared even before mangroves were planted, such as seaworms and molluscs. From late July to early September, local people in these areas are now able to catch and gather more mangrove products.

Before 2003, Vietnam had no unique organization responsible for wetland management at the central level. Each ministry carried out wetland management in its own way and the Government assigned development and conservation tasks to ministries and local governments. The ministries in charge of this task are Ministry of Natural Resource and Environment (MONRE), and the Ministry of Agriculture and Rural Development (MARD). At the provincial and city level, mangroves management is assigned to provincial people's committees, the department of natural resource and environment, and the department of agriculture and rural development. At the commune level there are many community group engaged in mangrove management, from People's Committees and oyster farming associations to schools and bee-keeping associations.

4.3.3. Impacts of climate change and human activity on mangrove ecology

Six factors directly have been found to impact directly on the sensitive mangrove ecosystem in Vietnam: air temperature, rainfall, northeast monsoon, storms, flood-tides, and activities of humans. Most of these will be affected by climate change. There is also a link between climate change and mangrove forest ecology due to rising sea levels. Sea level rise and monsoons, storms, and flood-tides erode the shore, but

sea level rise will create favourable conditions for some mangrove trees by invading interior land and agricultural lands, especially in Quang Binh and in the South-West; thence forward it will influence the food output and biological diversity. A number of freshwater animal and botanical species will disappear and be replaced with brackish water species. Sea level rise will also hinder the depositing of alluvia to the tide-expanses and the natural regeneration of mangrove trees, such as Avicennia tree, vinegary cypress etc.

The adverse effects of human activities include destroying mangrove forests by damming them to grow rice and shrimp ponds that take over the area of the tidal marsh and prevent the movement of the tide. Humans also destroy the habitat and food source of tidal animals, change the water flow, and decrease its dispersal in tidal marshes and coastal areas. Using underground water to adjust the salt level in the large shrimp fishery areas, as well as using water for daily lives, and emitting waste water, can seriously degrade the underground water sources (Hong et al, 2007).

Group discussion identified six distinct groups of people who have an impact on the mangroves, as shown in Table 6:

Table 6. Stakeholders different impacts on the mangroves

No	Group	Positive impacts	Negative impacts
1	Mangroves protection and replantation Team	- Replant, protect mangroves - Dissemination of mangroves roles - Consult commune people committee	- None identified
2	Primitive collectors of seafood	- Barnacle catching harms mangroves - Inform guards about mangrove destructions - Warning the mangroves cutters	- Walk and step on small mangrove trees - Cut down mangroves for firewood
3	Those who collect seafood using tools (net, seine,...)	- None identified	- Destroy premature mangroves trees and forest - Reduce seed growth - Seafood over exploitation
4	Pond making, clam farming group	- Replant mangroves to protect the ponds edges	- Destroy mangrove forest (high water level inside the ponds harm mangrove trees) - Use chemicals that damage environment - Emit pollutants into water environment
5	Buffalo and cow raising group	- Inform people about mangroves protection - Provide fertilizers	- Destroy premature mangrove forest - Cattle damage mangrove trees
6	Social organizations and local authority	- Replant and protect mangrove forest - Raise awareness for community - Penalize violations - Invest and develop mangrove forest	- Promulgate unreasonable decisions causing mangroves lost

4.3.4. Local awareness about mangroves and climate change

In discussions with local people about the role of mangroves in responding to climate change, they expressed limited knowledge. But when talking about the role of mangrove forests related to the protection of dikes, anti-erosion, climate control and prevention from damage caused by natural disasters, most of them understand and affirm the role of mangroves is very important to dealing with climate change for example through the purification of air, ecological balance, and limiting the intrusion of sea

water. The existence of mangrove forests provides food security by protecting seafood species and their habitats, and they also provide protection against high winds and storms, ensuring shore marshes and ponds are safe and do not break due to water erosion, storm surges and high tides. People are willing to participate in mangrove reforestation and planting trees as safety measures.

Because of mangrove replantation in the past, local people have experience in techniques for choosing seedlings, planting, caring for and protecting the mangroves. They have learned useful lesson from previous failures when they have tried to plant and care for the newly growing mangroves in the communes. Besides good opportunities such as support from all organizations and institutions and existing laws and policies, related to environmental protection and protection of wetlands, local communities also have to face many difficulties. Among them, conflicts over land use for different purposes and lack of land budget for mangrove plantation seem to be difficult to solve. These can be solved if local authorities can harmonize those activities to reconcile the demands of each sector as well as to consider the importance of the mangrove for sustainable livelihoods as well as in response to climate change.

Results of the research related to local people’s capacity, threats and opportunities to optimise mangrove protection to support climate change adaptation and local livelihoods are summarised in Table 7:

Table 7: SWOT analysis on local people’s ability to protect mangroves to address climate change and support sustainable livelihoods

<p>Strengths</p> <ul style="list-style-type: none"> ➤ Human resources (a number of local people are involved in mangrove protection and development) ➤ Local knowledge and experience in mangrove plantation and protection ➤ Local understanding of mangroves’ role (Mangroves can be a rich source of natural resources and income; mangrove protect residential areas, dyke and production) ➤ Most people in the communities support mangrove protection and development 	<p>Weaknesses</p> <ul style="list-style-type: none"> ➤ Urbanization, new establishment of industrial zones, causing a narrowed mangrove area ➤ Lack of participation by local people in planning of areas for mangrove plantation ➤ It is difficult to take back the land used for other purpose ➤ Lack of budget for implementation ➤ Assignment of roles and responsibilities for protection is not clear
<p>Opportunities</p> <ul style="list-style-type: none"> ➤ Existing policies and laws on environmental protection and wetland protection ➤ Human resources are available and ready for action ➤ Support from GOs, NGOs and INGOs ➤ Good perception of locally people in mangrove role, protection and development 	<p>Threats</p> <ul style="list-style-type: none"> ➤ Expanding space expected to be used for socio-economic development ➤ Lack of stable land budget for mangrove plantation ➤ Impacts of climate change, including extreme weather and salt water intrusion ➤ Pollution caused by factories, mining industry ➤ Lack of permanent jobs and demand of alternative jobs/livelihoods

4.3.5. Participants suggestions on finding solutions

Community based management is one of today’s approaches and it has been successful in several places, for instance by the fishing community in Trang Province, Thailand, who have been successfully managing

local coastal resources (Charnsoh, 1998). During the group's discussion, the stakeholders proposed preliminarily mangroves protection and management solutions. They indicated 5 groups of solutions as follows:

- **Awareness raising and capacity building solution:** They would like training classes, dissemination of information about mangroves' usefulness, laws on mangrove forest protection, as well as the harmful effect of mangroves destruction, for community and local authorities. To implement these activities, they propose receiving part of the expenditure and documents with a contribution ratio of 70% from National budget and 30% to be self-funded.
- **Establishment of protection team solution:** Based on current protection team, they would like to receive government support to improve their activities and make them more professional, for instance increasing salaries, providing tools, and promulgating regulations to further empower the protection team. In terms of expenditure for this solution, local people can contribute between 20% and 30%, and the rest would need to be provided by the state.
- **Jobs creation solution:** Nowadays, local people's only other source of food and income besides the mangroves is from raising livestock, therefore they have to exploit seafood in the mangrove forest to sustain their livelihoods. Some local people use destructive tools such as small-eye nets, mines or electricity. This means that people are very keen to see jobs being created. Job creation can be supported through career training, capital investment and support for accessing the market and selling products. This solution can be implemented by both the State and citizens .
- **The local authorities need to be more responsible:** for collaborating with unions and organizations to protect mangrove forest together. Furthermore, local authorities have to penalize behaviours that causes destruction of the mangroves.
- **Planning solution:** The district government need to have a clear scheme to regulate which places should be used for mangroves replantation, which for seafood farming, and which for natural seafood exploitation. Once such a scheme is established, local governments must announce and disseminate it to local people.

Thong Nhat commune in Hoanh Bo district has favorable natural conditions for economic development. A very important factor here is whether people consider it to be in their economic interests to protect forest resources or not. If it is seen as in the interests of the people to support conservation measures, they will be more likely to do so actively.

4.4. VALUE CHAINS

4.4.1. Key Agricultural Products in the Three Surveyed Communes

For Ky Thuong and Dong Son, commodity production is very limited. Local people are mainly subsistence farmers, with agricultural production being small scale and quite segmented.

Due to its proximity to the city, Thong Nhat is relatively better off than Ky Thuong and Dong Son. Farmers in this commune focus more on production that can satisfy market demands rather than just for

their own consumption. Although their agricultural production is also fragmented, the products they produce for sale are quite diverse. Money earned from selling these products has a direct role in improving their living conditions, enabling them to renovate their houses, to buy household equipment such as televisions and motorbikes, and to expand their agricultural production.

The main cash products of the farmers in Ky Thuong and Dong Song are forest products such as acacia trees, cinnamon bark, and resin of canari trees. Buffaloes and cattle are also important, with pigs and poultry providing additional cash income. In Thong Nhat, by contrast, the main products grown for income are high value agricultural products such as flowers and vegetables, in addition to acacia trees and pigs. Local people in Thong Nhat also gather seafood like oysters, arca, shrimp and crab from the coastal mangrove areas.

Table 8: Main agricultural cash products of the three communes

Rank	Ky Thuong	Dong Son	Thong Nhat
1	Buffaloes and cattle	Acacia trees	Flowers (lily)
2	Acacia trees	Cinnamon bark	Acacia trees
3	Pig	Resin of canari trees	Vegetable
4	Poultry	Pig	Pig
5			Sea food

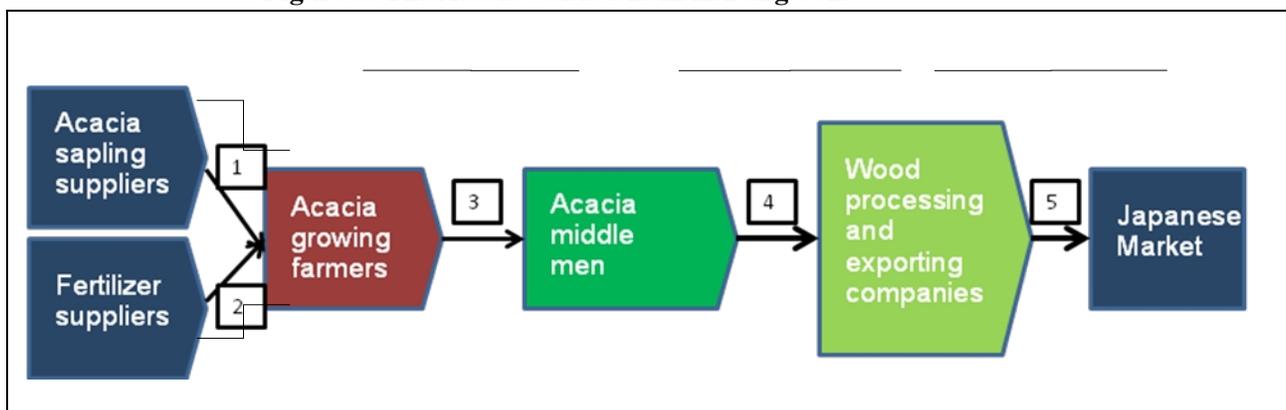
Source: PRA exercise 2010 – Ranking tool

After detailed analysis of the methods of production and potential returns from selling these different products, the research team concluded the most important agricultural products for local farmers are acacia trees (Ky Thuong, Dong Son and Thong Nhat), cattle & buffalo (Ky Thuong), and lily flower (Thong Nhat). A study into the value chain for one of these products was conducted in each of the three communes.

4.4.2. Value Chain Analysis of Acacia: A Case Study of Dong Son

Production farmers are the first actors in the acacia value chain. They buy saplings from farmers in Son Duong commune who cultivate acacia plantlets, and buy fertilizer from private input material stores in Troi. After 5 to 7 years of planting, their acacia trees are ready for logging. The farmers sell their trees for acacia middle men who cut down the trees and then sell acacia wood to several preliminary processing and exporting companies in Cai Lan¹. The companies export wood powder to the Japanese market.

Figure 3: The Acacia Value Chain in Dong Son



¹ The companies buy acacia wood and just grind/mince wood to dust.

Legend:

—	: Flows of goods	—	: Flows of information
[1]	: Acacia varieties	[2]	: Fertilizer
[3]	: Acacia trees	[4]	: Acacia woods
[5]	: Acacia wood powder		

Advantages for farmers

Among several perennial plant options for this area including cinnamon and canari, acacia production seems the most suitable for farmers who lack financial assets for investment, and have limited cultivation techniques and market information. In fact, acacia is called the “poverty reduction tree” in this district.

- The first ‘pro-poor’ characteristic of acacia cultivation is that it **requires low financial investment and labour**. For one hectare, less than 1 million VND is needed to buy saplings and fertilizers (fertilizers are often not needed due to the richness of the local soil) and a maximum total of 65 working days of labour are required during the growing period. At the beginning, 5-6 laborers are required to undertake planting for 3-4 days. In the second year, it takes 4-5 laborers working in 5-6 days for weeding. In the third year, it needs additional 10 working days for branch clearance.
- Secondly, **acacia trees grow fast**, with only 5-6 years to wait between planting and logging.
- Thirdly, **selling acacia is relatively easy**. When acacia trees are ready for logging and the farmer needs money, he simply needs to inform the acacia middle men.

Disadvantages for farmers

However, due to limited capacity and their remote locations, farmers have several disadvantages as compared to other actors in the acacia value chain:

- Local farmers have limited capacity to calculate a fair price for their acacia plot. Their estimation is based on the number of saplings originally planted, the number of years the wood has grown for, and the most recent price their neighbours have sold their trees for. The middlemen tend to be self-motivated and well-informed, with good economic **analytical skills** and the confidence to take risks, whereas farmers do not have good skills at market analysis or the confidence to maximise their profits other than by reducing input costs.
- There is an **information asymmetry** between the middlemen and the production farmers. Whereas the middlemen have good access to information about the acacia wood market such as demand from wood processing and exporting companies and current prices, local farmers only know the local acacia market and they are forced to accept the price set by the middlemen.
- Moreover, **transport costs** are high. The fee for one truck to carry timber from the commune to the company is 1.5 million VND. For 1 hectare of acacia tree, 10-14 trips are needed.
- **Support services** in the value chain of acacia in Dong Son also mainly serve the middlemen. The most developed services are logging and transportation services, which production farmers do not use

because the fee is high. If they could pay for logging service and transportation service, they would sell their product to the wood processing and exporting companies and get more money.

- Middlemen also have more initial **financial capital** to invest. While farmers can get 10–15 million VND from 1 ha of acacia once every 5-6 years, the middlemen can earn 5–10 million VND by buying 1 hectare of acacia wood from the farmers. The middlemen have to invest more (2-3 million VND for logging service and an additional 10-15 million VND for transport) but overall their profits are much greater.
- **Social networking** is an important skill to benefit from the value of acacia. and good capacity and opportunity to make social networks. The middle men also provide transport services for the farmers for acacia saplings and fertilizers, which gives the middlemen further power in their economic relationships with farmers.
- The research team found that there is little **collective action** on selling acacia trees among the local farmers. Farmers make the decision to sell their acacia individually, and often this is when they badly need cash. Farmers do not have common agreements on prices for acacia. Clearly, the negotiating power of individual producers is extremely limited.
- There are many more sellers than middlemen, which means there is limited **competition** between them, so the middlemen can easily protect their profit.

Needs of acacia farmers related to accessing benefits from the value chain

1. Skills in market analysis and negotiation

Farmers have limited economic knowledge and mathematical skills which means they do not have the ability to analyze market and price information. More importantly, they do not have the ability to calculate the quantity of their acacia trees. Enhancing the farmers' opportunities to access full information of acacia market and developing their ability to analyze the obtained information will give them more power to negotiate prices with the middlemen.

2. Knowledge and techniques in acacia planting

The farmers are the ones who play very important roles in the value chain but they are the disadvantaged ones. Their knowledge and techniques of planting acacia is very simple. They do not have sufficient knowledge and modern techniques of cultivating acacia saplings. It is therefore important to offer them access to improved techniques of cultivating acacia saplings. This will reduce their cost of production.

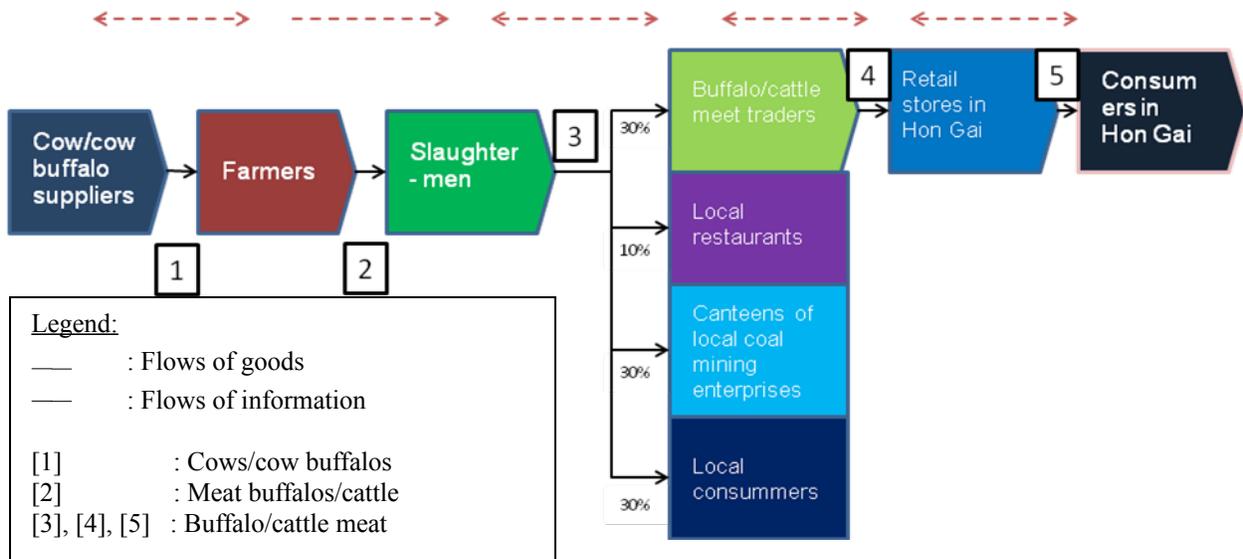
3. Support services

Regarding support services, the most important need is transport. For now, the middlemen control this service and their transport fees are quite high. The farmers have no other option. If the transport services could work independently from the middlemen, the farmers would have the option to sell their acacia wood directly to the companies.

4.4.3. Value Chain Analysis of Buffalo & Cattle: A Case Study of Ky Thuong

The flow of buffalo & cattle products is represented in figure 4. Farmers in Ky Thuong often buy female buffalo and cattle from farmers in Lang Son province or from local farmers who raise them. Normally, farmers keep their herd growing like savings, and only sell if they have slow developing cattle or they really need a large amount of money such as for building new houses, paying loans, or to fund weddings or funerals. They sell to local private slaughter-men who sell to local consumers, local restaurants, canteens of local coal-mining enterprises, and local traders who then delivers meat to the Hong Gai retailer outlets.

Figure 4: The Value Chain of Buffalo/Cattle Products in Ky Thuong



Advantages of buffalo and cattle farmers

Farmers can gain a relatively high benefit from cattle production. For example, if a farmer invests 12-15 million VND to buy a female buffalo, and releases it into natural forest, he gets a herd of two mature buffalos including the original one and 1 or 2 buffalo calves, after 4-6 years. The price of the new mature one is about 7-10 million VND, and the buffalo calf's value is 5-7 million VND. This means after 4-6 years his asset has more or less doubled in value, if the available grazing area remains and animal disease has not occurred.

The most important advantage of the local producers is the low production cost of cattle and buffaloes.

- A program of subsidized credit provided under Program 135, a government poverty reduction program, charges farmers a very low interest rate of 0.65%² per month, enabling them to buy cows and buffalo to start their herd.
- The available natural resources for grazing reduces farmers' production costs to zero.

Social relationships also play an important role in allowing farmers to access benefits from cattle. The slaughter-men maintain a good relationship with the farmers in order to have a deal in the future.

Disadvantages of buffalo and cattle farmers

However buffalo and cattle farmers face a number of challenges, similar to the difficulties faced by acacia farmers in accessing benefits from their products.

- Farmers currently raise buffalos/cattle in order to accumulate their livestock asset rather than to sell their product to the market. They lack advanced **techniques and technology**. They still raise their buffaloes and cattle in a traditional way, relying on natural grazing resources to feed their animals. If access to natural forest is restricted, their production will face difficulties.
- Farmers do not have sufficient **information about marketing** their buffaloes and cattle. Most of the information they have is brought to them by the slaughter-men, even related to the market price. In other words, there is an information asymmetry between farmers and slaughter-men. In this situation, the slaughter men have more power over the farmers in terms of price setting. However, when there is a shortage of supply, it keeps the power balance between the two actors as less unequal.
- Farmers also do not have enough **knowledge to calculate the value** of their livestock. They measure the weight of their buffaloes and cattle by visual appraisal and estimate its value based on the prices their neighbours recently achieved.
- Coordination between production farmers and the slaughter-men is very weak. There is **no written contract** or commitment between the actors. While slaughter-men are always able to ensure that their supply meet their customers' demand, farmers are not able to ensure a consistent and predictable flow of products to the slaughter-men.
- There are only few slaughter-men, so limited **competition** in terms of prices, and yet the demand is high. In the current set up of the livestock industry, the price is set by the market.

² The commercial interest rate is often higher than 1% per month.

- There is a lack of **support services** like veterinary service and insurance service.

Needs of buffalo and cattle farmers

1. Market analysis and negotiation skills

- Enhancing the farmers' knowledge of the market economy will help change their production patterns from self-supply to market-oriented supply.

2. Improved farming techniques

- Giving farmers access to more advanced techniques of cattle growing will help them adjust their production patterns to cope when available forest grazing areas are reduced.

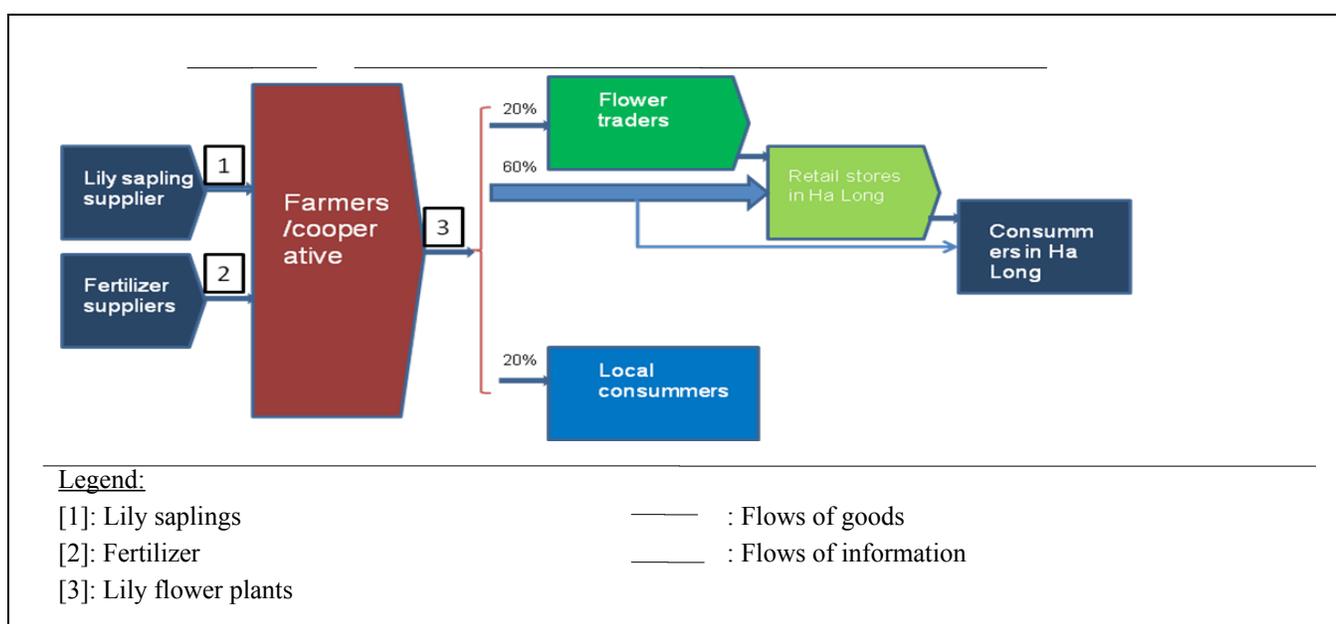
3. Support services

- Regarding support services, the most important one is veterinary service. Both human resources and medical supplies are required.
- Support for the setting up of community-based insurance services should be considered.

4.4.4. Value Chain Analysis of Lily Flower: A Case study of Thong Nhat

As we can see in figure 5, the flows of products begin with the input material suppliers and ends at the consumers living in Thong Nhat commune and Ha Long city. Among the seven key actors in the value chain, we focus primarily on the farmers, who sell lily flowers to three different actors: local consumers; lily flower traders; and private flower retail outlets. On average, a farmer gains a net income of 50 million VND per Sao (equal to 360 m²). The cost of input materials is more than 80 million VND per Sao while the total revenue is about 130 million VND. Besides the cash cost, one person's labour per Sao is required during the three cultivation months.

Figure 5: The Value Chain of Lily Flower in Thong Nhat



Advantages of lily farmers

In Cho village, local farmers have a organised into a **production cooperative** since 2009. There are 25 farmer households in the cooperative that covers 12 hectares. A netted cage, cool store, and drainage system have been constructed with promised financial assistance of 3 billion VND from the district's Department of Agriculture and Rural Development.

Form farmers, **information flows** quite well along the value chain. Unlike acacia and cattle farmers, the farmers are located not far from consumers, and actively search for information about market demand. As a result, they often have updated market information. However, they have more limited access to information on the supply side.

Disadvantages of lily farmers

At this early stage, many cooperative members **lack skills, experience and techniques** of lily flower production. Of 25 households, 10 households were found to have no knowledge, techniques and even experiences in flower production.

Farmers sell their flower plants through a “purchase and sale agreement”. The payment vehicle is cash on delivery. This means there is **no contract or commitment** between the farmers and its customers.

Producing lily flowers is a **high risk** business. One source of risks comes from the **supply** side. In order to have lily seedlings, the farmers have to order and pay their seedling suppliers around 4-5 months in advance. However, the date of delivery and the quality of the plants is not guaranteed. The sapling supplier use administrative regulations to dominate the lily producers, setting the price and payment method, which means all the risks are taken by the farmers.

The second risk comes from both the **market** and the **weather**. Farmers only have 5 days to sell all their flowers. That is because consumers only buy them during the Tet holiday³. During this time price lily flower ranges between 25000 VND and 30000 VND per plant⁴. If farmers cannot sell all of their flowers during this time, they will incur losses since the price falls to 10000 VND to 15000 VND per plant⁵. Their losses are worse if the harvesting time fails to meet the market time. When the climate changes, farmers have difficulty in determining their crop calendar.

Needs of lily farmers

Local farmers have some experience and techniques in flower production, but their knowledge is not enough to allow production is going to expand in scale. They have not participated in any business management training for example, and their knowledge of the flower market is limited to Ha Long city, which is a small market.

In order to expand production, and improve the sustainability of their income from flower growing, farmers need:

³ Tet holiday is the Vietnamese traditional New Year holiday.

⁴ During the market time, the price is 9000 VND to 14000 VND higher than the price of a sapling, which is 16000 VND per one.

⁵ Out of the market time the price is 1000 VND to 6000 VND lower than the price of a sapling.

- upgraded skills and production techniques
- training courses in marketing and management

4.5. IRRIGATION, WATER AND SANITATION

Irrigation, clean water and sanitation are crucial factors in ensuring the food security, health and ability to generate income for poor rural communities. Availability of clean water is particularly threatened by the impacts of climate change, including rising temperatures, droughts, and natural disasters that can damage infrastructure and sanitation systems. Besides the health impacts, if local people are obliged to travel far to access clean water, it reduces their capacity to undertake other livelihoods activities, and can even cause conflicts between households.

4.5.1. Irrigation systems

There are 13 reservoirs and 31 dams in Hoanh Bo district which are all managed by Irrigation Management Company (IMC). The gross design irrigation capacity is 1,976 ha, but in fact, only 1,155 ha of Winter-Spring season crop is irrigated, i.e., 58% of the design capacity, plus, 1,359 ha of Summer crop season, i.e., 68% design capacity.⁶

In the study area, there are three dams managed by IMC of which the actual capacity is 70% of the designed capacity. In those schemes, headworks are normally managed by IMC and the canal systems are managed by agricultural cooperatives. In addition, there are 8 small dams managed by communes which have been generally deteriorating and the earth or PVC piped canals have been frequently broken (see details in table 2).

In the two mountainous communes, Ky Thuong and Dong Son, as topographical conditions are complicated and frequently affected with floods, the canal systems have been degraded, broken down and eroded in every rainy season. Therefore, many canal sections have been replaced with steel pipes to maintain water conveyance.

In addition to the existing works that have deteriorated and been failing to irrigate the required areas, there is quite a large area in the Dong Cut area of Khe Tre hamlet (4ha) in Ky Thuong commune, and Khe Rieng of Tan Oc 1 hamlet in Dong Son commune where no irrigation works are constructed.

Water fees have been subsidised since 2008, however the communes in the study area have never received any permanent funding for operation and management. There is no contract between water using cooperatives or the IMC with farmers to get budget from Government because most of the hydraulic works here are managed by the commune which has no water using cooperative. Therefore hydraulic works usually degrade very quickly. When these systems have problems, people in the hamlets work together to repair them or wait for the district budget. Capital sources of the national and provincial governments do not reach small irrigation projects at the commune level.

Due to water resource depletion, there are conflicts between water users, for example, conflicts between 3 hamlets using water from Dong Vai weir (Dong cao, Cho and Dat Do) usually happen in the dry season.

⁶ List of existing hydraulic works of Hoanh Bo District.

In these hamlets, the irrigation calendar is applied and somebody is appointed to stand at the intake to monitor and prevent illegal water taking.

Available data and community consultations in association with field trips showed that irrigation issues in the study area were: water resources been depleting day by day; most of irrigation works were of small scale, temporary status and vulnerable to weather impacts; in some places, there was no irrigation works, in other places, there were some, but O&M was poor, hence, works have quickly deteriorated.

4.5.2. Water supply

In Hoanh Bo district, only Troi town is supplied with water from Dong Ho water plant of Bai Chay Water Supply Enterprise. Low mountainous and delta communes, except for some hamlets where centralized water supply works are built with raw filtered basin, mainly use well water and rainwater. In general, hamlets in the mountainous communes use raw and untreated water that is exploited in streams and rivers. By 2009, 60% of rural households had access to hygienic water, of which 34.5% rural households used well water, 22% used rainwater, and the rest used water conveyed by gravity from small streams and rivers.

According to statistical data available (table 9), although the ratio of the population who use clean water in the district as a whole was high, in the two mountainous communes, the ratio was very low. In Thong Nhat coastal commune, up to 71.1% of the population use clean water, which is a considerably higher figure.

Table 9. Existing water supply situation in study area

No	Commune	Household	Rural population (person)	Clean water using (person)	Percentage of people using clean water (%)
1	Ky Thuong	145	662	10	1,51
3	Dong Son	493	2539	549	21,62
2	Thong Nhat	2112	9331	6634	71,10

Source: Water supply and sanitation planning of Hoanh Bo to 2020

Despite those statistical data, during the field trips and consultation meetings, the study group observed that in most areas of Ky Thuong and Dong Son, farmers usually get water from streams using soft plastic pipes or pumping water from rivers without any treatment measures. Water supply systems often break down and are frequently polluted due to free cattle grazing. In Ky Thuong commune, there is not even a central water supply works for the CPC office, the local school, pharmacist or post office. In Ky Thuong and Dong Son, although systems are temporary, farmers do not have to go far to get water, and although it was not within the scope of this study to conduct chemical tests on the water, it appears that the quality is good. However, farmers there are too poor to build fences to protect their water resources, or to build permanent pipelines and reservoirs.

In Thong Nhat commune, although the proportion of people with access to clean water is high, water shortages and poor water quality are critical. Water is supplied to households from deep wells, some drilling wells or rain water containers and water shortages last for about 5 months in the dry season. Pipes are damaged and dysfunctional and water from deep wells is sub-standard due to high calcium content and pollution from animal waste. 70-80% of households have built rain collection containers, however,

rainwater tank capacity is sufficient for only 1-2 months, and in the dry months, farmers have to go a long way to bathe and wash, or they transport water from 2-3 km away.

Public awareness about water use, hygiene and the environment is poor.

4.5.3. Sanitation

Throughout Hoanh Bo district, cattle and poultry grazing customs are common in mountainous communes, with only 48% of households reaching hygienic breeding standards. People are not fully aware about hygienic latrines in mountainous communes, with only 53.3% of households having them. In Troi town, an organization provides collection, transportation and treatment of domestic waste on a daily basis to some communes near the centre of the commune, but other more remote communes have no such services.

According to the district's statistical data (table 10), environmental sanitation in Ky Thuong and Dong Son is very poor: only about a third of households have hygienic latrines and less than a quarter have hygienic cages, less than 5% in Dong Son. Where they exist, they are the outcomes of programs and projects financed by the government in recent years. In general, in Ky Thuong and Dong Son, toilets are usually pit toilets in the garden or on the mountain, while breeding facilities do not have solid floors, they have temporary bamboo wattle and no materials to insulate against the cold. Sewage from breeding facilities and latrines usually runs across the land, and harbours flies and mosquitoes. Even in Tan Oc 1 which is very near the commune centre, where percentage of households with hygienic latrines is quite high (80%) and about 10% households have lined breeding facilities, waste water from latrines and cages is overflowing as there is no appropriate dung storage and water drainage system.

Table 10. Existing sanitation situation in study area

No	Commune	Household	Hygienic Latrine (one)	Households using hygienic latrine (%)	Hygienic Breeding facility (one)	Households using hygienic breeding facility (%)
1	Ky Thuong	145	53	36.6	31	21.4
3	Dong Son	493	179	36.3	24	4.9
2	Thong Nhat	2,112	1,329	62.9	1,819	86.1

Source: Water supply and sanitation planning of Hoanh Bo to 2020

In Thong Nhat commune, the number of households with hygienic latrines and cages is high in comparison with the district. However, this does not mean that environmental sanitation in this area is better than the two mountainous communes. Although latrines and cages are built, waste water is overflowing from storage and drainage systems, polluting water and the environment. The District People's Committee has been supporting a programme to build latrines in 1-2 households at a time in each hamlet costing 1 mill VND per household.

Due to low population density in Ky Thuong and Dong Son, although there is no collection and treating of garbage, the environmental conditions are quite.

At Thong Nhat commune, there is a sanitation company, but it only has a service contract to collect garbage from the two cement plants. At present, every week the Women’s Association collects garbage from two markets and the commune centre funded by the commune budget to a garbage tank 3km from the commune centre, but the road to the garbage tank goes through a stream so it is difficult to access during floods.

4.5.4. How to prioritise these issues

To tackle these issues of clean water, irrigation and pollution, these areas are in need of human resources, financial resources and institutional support mechanisms to help local communities improve their food security and health. In the context of climate change, these water resources are under increasing pressure.

Given that this project cannot address all the problems, and time did not permit the study team to visit every part of the study areas, we worked with the stakeholders to identify the most critical issues and the most disadvantaged areas, in order to decide which to focus on. The results are summarized in table 11.

Table 11. Prioritisation of issues

Issues	Priority		
	Ky Thuong	Dong Son	Thong Nhat
Pollution from latrines and breeding facilities	3	1	2
Lack of water for irrigation	2	3	4
Lack of clean water supply	1	2	1
Pollution from household garbage	-	-	3

5. CONCLUSION

This study has found the impacts of climate change to present a serious risk to the sustainability of local livelihoods and the success of poverty reduction efforts in all three of the communes selected for this study, both in the remote highland areas and the coastal lowland areas. The changes in terms of temperature, precipitation, extreme weather events, water availability and salt water intrusion already being reported by the consulted stakeholders aligns closely with the range of changes predicted by the science.

Local people identified direct and indirect impacts in economic, social and environmental terms, and their linked nature. The most serious results of these impacts for farmers include diminishing soil fertility, loss of arable land, falling agricultural productivity, and increased risk of losing assets to natural disasters. Diseases in crops and animals are becoming more prevalent, and changes of climate as well as reduction of water quality are exacerbating health problems, with a number of instances of new diseases being identified.

Various adaptation measures are being adopted by local people already, including changing their planting and harvesting times and converting to new crops, and a key strength they possess is their knowledge of local terrain and conditions and familiarity with indigenous crop varieties. But the challenge of climate change is that it is bringing changes that are unfamiliar and unpredictable, and traditional approaches may not be enough.

The range of adverse impacts of climate change can be mutually reinforcing, resulting in a vicious circle in which the vulnerability of the poor increases. An appropriate response strategy must therefore take a 'big picture' approach, and seek solutions that address social, environmental and economic challenges together. One way to build farmers' resilience that was identified by this study is to support them to diversify their income sources and maximising their opportunities to sell their agricultural products on the market and receive a fair price.

Despite receiving support from external sources including local government, non-government organisations neighbours and relatives, and other organisations, vulnerable people and their families still face many challenges. A range of approaches is recommended, not only providing financial support and transferring new skills to local people, but also building the capacity of local authorities to support their communities to adapt to climate change. Adaptability requires long term resilience and the flexibility to change in response to unexpected new conditions, all of which are much more difficult for households living in poverty. A key to the success of all the recommendation below will be empowering local people to understand, lead and work together to address these changes and maintain sustainable livelihoods into the future.

6. RECOMMENDATIONS & INTERVENTION ACTIVITIES

The five different research teams made the following key recommendations of how to support local communities to build sustainable livelihoods in the face of climate change. Many of these will be mutually supportive and be more successful if implemented in combination. The range of initial responses selected will depend on the resources available and should be developed with maximum involvement and ownership by the local people who are the intended beneficiaries, to ensure that the results are sustainable in the long term and that lessons can be shared with neighbouring communes and other districts and provinces.

6.1. CLIMATE CHANGE

Roll out a capacity building program:

- Giving training courses to local people and local authorities about climate change, its possible impacts in the near future, and mitigation and adaptation measures;
- Giving training courses to local people in management skills, record-keeping skills, sharing experience and information to adapt to climate change;
- Giving technical training courses for building model projects that assist adaptation to local conditions at the household level;

Provide useful materials and equipment that can prevent soil erosion and landslides such as:

- construction of metal reinforcements on sloping hills to;
- saplings and equipment for planting trees

Support the development of pilot programs for building the resilience of local communities, so that lessons can be learned and shared more widely, e.g.:

- A communication systems in selected villages to record, predict and disseminate information about extreme weather events, natural disasters and how to prepare and recover from them;
- Adaptation measures are appropriate to local agricultural and forestry practices and terrain, including: forest cultivation and protection; transition to drought-resistant crops
- Support a funding source to build a microfinance loan system that provides longer-term loans and low interest rates in order to benefit more people.

6.2. LAND

In the mountainous areas, introduce new crop varieties and techniques:

- Introduce drought-resistant crops for areas affected by water and food shortages.
- Introduce aerobic rice with high yield following tests in mountainous areas by the Agricultural Institute.
- Apply new technology to for maintaining crop moisture such as mulching techniques.
- Plant legumes to improve soil nutrition.

Provide training and capacity building on:

- Production and management of sustainable agriculture and forestry in order to help people improve their productivity, as well as environmental and human health.
- The negative environmental, agricultural and health impacts of over-using chemical fertilizers, pesticides and herbicides.

Help to develop new higher-value crop and livestock varieties in upland areas

- E.g. wild pig and bee. These are animals or plants that are suitable for the local climate and bring high economic efficiency, as well as helping to increase biodiversity and the sustainability of the ecological environment.

In coastal areas nearer the district centre

- Make a plan to rehabilitate and protect the mangrove forests.
- Support local authorities and inhabitants to make a plans to avoid the negative effects of urbanization on the environment of mangroves, that includes monitoring measures.
- Improve intensive farming of high value products (such as flowers and vegetables) to produce goods to provide for downtown consumers.
- Improve market channels of farm output to help people restructure and plant new crops.
- Adjust the compensation policy of taking agricultural land and converting it into industrial or residential land, by providing ongoing grants of 5 years to households who lose land to help them stabilize and change their livelihoods.

6.3. MANGROVES

Empower local people to participate in decisions about how to manage the resources, how to monitor them and how to negotiate different and shared interests:

- Promote more effective protection of mangrove forest area by empowering local people to have ownership and supervision rights over these resources, for example by learning from community-based management schemes for mangroves that have been implemented successfully elsewhere in Vietnam.
- Raise awareness about the value and role of the mangroves, emphasizing the role of mangroves in supporting biodiversity and resilience to climate change.
- Support local communities to participate in consultations, planning and decision-making with local authorities about how to protect, manage and sustainably use natural resources in local mangroves, and to participate in organizing and implementing activities
- Support local communities to participate in monitoring compliance with the agreement of co-management and sustainability in the use of mangrove resources.

Implement new measures to rehabilitate degraded areas and protect the remaining mangroves.

- Focus on native plant species, location, planting season, technology, and natural regeneration of mangroves in some areas.

Support the continued development of consistent government regulations on the protection of mangroves and sustainable use of natural resources

- Work with agencies like MOST, MARD, District People's Committee, commune to support them to develop, promulgate and enforce regulations about mangroves protection.
- Improve policies and decision-making regarding land allocation, ensuring that local people have a voice.
- Support development of regulations in the sustainable use of natural resources (areas to be exploited, areas where use is limited etc) should be developed.

6.4. VALUE CHAIN / MARKET ASSESSMENT

In Ky Thuong and Dong Son communes, priority support should be given to acacia value chains:

- Transportation vehicles and fuels should be subsidized to the local farmers. This support will create alternative transportation services, which can compete with the existing services dominated by the middle men. Accordingly, it will allow the farmers to choose between selling their products to the middle men or directly to the companies.
- Local farmers should organize themselves into groups to give each other mutual support with their sales activities. Village heads could play a key role in organizing the local farmers. By doing this the local farmer can exchange selling price information. This improved cohesion will give them more power to negotiate with the middle men.
- It is very important that farmers have access to detailed, up-to-date market information, especially price information. In order to achieve this, an information centre should be set up. Village head could be the person in charge and he will be paid for this extra responsibly.

Additionally, in Ky Thuong commune, the following interventions are required to upgrade the buffalo/cattle value chain:

- Advocating for a policy which would allow farmers to retain access to natural grazing areas is very important. If the natural grazing area is restricted, the production of the farmers will be reduced or even stop completely.
- Providing veterinary service and production technology is necessary. In each village, it is essential to give veterinary services, and updates on different diseases through the district extension office and at the same time gives consultation on the technological advancements of livestock production. This person should be paid monthly and be offered updated technical training. These services play an important role in avoiding risks for the farmers.
- Promoting a community insurance mechanism that would be availed by all farmers. This would help the farmers to protect their production against risk and losses.

- In Thong Nhat commune, in order to improve the lily flower value chain the necessary interventions include:
- Providing information about small plant suppliers would open opportunities for the farmers to access better supply services and better quality of small plants.
- A cooperative of farmers has been established. Enhancing the business management capacity of the cooperative management board is essential. The cooperative managers should be offered several training courses relating to farm management, and basic marketing. This will help farmers reduce production costs and better promote their products.
- Investing in production facilities is recommended, especially the drainage system and the cool house. Since there is an ongoing project financing these facilities, further support of managing these facilities would be useful.

Conduct further research on these three value chains is suggested to gather the missing information due to the geographical and time constraints of the research.

6.5. IRRIGATION, WATER, SANITATION

In Ky Thuong:

- Continue lining Khe Trè canal, build Đồng Cút weir, replace Khe O pipe.
- Build water supply system for CPC house, sub- school, dispensary; about 4 water containers (5-6 household/ group), support plastic tanks, household water containers...
- Build sanitary two-compartment latrines; line foundations of breeding facilities and pigsties, insulate them against the cold and build cesspools.

In Dong Son:

- Continue lining Khe Trạng canal, replace Khe Này pipe; repair Khe O ngoài canal.
- Build a water supply system (from 4km) for 2 hamlets (about 6 household groups), supplement water to CPC, houses and school and support the building of household plastic tanks
- Build sanitary two-compartment latrines; line foundations of breeding facilities and pigsties, insulate them against the cold and build cesspools.

In Thong Nhat:

- Line and repair Đồng Vải canal to Đồng Cao hamlet, to finish drainage system for flower and vegetable cultivation of Cho hamlet.
- Finish water supply systems from Đá Trắng plant to 2 hamlets, support rain water containers, drilling wells.
- Build sanitary two-compartment latrine; line foundations of breeding facilities and pigsties, insulate them against the cold and build biogas cesspools and waste water drainage system.
- Support establishment of garbage collecting teams or companies, garbage tank building and treating.

In all three communes:

- Establish water using cooperatives, build mechanism to ask cost for irrigation and water supply work O&M.
- Distribute information to improve public awareness in water use and environmental protection.
- Change crop patterns according to water resource availability.
- Support establishment of garbage collecting teams in Thống Nhất commune
- Capacity building for hydraulic work, water supply and sanitation staff at commune and hamlet level.

7. REFERENCES:

ADB (2005). Making Markets Work Better for the Poor: The Participation of the Poor in Agricultural Value Chains - A Case Study of Cassava. Hanoi, Economic and Social Research Center, National Economics University, Informatics Center for Agricultural and Rural Development (ICARD), and Agrifood Consulting International (ACI) for the Making Markets Work Better for the Poor Project, Asian Development Bank.

ADB (2006) Facilitating market integration of the upland poor into bamboo value chains: Upgrading strategies for local producer groups. ADB M4P Discussion Paper No 15.

ADB (2007) Making Markets Work Better for the Poor Project (M4P/ADB). Making Value Chains Work Better for the Poor : A toolbox for practitioners of Value Chain Analysis.

ADGER, W. N. (1999). Social Vulnerability to Climate Change and Extremes in Coastal Vietnam. World Development Vol. 27, No. 2, pp. 249-269.

Asian Disaster Preparedness Center (ADPC). (2003). Climate Change and development in Vietnam: Agriculture and Adaptation for the Mekong Delta Region. GTZ report. Division 44 - Environment and Infrastructure.

Carney, D. 1998. Sustainable Rural Livelihoods: What Contribution Can We Make? Nottingham: Department for International Development, Russell Press Ltd.

Chaudhry, P; Ruyschaert, G. (2007). Climate change and human development in Vietnam: A case study. Human development report 2007/2008. UNDP.

Dasgupta, S., Laplante, B., Meisner C., Wheller, D., Yan, J. (2007). The Impact of Sea Level Rise on Developing Countries: A Comparative Analysis. World Bank. http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/2007/02/09/000016406_20070209161430/Rendered/PDF/wps4136.pdf

Dong Son Communes (2010). Commune People Committee Annual Report

Doppler (2008): Farming system analysis in the tropics and subtropics – lecture handout at Thainguyen university of Economics and Business administration in 2008

General land management office (2010): Climate change and sustainability land resource use: Do not create “dead lands” http://www.gdla.gov.vn/index.php?option=com_content&task=view&id=598

General Statistics Office of Vietnam (GSO) (2010): Statistical data – http://www.gso.gov.vn/default_en.aspx?tabid=491

Phan Nguyen Hong, Vu Thuc Hien, Le Xuan Tuan, Nguyen Huu Tho, Vu Doan Thai, 2007. The mangroves' role in protecting coastal areas. In: Phan Nguyen Hong, Le Xuan, Vu Thuc Hien (chief editor) The roles of mangroves and corals ecosystems in reducing natural disaster and improving coastal lives. Agricultural Publishing House, 2007: 57-70.

Hoanh Bo District (2010): Reports on agriculture and rural development

Hoanh Bo district (2010). Water supply and sanitation plan to 2020

IFAD, M4P, et al. (2007). Truc Bamboo Value Chain Study, Cao Bang Province, Vietnam. Hanoi, Vietnam, International Fund for Agricultural Development (IFAD), Making Markets Work Better for the Poor (M4P) Project and Center for Agrarian Systems Research and Development (CASRAD).

IFAD, M4P, et al. (2007). Sugar Value Chain Study, Cao Bang Province, Vietnam. Hanoi, Vietnam, International Fund for Agricultural Development (IFAD), Making Markets Work Better for the Poor (M4P) Project and Center for Agrarian Systems Research and Development (CASRAD).

Intergovernmental Panel on Climate Change (IPCC, 2001), Climate Change 2001: Impacts, Adaptation and Vulnerability, Contribution of Working Group III (WGIII) to the Third Assessment Report (AR3) of the Intergovernmental Panel on Climate Change

Intergovernmental Panel on Climate Change (IPCC, 2007), Climate Change 2007: The Physical Science Basis, Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Solomon, S., D. Qin, M. Manning, Z. Chen, M. GSO (2009) Statistical handbook 2009.

John A. C, Neil J, W, John R H, and Kurt L. (2008). BRIEFING: a post-IPCC AR4 update on sea level rise. Antarctic Climate & Ecosystems Cooperative Research Centre (ACECRC).

Ky Thuong (2010). Commune People Committee Annual Report

Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.), Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA

C. McSweeney, M. New and G. Lizcano. (Undated). Vietnam. UNDP Climate Change Country Profiles

MONRE (2008). National target programme responding to climate change

MONRE (2009). Climate change and sea water rising scenarios

Quang Ninh province (2010). Information portal: <http://www.quangninh.gov.vn>

Vo Quy (2010): Climate change: Great challenge, great endeavour with Vietnam - <http://vietnamnet.vn/khoahoc/2009/08/865239/>

Scawthorn, S (2009). Disaster Damage Assessment in Vietnam. Report 01: Current Status. Prepared for Central Project Office - Ministry of Agriculture and Rural Development - The Socialist Republic of Vietnam

SNV. 2006. Pro-Poor Value Chain Development Capacity Building of Service Providers: North West Vietnam. SNV

SNV (2005). Development of the Sedge Value Chain in Ninh Binh. Hanoi, SNV.