

**CLIMATE CHANGE VULNERABILITY AND ADAPTATION IN  
AGRICULTURE AREAS IN THE BCI PILOT SITES**

**SOCIO-ECONOMIC PROFILE AND VULNERABILITY ASSESSMENTS,  
BCI SITES IN QUANG NAM PROVINCE, VIET NAM**

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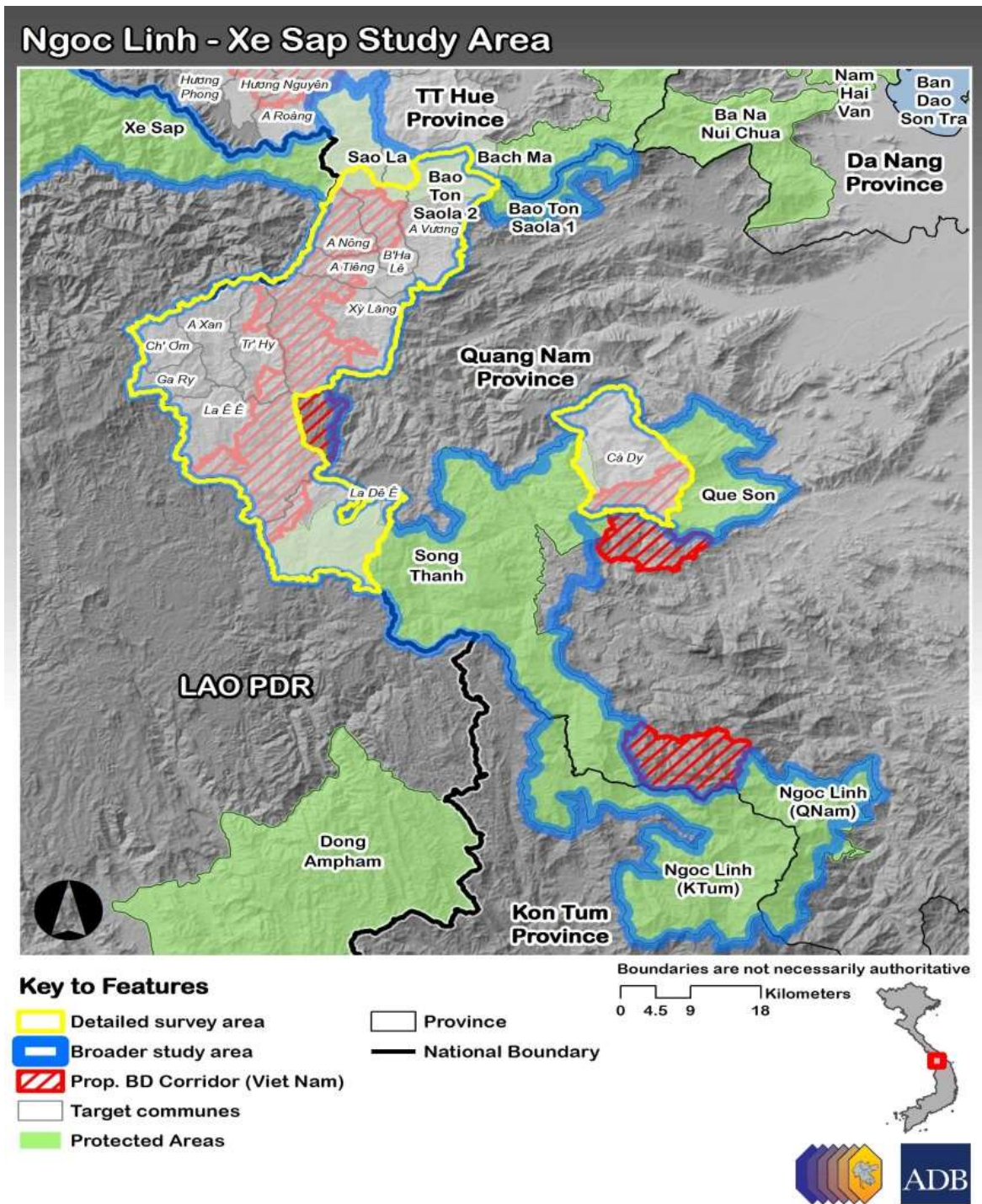
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Contents

I.	BACKGROUND OF THE STUDY SITE	3
II.	SURVEY DESIGN	5
III.	SOCIO-ECONOMIC CONDITIONS AND LIVELIHOODS STRATEGIES	6
	1. Socio-economic conditions	6
	2. Agricultural system and Livelihoods strategies	8
	a) Agricultural Livelihoods	9
	b) Ecosystem Services and Livelihoods	12
	3. Food Security and Poverty	15
IV.	RISKS-VULNERABILITY ASSESSMENT	17
	1. Natural disaster	17
	2. Non-Climate Concerns	17
	3. Key Climate Concerns	18
	4. Community's Vulnerability	20
	5. Key Livelihood Groups' Vulnerability	22
V.	FUTURE CHANGE SCENARIO ANALYSIS	25
	1. Plausible future of sector and community:	25
	2. Community's Adaptive Capacity and Adaptation Options	26

## I. BACKGROUND OF THE STUDY SITE

1. Under the Greater Mekong Subregion (GMS) Biodiversity Conservation Corridors Initiative (BCI), BCI interventions are focused in Quang Nam Province and bordering areas of Thua Thien Hue and Kon Tum provinces of Viet Nam and Sekong and Attapeu provinces in the Lao PDR. Quang Nam is a central province of Viet Nam in the Indo-Malayan zoogeographic region and in Central Annamite Mountains. Phase 1 of the BCI focused on the northern part of the landscapes, where the immediate threats are, for example, the roads with direct impacts in Quang Nam Province. During phase 2, 12 communes under two districts (Nam Giang and Tay Giang) were selected for BCI interventions (See Figure 1). This is the critical watershed for a hydropower dam projects including Song Bung IV and A'Vuong. Bisected by the east-west economic corridor's road 14D, this corridor links Song Thanh to Xe Sap, Bach Ma, Ba Na, and the Green Corridor area.
2. In Quang Nam province, the twelve communes selected for BCI interventions are all located in mountainous area and highly dependent on agricultural practices and natural resources. Common characteristic of these communes is that the topography is mostly steep and strongly partitioned. Accordingly, agriculture practices in BCI site are largely limited to upland crops and highly depend on natural conditions.
3. The BCI site in Quang Nam province covers a large population of 99,078 people and 20,712 households distributed over 50 communes. Most BCI targeted communes have low population density varying from 10 to 30 persons per km<sup>2</sup> with four to five persons per households.
4. Apart from Cady and Ladee commune belonging to Nam Giang district, BCI interventions have been mainly focused in Tay Giang district, specifically in 10 communes: Tr'hy, A Nong, A Xan, Bhalee, Ch'om, Gari, Laee, Lang, A Tieng, and A Vuong commune. Out of these twelve communes, Cady, A Tieng, and A Vuong communes were selected as field survey for the research because they represent following typical characteristics of BCI sites regarding to climate characteristics and agriculture systems.
5. Specifically, BCI site experiences tropical monsoon in valley with two seasons. The dry season starts from March to September with South Eastern wind and high temperature (temperature amplitude is from 22°C to 38°C). Hot season lasts long in a year, which affects much on agricultural production activities. Rainy season starts from September to March with Northeastern Monsoon, rain and low temperature in a long time due to influence of Truong Son mountain range. Average annual rainfall is 2,800 mm, mostly in September and February, which results in floods and soil erosion. Average humidity is 88 %. There are two main types of wind. The South west wind has average frequency of 22 – 48% in July. It lasts in a long time along with high temperature, which significantly affects on agricultural productiveness, especially for rice and corn production. The Northeastern wind often starts from October to March, bringing great rainfall and low temperature, which also causes negative impacts on agricultural production and domestic animal (ADB, 2010).
6. Agriculture system in BCI site is characterized with upland crops cultivation which are highly dependent on weather conditions. Rice crop is the most important crop to majority of the population and set as the first livelihood priority as it meets critical food demand. Due to unfavorable topographic and geographic conditions, agriculture system in this mountainous upland area is not quite diversified and restricted with certain types of crop such as upland rice, acacia, corn, etc.



Map 1. Ngoc Linh – Xe Sap Study Area

## II. SURVEY DESIGN

7. Cady commune in Nam Giang district (15 42' N, 107 47' E, Elevation: 173ft) is bordered by Thanh My town in the North, by Phuoc Son district in the South, by Que Lam commune, QuePhuoc commune in the East, and by Tabhing commune in the West, is more advantageous regarding to transportation because 25 km of the Ho Chi Minh trail running across the commune is on the main route traveling between the North and the South of Vietnam.
8. A Vuong commune (15 56' N, 107 33' E, 2000 ft) is bordered by Prao town and Hien district in the South, by Bhalee commune in the west, and by Thua Thien Hue province in the North. Unlike Cady, although having more than 20 km of Hochiminh trail running across the commune, A Vuong is not located on the main route traveling between the North and the South. This route is just familiar with tourists traveling through Viet Nam, along Hochiminh trail.
9. A Tieng commune (15 55' N, 107 30' E, 2100 ft) is bordered by Lao PDR in the West, by A nong commune in the North, by Bhalee commune in the East, and by Lang commune and Dang commune in the South, is located in the least advantaged location as the national road does not pass through it.
10. The survey was designed with two phases. The first one aimed at collecting qualitative data by conducting indepth interview and Participatory Rural Appraisal PRA. Indepth interviews were conducted with. First, key-informants of in-depth interviews included government staffs being in charge of agriculture and climate change components at provincial and district levels; commune and village leaders. These key-informant interviews provided preliminary understanding about the study area and helped to prepare in advance for PRA. Two groups were selected in each surveyed commune with four to five male villagers and four to five female villagers. PRA played as the most important source of data of impacts of climate threats on people's livelihoods and their adaptation strategies.
11. In the second phase, household questionnaire survey was designed based on analysis results of the first phase with the main purpose of quantitatively consolidating qualitative data and quantifying study results. By using random sampling technique, two hundreds and sixty households were covered by the survey. In each village of every commune, at least ten representative households were included.

### III. SOCIO-ECONOMIC CONDITIONS AND LIVELIHOODS STRATEGIES

#### 1. Socio-economic conditions

Table 1. Surveyed commune profiles

	Agricultural /Total land area (ha)	Population (person)	Livelihood Strategies	Average cultivated land area per capita	Average Income(per capita/per annum)	% of poor Hhs
Cady	491,57/ 20,000	2,958	Upland Farming NTFPs gathering Livestock Raising Wage labour Small business Government employees	>=0.2 ha	VND 7.2 millions	44.48 %
A Tieng	320.02/ 6,450.6 2	1,682	Upland Farming Paddy NTFPs gathering Livestock Raising Wage labour Small business Government employees	>=0.3 ha	VND 3.7 millions	41.45 %
A Vuong	391.36/ 2,025	2,025	Upland Farming Paddy NTFPs gathering Livestock Raising Wage labour Small business Government employees	>=0.5 ha	VND 3.2 millions	63.75 %

Source: Survey, 2011  
ADB, 2010

12. According to poverty rate provided by Ministry of Labor – Invalid and Social Affairs (MOLISA), Quang Nam has high rate of poverty. Highest rate can be found in Nam Giang and Tay Giang district which BCI targeted communes are all belong to. With 24.57% of household population is poor, Laee is the only one out of twelve commune that is not poor according to MOLISA's



criteria. Poverty rate A Tieng, A Vuong, and Cady, three surveyed communes are respectively 41.45%; 63.75%; and 44.48% (Table 1).

13. The ethnic minorities form the majority of the population in the Viet Nam BCI site with an estimated population of 78,013 and 14,875 households representing such groups as the Ka Tu (Co To), Kadong, M'Nong, Khac, GieTrieng, Tay, Nung, Mong, and Xe Dang (Map 6). The Kinh also live in this area. Among 12 targeted communes under BCI phase 2, The KaTu occupies major parts of the population in 11 out of 12 communes
14. Similarly to many ethnic minority peoples, the Ka Tu has been practicing shifting cultivation for ages (making it difficult to obtain "red-book" land ownership certificates). The Kinh majority, occupying for a small population in the area, is less forest-based although they also hunt and gather in the forests. More significantly, the Kinh practices permanent cultivation. Expansion of settlements and agricultural production have resulted in clearing large swathes of lowland forest, decreasing the area and biodiversity of critical habitat, and fragmenting forest cover
15. The Ka Tu women are culturally and socially inferior to men, especially in decision making process. They do have access to land and resources as results of the fact that women are more actively engaged in livelihood activities than men do. Initially, respondents, especially male respondents affirmed that women and men household members share every work. Further investigation revealed that on the whole, household division of labour among the Ka Tu are gendered inequity. The Ka Tu women undertake major part of both productive and reproductive works. Yet, they mostly do not have control power to income and expenditure in their households.
16. In terms of production activities (labor division within households) women have more tasks than men such as child care, cleaning and laundry work, fuel wood gathering, fetching water, and collecting animal feed. Men are in charge in house repairing, gathering forest products. Women also take part in tasks that are supposed for men but fewer. However, in terms of agriculture, women have more tasks than men such as clearing fields, trimming, weeding and harvesting, etc.
17. Resources management is handled by men, for instance, forest product usage, land use rights, investment decision, approaching information and technology, services of production assistance, emblements and other decisions in production, etc. All other leadership positions in the commune belong to men apart from posts in Women Association.
18. In most cases, BCI targeted communities are located in unfavorable locations for transportation; somewhat isolated from the outside world. This is one the biggest challenge for livelihood improvement. Besides, traditional culture and conceptions remain strongly among ethnic minority groups. For example the Ka Tu still does not actively engage in doing business like trading because they prefer self-production and self-provision. Trading activities and wage jobs were traditionally not popular among the Ka Tu. Men in these communities would feel ashamed if their friends or relatives discover that they are hired labours of someone else. The Ka Tu considers wedding as one the most important events that require a lot of money. This custom has been changing toward reducing wedding expenses according to one's financial conditions. Dowry is still considered as heavy burden, especially to the groom's family.
19. Illiteracy is not common but people generally quit school after finishing 7<sup>th</sup> or 8<sup>th</sup> grade. This rate is higher among schoolgirls. Priority is given to boy children. Early marriage is more popular in these ethnic minority groups compared to the Kinh.

20. Unlike other communes, Cady is favorably located on the main route of North-South traveling. As a result, trading activities in this commune are more developed than in other communes. However, this advantage also brings along socially negative impacts to the commune with the development of entertainment's services which were at first opened to serve long-journey drivers. In-depth interviews with female respondents in Cady commune revealed that some men in their commune spend money on drinking, karaoke, even prostitution. The respondents believed that these bad deeds have been adopted from low land communities.
21. With more than 25% of households classified as (poor households)<sup>1</sup>, most of BCI targeted communes are poor communes according to the Decision no 587/2002/QĐ-BLĐTĐBXH<sup>2</sup> on criteria defining poor commune (figure 1). Poor minority communities located in remote mountainous areas are highly dependent on forest resources for their food production, building materials, handicraft material, and cultural practices. This was confirmed by the Ka Tu respondents in Cady, A Tieng, and A Vuong commune. In recent years, due to changes in government policies, people in these BCI targeted communes are no longer free to clear the new forestry area that are not defined in the red-books as their own lands, shifting cultivation is still considered as the primary livelihood of majority population in the BCI site.

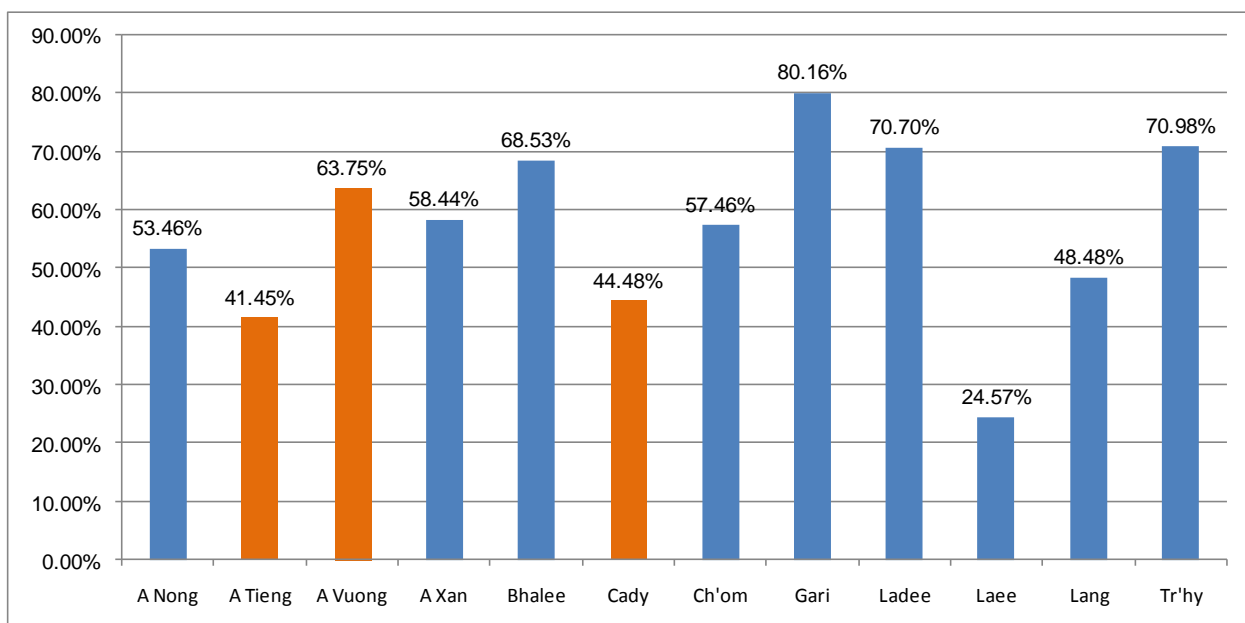


Figure 1. Poverty rate in BCI targeted communes

Source: ADB, 2010  
Household survey (July, 2011)

## 2. Agricultural system and Livelihoods strategies

22. BCI targeted communes' livelihoods are a combination of subsistence and income oriented activities with the emphasis of agricultural subsistence. Upland farming is the most important livelihood activity to 92% of interviewed households in A Vuong commune, 80% of interviewed households in Cady commune, and 72% of interviewed households in A Vuong commune.

<sup>1</sup>Poor household: According to Decision no 1752/CT-TTg of the Prime Minister, poor household is the household with less than VND 400,000 per person per month (\$US 20/person/month).

<sup>2</sup>Decision no 587/2002/QĐ-BLĐTĐBXH: Poor commune is the commune that has more than 25% of total households classified as poor households and lack of three out of six infrastructure items including road; school; medical station, water, electricity



Paddy land area is available only in A Tieng Commune and plays as the most important livelihood of 16% interviewed households.

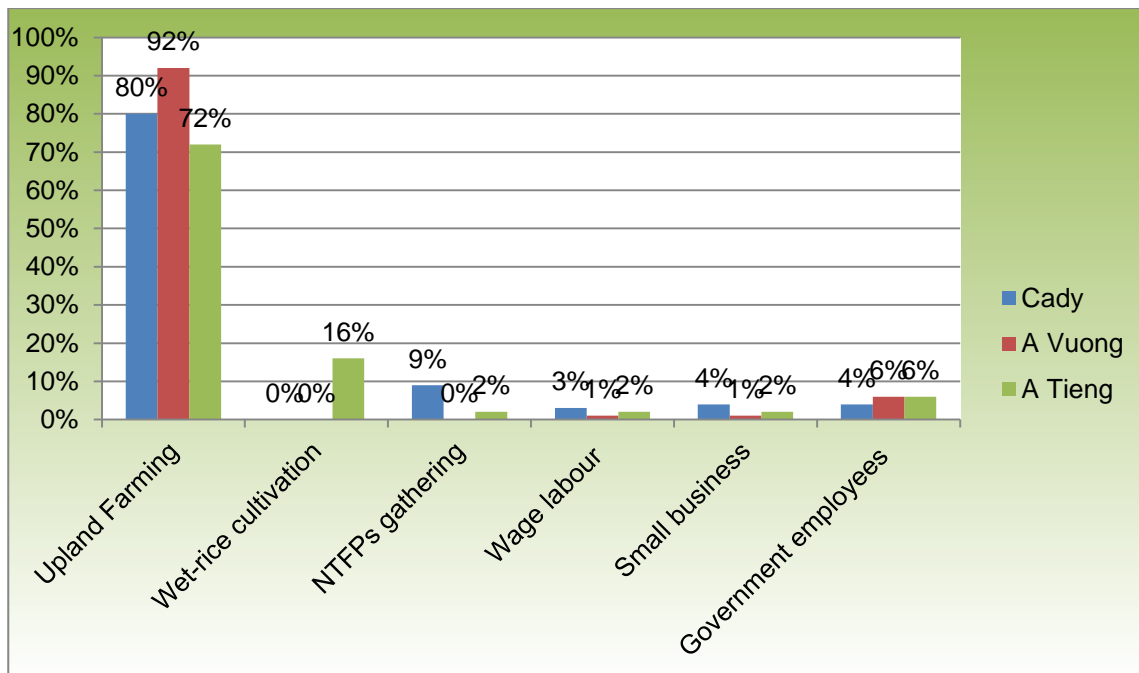


Figure 2. The most important livelihood according to interviewed households in three communes

Source: Household Survey (July, 2011)

23. Average cultivated land area per capita in BCI targeted communes is not very low in comparing to other regions. Owing more than 0.2 ha of cultivated land per person is popular rate in this area. 22.2% of households in Cady commune have 0.5 ha (or more than this) of cultivated land per capita. This number is up to 61.1% of the population in A Vuong commune. Especially in the case of A Tieng commune, it might not be stated in the red book, 70% of the population have access to more than 0.5 ha per person. Still, most of the respondents reported that they do not have enough land for cultivation though nearly 100% of the households in BCI sites keep leaving some parts of their land idle each year. This is usual practice of shifting cultivation with the main aim of recovering the soil quality. Depending on how large the cultivated land is, people will decide how long and how much land area can be left idle. The duration is about two to three years after two to three continuous crops in the case of Cady commune. It is much longer in the case of A Vuong and A Tieng commune. Land is left idle for about five years after just only one crop.

#### a) Agricultural Livelihoods

24. As BCI site in Quang Nam province covers a mountainous area with high slope, **farming activities** are limited to certain upland crops. The most popular crops grown in BCI area are classified into three main groups: subsistence crops such as upland rice, wet-rice, cassava; short-day crops for sale including beans, corn, peanuts; and perennial crops like acacia, cinnamon, rubber. These crops are respectively grown and taken care throughout the year as represented in the following Figure 3. Major focus is paid on rice production. Depending on rice variety, sowing time varies from March to June. People in A Tieng and A Vuong commune plant **short-day upland rice** which needs to be sown no later than March 15. Local people name this kind of variety as 90-day-rice variety because it can be harvested about three months after grown.

25. **Long-day day upland rice** is grown mainly in Cady commune. This rice variety is basically sown in May or June and harvested five to six months later. According to interviewed farmers, short-day rice variety does not develop well in this area. In addition, local people prefer long-day rice variety's taste more than the short day one.
26. Wet-rice cultivation is applicable in few places where paddy land and irrigation system are available. In A Tieng commune, thanks to government's investment under "Developing new countryside" program, **wet-rice** cultivation has been developed in order to totally replace upland rice cultivation by 2015, according to A Tieng commune's chairman. In 2011, out of 150.09, 38.49 ha of wet-rice were cultivated, occupying 25.65% of total land area of rice production. Unlike upland rice, wet-rice can be cultivated two crops per year. Winter-Spring Wet-rice Crop lasts from January to May. Summer-Autumn Wet-rice Crop) lasts from June to November. Still, some households stick to upland-rice production as their priorities even though they do have paddy land because for many generations, cultivating upland-rice crop is their habit and the most important food source that keep them survive throughout the year.
27. 97%% of the respondents in Cady commune, 73% of respondents in A Vuong commune and 58% of respondents in A Tieng commune ranked upland-rice crop as the most important subsistent crop to their households. Few households who have regular income from paid jobs consider these jobs are more important. More than 20% of respondents living in A Tieng commune who have access to paddy land ranked wet-rice crop as their first livelihood priority.
28. **Cassava** is the second popular crop in BCI site. Most of household that have available land grow cassava as alternate food in rice deficiency time and can be sold as dried cassava. Cassava can be grown anytime in the year when people have free time and harvest one to two years after that. Cassava has been one of the most important crops in BCI targeted communes. Since it is easily cultivated and less threatened by extreme weather, people prefer growing cassava as an alternate food source in rice-deficiency months. Cassava can be mixed with rice or eaten as rice alternate. Cassava can also be sold as dried cassava for about 0.1US\$ per kg. A Vuong commune has the largest area of cassava compared to Cady and A Tieng commune
29. In recent years, **short-day crops for sale** like beans, corns, peanuts have been considerably developed in communes located in convenient locations for trading activities like Cady commune. These crops make significant contribution to households' cash income, varying from VND 1.5 million to VND 7.5 million (US\$ 75 – 375) per household. Due to limited available cultivated land area, people in Cady commune save land for upland-rice and other short-time crops such as beans and corn rather than cassava. In recent years, beans crop has become very popular and played an important source of income to many households in Cady commune where sources providing cash income are very limited. 76% of Cady commune's respondents reported that they grow beans because they can earn about VND 2.5 million (125US\$) for one bean crop in average.
30. The most popular **perennial crops** that are planted the most in BCI site are acacia, cinnamon and rubber. These crops were all introduced by government's income generation programs. Acacia was popular the most in this area five years ago. In recent years, rubber plantation has significantly increased. During 2009-2010 Incremental planted area of rubber was 359ha in Nam Giang district, 284 ha in Tay Giang district. According to the five-year agricultural development plan 2011-2015 of Quang Nam province rubber plantation would reach 1,000ha in Nam Giang district and 300 ha in Tay Giang district.

31. For the past few years, Acacia was so popular that almost all households have at least one piece of their land saved for planting acacia. The government introduced acacia and cinnamon to local people and also provide them seedlings and technical training for free. Each household could earn from VND 5 million (250US\$) to VND 25 million (1250 US\$) for one acacia crop which can be harvested after five to seven years of planting. However, acacia demand has been dramatically gone down since last year when paper companies started establishing their own acacia farms and stopped buying acacia from local communities.
32. Since the 90s, the government had a project supporting villagers in A Vuong and A Tieng commune planting cinnamon as a poverty elimination tree. A large cultivated area was occupied with cinnamon. The number of cinnamon trees per household was up 2000 or even 5000. When cinnamon had been matured enough for harvesting, cinnamon price suddenly halved compared to ten years ago. It was estimated that one cinnamon tree, after ten years of planting, provides about 15 kg of bark which prices about \$US 2.5 to 3. Furthermore, cinnamon demand has also significantly declined so that very few traders coming to remote areas like A Tieng and A Vuong commune to purchase cinnamon. Many households had to cut down cinnamon for other plants. To an already susceptible community, one inappropriate policy can lead to serious loss and strongly affect people's well-being.
33. Rubber has been recently introduced to A Tieng and then A Vuong commune thanks to Rubber Development Project of Nam Giang Rubber Company. Villagers in these two communes, whoever signed the contract with the company are provided with seedlings, fertilizers, pesticides and paid for efforts of taking care of rubber trees. The company also pays them 40% of the benefit from harvesting rubber latex. So far the project seems to be very promising to local communities. More and more villagers engage in planting and taking care of rubber trees for Nam Giang Company. A large amount of cultivated land has been used for planting rubber trees
34. **Livestock raising** is practiced by most of the households in BCI targeted communes as subsistent livelihood activity. Raising chickens, pigs, cow, buffalos, etc. is mostly for their own use in special days like New Year, Wedding, etc. While nearly 100% of the respondents engage in breeding, contribution to household consumption and income remains very low. It appears, however, that poultry production used to be more important 10-15 years ago; the interviewed villagers noted that disease levels were lower in those days. 77% of respondents claimed that they have lost chickens, pigs, cows, buffalos, because of epidemic. Technical insufficiency is also believed to be the main reason that restricts local people from expanding breeding.

Table 2. Crop Calendar

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
		Short-day Upland Rice <i>Sowing</i>		Flowering		Harvesting					
				Long-day Upland Ordinary Rice <i>Sowing</i>				Flowering		Harvesting	
				Long-day Upland Sticky Rice <i>Sowing</i>				Flowering		Harvesting	
Wet-rice (Winter-Spring Crop)			Flowering		Harvesting						Wet-rice <i>Sowing</i>
				Wet-Rice (Summer-Autumn Crop) <i>Sowing</i>				Flowering		Harvesting	
			Corn <i>Sowing</i>				Harvesting				
Winter-Spring Bean Crop <i>Harvesting</i>					Bean (Summer-Autumn Crop) <i>Sowing</i>		Harvesting				Bean Crop <i>Sowing</i>
Cassava											
Acacia, Cinnamon											
Rubber											

Source: Survey Results (May and July, 2011)

**b) Ecosystem Services and Livelihoods**

35. The KaTu communities' livelihoods are mainly derived from upland cultivation and forest products collection. Gathering non-timber forest products (NTFPs) remains an important livelihood to villagers in BCI targeted communes because it provides almost 100% of housing needs and 30-60% of the total cash income of a household. Contribution of NTFP collection to household's income varies according to household's location in relation to natural resources' location and labour availability.
36. Loongboong (*Lansiumdomesticum*) (Picture 1), Uoi bay (*Sahiumlychnporum*) (Picture 2) and Rattan (Picture 3) are the most important NTFP source to villagers in Cady commune. Loongboong is one special forestry fruit that is now in high demand in urban area. However, contribution of loongboong collection to cash income is not as high as Uoi bay and rattan collection because of price differences. Although price of Loongboong in the market is about US\$ 2 to 3 per kg, villagers can only sell with the price of US\$ 0.2 to 0.3 per kg. Loongboong can be harvested in two to three months from May to July. One household can earn from US\$ 30 to US\$50 each Uoi season.



Picture 1. Loongboong - *Lansiumdomesticum*

37. Uoi bay is a valuable herbal that can be sold with a price of US\$ 10 to US\$ 15 per one kg of dried Uoi bay. One Uoi tree provides about 15 to 20 kg Uoi. Nevertheless, Uoi bay fruits in July or August every three to four years and need to be completely harvested within one month otherwise they will be unusable. During this time, nearly 100% of households, who live not too far from Uoi trees' locations postpone all other activities, even ask for leave if they are paid labour or government staffs at village and commune level, to go collecting Uoi fruits. Four to five villagers form a group and keep going to the forest collecting and bringing Uoi fruits back to their houses for one, two days or even one week each time until Uoi fruits are completely harvested. In the past, people wait till Uoi is mature and falls on the ground to gather them. In recent years, due to the increase in price of Uoi bay, Uoi collectors cut down the whole Uoi trees leading to a serious decline in Uoi resource



*Picture 2. Uoi bay (Sahiumlychnporum)*

38. While Uoi and Loongboong are seasonal income sources, plucking rattan is annual secondary livelihood activity to many households in Cady and A Vuong commune. Villagers in these two communes can go plucking rattan any time in the year. One rattan thread prices US\$0.1. One person can gather around 20 threads of rattan in one day. Although rattan collection can provide stable cash income, people are no longer relying on plucking rattan like they did 20 years ago because of the decline in rattan reserve. Nowadays, villagers have to go further into the forests to pluck rattan. It might take even one day to get to rattan area. Accordingly, villagers normally go plucking rattan in leisure time only.
39. Among three studied communes, Loongboong, Uoi, and Rattan are available the most to villagers in Cady commune. A Vuong villagers engage in collecting LoongBoong and rattan with smaller scale but not Uoi because transportation for traders coming to this commune is less convenient than transportation to Cady commune. Villagers in A Vuong and A Tieng commune can also make profit with small scale though, from collecting Mat nhan tree (*Eurycomalongifolia* jack), herbal medicine which prices about US\$ 2 to 2.5 per one kg.





Picture 3. Rattan

40. Villagers in A Tieng commune do not engage in collecting Loongboong, Uoi, rattan as the other two communes because of two reasons. First, A Tieng commune is not located along Hochiminh trail like A Vuong commune or on the national main route like Cady commune. For this reason, traders do not go to the commune just to purchase NTFPs that are also available in other communes. Second, A Tieng commune location is also not favorable for collecting these NTFPs. Rather than that, villagers in A Tieng commune have access to Ba Kich (*Morinda Officinalis* How) – valuable herbal medicine which prices about US\$ 20 to 25 per one kg. Since Ba Kich is in high demand and more importantly only available in high altitude areas like A Vuong commune, many traders travel to A Tieng to buy this precious product. Unlike Uoi, Ba Kich is rarer and grows far from residential area, contribution of Ba Kich to household's income is very promising but yet significant. The government had invested a project that supports local communities growing Ba Kich by providing training and seedlings for free. However, very few households have succeeded in developing this valuable medicinal herb because it is quite difficult to grow and take care of.





Picture 4. Ba Kich - *Morinda Officinalis* How

### 3. Food Security and Poverty

41. Food insufficiency occurs commonly. Overall, upland rice is the staple food, added with maize and cassava. A typical household (which represents about 70% of the total population) can only grow three months (in the case of Cady commune), six to seven months (in the case of A Vuong commune and A Tieng commune) worth of staple crop a year; the balance has to be purchased (Table 2).
42. Almost all interviewed elder villagers affirmed that rice yield has decreased by half compared to rice yield of the 80s. Twenty to thirty years ago, only upland rice crop was able to meet household rice demand for the whole year. Nowadays, upland rice cultivation meet rice demand for three months (in the case of Cady commune) to six or or nine months (in the case of A Vuong) in average (Table 2). The number of households that reported to produce enough rice for household demand for the whole years account for 4% of interviewed households of Cady commune, 7% of interviewed households of A Vuong commune, and 40% of interviewed households of A Tieng commune. A Tieng commune is only one commune that has wet-rice cultivation with an area of 38.49 ha.
43. In the corridor area, over 60% of the households have insufficient cash income to meet basic needs estimated at an average shortfall of VND 2-3 million (US\$ 105-157) annually per household, while only 13% of the households have savings and invest in livelihood activities. One crop loss can seriously threaten household's food security. Unfavorable geographical locations, inconvenient transportation and restrictions of the Co Tu's customs and beliefs collectively limit community's adaptive capacity and recover after shock.

Table 3. Changes in livelihoods over 30 years

<u>In the past (1980s)</u>	<u>At Present</u>
----------------------------	-------------------

Main Livelihood Strategies	Upland Farming Hunting NTFPs Gathering Livestock Raising Government Employees	Upland Farming Paddy Cultivation NTFPs Gathering Livestock Raising Wage Labour Small Business Government Employees
Upland Farming	Upland rice was the main crop that met food demand for the whole year	Upland Rice remains the main crop but it meets food demand for only three to six months  Upland crops are more diversified
NTFPs Gathering	Gathering NTFPs (rattan) was easier Lower price	NTFPs' reserves have significantly declined and been more competitive  Higher price
Hunting	Was one of the main food sources	Is no longer legal
Livestock Raising	Smaller scale but less affected by epidemic diseases	Greater scale High risk of epidemic diseases
Major changes	Agriculture production was mainly to served domestic uses Food demand was more secured with better rice production and hunting Cash income sources were limited Sufficient cultivated land Soil quality was better	Agriculture production is also income-oriented Livelihood strategies are more diversified Rice deficiency commonly occurs in majority of households Hunting is no longer a good source of food Cash income sources are more available Insufficient cultivated land Soil quality has been degraded

*Source: Survey (June and July, 2011)*

44. Over the last 30 years, local communities have experienced major changes in livelihood sources and strategies. First, shifting cultivation is no longer allowed. Second, hunting has been prohibited due to the Law on Forest Protection. As a result, upland farming is restricted in certain amount of cultivated land that is legally distributed by the government. In order to cope with rice deficiency, local communities diversify their livelihood system with paddy cultivation, doing small business, working as hired labour, and growing plants that can be sold instead of subsistence crops only.
45. NTFP gathering was easier in the past due to legislation restrictions, higher competition because of population growth, as well as decline in NTFPs' reserves, people have to go further

in to the forests to collect NTFPs. Nevertheless, prices are also much higher due to high demand.

46. In conclusion, over the last 30 years, people have been facing rice deficiency more often while livelihood system is more diversified.

#### IV. RISKS-VULNERABILITY ASSESSMENT

##### 1. Natural disaster

47. In the period of September to November, flood often occurs when there's one of the three following weather phenomenon: (i) storm together with heavy rain, tropical depression comes into land causing storm and heavy rain afterward; (ii) northeast monsoon together with tropical depression creating heavy rain and big flood; (iii) tropical convergent sequence in the South of East Ocean together with monsoon in the North, or northeastern coming to the South leading to long lasting heavy rain. Big floods occurring in Quang Nam in 1964, 1999, 2007, 2009 were all caused by these weather combinations<sup>2</sup>. In recent years, as rain intensity becomes more and more extreme, flash flood have occurred with increasing frequency at different level of damage. Generally, it occurs unexpectedly in narrow range but severe damage causing serious loss to human life and assets.
48. Heavy rain potentially leading to flash flood often occurs in the period of September to November. In the last ten years, Quang Nam province suffered three typhoons: typhoon Chanchu occurred in May, 2006; typhoon Xangsane occurred in October, 2006; and typhoon Ketsana, September 2009. Two big floods destroyed crops, houses in all over the province in November 1998 and December 1999.

##### 2. Non-Climate Concerns

49. The biggest non-climate concern to majority of population in BCI site is **quality and quantity of cultivated land**. Local communities used to practices shifting cultivation that allowed them to move to new piece of land almost every one or two years. Soil quality was better since people cut and burn the old forest for their farming activities. In recent years, due to changes in government policies on forest protection, shifting cultivation has been prohibited. Examples of government law and policies are Directive of Prime Minister number 12/2003/CT-TTg – dated on 16/5/2003 – “Reinforcement of urgent solutions for forest protection and development”; Law on Forest Protection and Development - No. 29/2004/QH11; Directive dated on 08/2006/CT-TTg on the strengthening of urgent measures to prevent deforestation and burning of forests, illegal forest exploitation; Decree 23/2006/ND-CP of March 3, 2006 - On the implementation of Law on Forest Protection and Development. Once shifting cultivation is longer allowed, people are restricted with certain amount of land area and certain pieces of cultivated land. As a result, nearly 100% of interviewed villagers in Cady and A Vuong commune, and more than 60% in the case of A Tieng commune reported that they do not have enough land for cultivation. In fact, they meant that they do not have enough land with good quality of soil because many respondents, mostly in A Tieng commune reported that their households do not have enough labour to undertake farming activities in a larger area while they still have a lot of land being left idle. Keep cultivating on certain pieces of land that is highly sensitive to heavy rain, flash flood, hot and dry weather due to its high slope leads to soil degradation.
50. Apart from land quality and quantity concerns, major challenges to local communities in practicing agricultural activities are **the lack of capital seeds and poor technical knowledge**. Many interviewed villagers reported that they did not know how to use pesticides and fertilizers.

More 90% of respondents claimed that they do not have money to buy poultry or cattle, seedlings or fertilizers and pesticides.

### 3. Key Climate Concerns

51. Given the common situation, respondents of Cady, A Vuong and A Tieng commune affirmed that these three communes are exposed to **dry spell in dry season, long lasting heavy rain and flash flood in rainy season**. Excepting for previously described extreme weather events, villagers in this study area have not been regularly threatened by climate extremes. Their exposure to dry spell, long lasting heavy rain and flash flood leads to negative impacts due to the dependency of their livelihood activities on weather conditions. More than 90% of respondents stated that the weather has become more severe nowadays as hot and dry weather lasts longer, number of hot days increases, number of days without rain increases, there's increase in the intensity of heavy rain.
52. Long-lasting heavy rain leading to flash flood and long lasting hot and dry weather leading to dry spell are annual threats. Dry spell occurs once every two to three years. Dry spell, according to conception of local community, is the weather phenomenon occurs when hot and dry weather lasts from one to three month without rain. Flash flood potentially leading to land slide occurs when heavy rain last for few days.
53. As presented earlier, there are seven key livelihood activities in the study area upland farming; paddy cultivation; NTFPs gathering; livestock raising; paid jobs; small business; government employees. Among these livelihoods, upland farming is the most popular activity in the area. It is the main food source and income source of studied communities. Major upland crops include upland rice, cassava, beans, corns, peanuts, acacia, cinnamon, rubber.
54. Upland rice crop is the most important livelihood activity to majority of the population in study area. There are two types of upland rice crops including long-day upland rice cultivated in five to six months from May to October in Cady commune and short-day upland rice cultivated in three months from March to June in A Tieng and A Vuong commune. Local communities classify upland rice into four main types: long-day ordinary upland rice; long-day sticky upland rice; short-day ordinary upland rice; and short-day sticky upland rice. While ordinary rice is for daily use, sticky rice cultivated with smaller scale is saved for special occasion such as New Year, Wedding, Parties, etc.
55. Regarding to long-day upland ordinary rice crop (cultivated in Cady commune), three main climate threats are dry spell in May, June and July; rains-storm in May, and long-lasting heavy rain in September and October (Figure 3). Dry spell during the period of April to July is the greatest threat to the growth of upland ordinary rice. Respondents of Cady commune believe that long-lasting hot and dry weather is the critical reason of crop loss. In addition, rice seeds are sown in May when there is high risk of rain-storm occurrence. The combination of rain-storm and high-slope topography of upland field leads to the risk of being swept away of newly-sown seeds. More than 50% of the interviewed villagers reported that they had experiences of newly sown seed being swept away because of rain-storm.
56. Long-day upland rice flowers in September and is harvested in October, therefore is seriously threatened by long-lasting heavy rain with rice flowering and potentially leading to crop loss. Long day upland rice is also exposed to the risk of flash flood in October. It takes villagers one or even one and a half month to complete harvesting due to the long walk from their houses to their fields. Furthermore, impact of flash flood is exacerbated by the sensitivity of upland crop to flash flood since it is largely cultivated in steep hills.

57. Short-day upland rice cultivated in A Tieng and A Vuong commune can be harvested in about 90 days after being sown. Since the crop duration is from March to June, it is highly exposed to dry spell in April, May, and July. Being cultivated on the high-slope-hills, watering is impossible, upland rice is completely dependent of natural conditions. Short-day upland rice flowers in May and can be harvested in June, the hottest and driest time in the year. Accordingly, short-day rice yield is highly affected by the number of continuously dry and hot days.
58. Apart from upland rice, other upland crops like beans, corns, cassava, acacia, rubber are better resistant to dry spell and less threatened by flash flood. Except for major climate extremes like typhoons 2006 and 2009, perennial crops are safe with annual climate threats.
59. Unlike upland rice, wet-rice crop is not very much exposed to dry spell because it is cultivated in location where watering is possible and irrigation system is accessible. Local villager can somehow manage to overcome long-lasting hot and dry weather. Summer-Autumn wet-rice crop is rather threatened by long lasting heavy rain and sudden flash flood during the month of October when rice is not yet harvested. In addition, the sensitivity of this crop to climate threat is increased due to long harvesting time, especially in rainy season when transportation is more difficult and land slide can occurs. Winter-Spring wet rice crop is not exposed to climate threats.
60. Livestock raising group is also threatened by long lasting hot and dry weather as well as flash flood. In the past, local communities experienced serious loss caused by big floods in 1998, 1999 that swept livestock away due to poor breeding facilities. This has been improved after previous loss. Local people have paid more attention in the facilities to protect their livestock from climate threats. Instead of climate extremes, in recent year, biggest concern to Livestock raising group is epidemic diseases. In the last two years, most households raising livestock experienced major loss because of the diseases, mostly in poultry herd (H5N1, H1N1 diseases) and in pigs. Long lasting hot weather was exacerbating factor of these diseases. From these lessons learnt from the previous years, this year, livestock raising households all follow government instruction in vaccine injection. However, interviewed villagers reported that they lack of technical knowledge in raising livestock so return from it is quite low. Livestock raising is mainly subsistence food source.

Table 4. Livelihood activities and Present Climate threats

Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
								Long lasting heavy rain potentially leading to slash flood			
			Heavy rainstorm								
			Long lasting hot & dry weather potentially leading to dry spell								
		Short-day Upland Rice									
		Sowing			Flowering	Harvesting					
			Long-day Upland Ordinary Rice						Flowering	Harvesting	
				Sowing							
					Long-day Upland Sticky Rice					Flowering	Harvesting
					Sowing						
Wet-rice (Winter-Spring Crop)				Flowering	Harvesting						Wet-rice Sowing
					Wet-Rice (Summer-Autumn Crop)					Flowering	Harvesting
					Sowing						
			Corn								
				Sowing			Harvesting				
Winter-Spring Crop											Bean Crop Sowing
				Bean (Summer-Autumn Crop)							
				Sowing		Harvesting					
Cassava											
Acacia, Cinnamon											
Rubber											
Livestock Raising											
				Loong Boong Collecting							
							Uoi Collecting				
Rattan Plucking											
Ba Kich											

Source: Surveys (June and July, 2011)

#### 4. Community's Vulnerability

61. Regarding to community as a whole, dry spell, heavy rain and flash flood have yet directly affected people's living. Still, villagers in the study area have been experiencing land slide caused by long lasting heavy rain and flash flood. In Cady commune, 33.3% of interviewed villagers whose houses or cultivated land located along the river reported that they experience land slide every year and have met a lot of difficulties in harvesting rice in rainy season. According to interviewed villagers, except the two big storms and one big flood occurred in 2006, 2009, and 1998, land slide has not caused accommodation damage but rather negatively affected on transportation. The most affected villages are the one located away from the main road. In A Vuong commune, villages like A Rec, A Pat, A Um, XaOi 3, XaOi 1 can easily be isolated for few days because of flash flood or land slide.
62. As earlier presented, local communities are affected the most by negative impacts of climate and non-climate threats on agriculture system leading to **food insecurity**. Major rice source is upland rice cultivation is threatened by dry spell, long lasting heavy rain, flash flood, heavy rainstorm, decrease in soil quality and cultivated land quantity. As upland rice yield decrease by half compared to twenty years ago, people have to promote other income oriented activities. Short-day crops and perennial crops for sale are the first option because local people are familiar with farming techniques and not very much active in diversifying livelihoods.



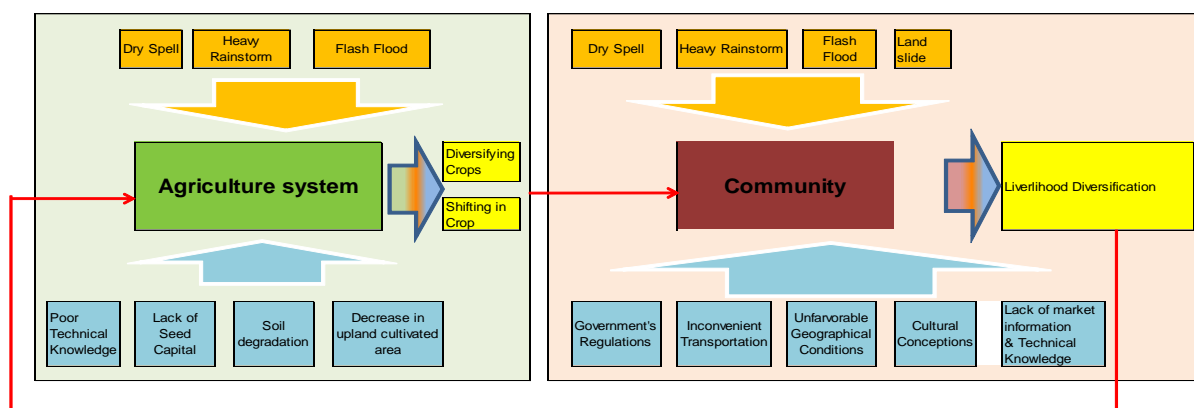


Figure 4. Vulnerability assessment

63. Food security is threatened not only by **climate threats, soil degradation, decrease in cultivated land area** but also by **government's regulation in exploiting forest products** (e.g. National Strategy for Management of trade in species Wildlife from 2004-2010, issued in 2004 for instance). Since hunting was prohibited, local communities have not been able to benefit from this source of food. Hunting activity might not be completely stopped, its scale reduces to minimum level, therefore is no longer considered as a regular food source.
64. **Unfavorable geographic location** is another challenge that restricts local community in income generation. Consequently, beans and corn crops are not very developed in communes like A Tieng and A Vuong commune. It is not very convenient for traders coming to these communes as coming to Cady commune.
65. **Lack of market information and technical knowledge** are also worth mentioning here. Most of crops grown in the BCI area were introduced by the government. Local communities passively follow government's instructions, especially when they are provided with seedlings and trainings. Cinnamon was a bad experience of A Vuong commune. Five years ago, cinnamon was introduced to local communities as income generation crop. Households interested in planting cinnamon were provided with seedlings and trainings. Unfortunately, when cinnamons are mature enough to be harvested, local people learnt that market demand for cinnamons is very low. Cinnamon's price is so low that many households cut them down after three to five years just to have land for growing other crops. Acacia and rubber which are the most popular perennial crops at the moment were also introduced by the government. As being restricted with market information and having poor technical knowledge, local communities have not been able to actively decide on crop types.
66. Ethnic minorities form majority of the population in the BCI site. Their **cultural conceptions** have strong impacts on livelihood system. In the case of the Ka Tu, the most popular ethnic minority group in the study area, trading activities and paid jobs were not their preferences. In the past, the Ka Tu would prefer subsistence production. Hence, they are quite passive in these trading activities, highly dependent on middle men. Generally, local people in the BCI site sell their products for local middle men or wait for traders coming into their villages. They are inferior in negotiating the price. This is the reason why many households in the study areas are keeping acacia in their fields for a long time. Market demand for acacia is going down and they are unable to negotiate the price with traders so some of the farmers decided to sell with low price while some others who did not urgently need money, keep acacia even though they can be harvested one or two years ago. Similarly, the Ka Tu, especially the Ka Tu men feel ashamed if their friends or relatives discover that they are working for another person. Although

these conceptions have been changing, they still have negative influences on livelihood diversification of the Ka Tu in BCI targeted communes.

## 5. Key Livelihood Groups' Vulnerability

### 67. Upland Farmers

Table 5. Upland farmers' vulnerability

Exposure	Sensitivity	Coping capacity
<p>Prolong hot and dry weather from April to June:</p> <p>Frequency: every one to two years</p>	<p>Rice productivity loss by 10% - 30% varying accordingly to duration of dry spell</p>	<p>Limited:</p> <p>No irrigation system</p> <p>Lack of capital to try new variety of rice that might be better drought resistant</p>
<p>Prolong heavy rain and potential flash flood during the period of September to November</p> <p>Frequency: every one to two years</p>	<p>Rice productivity loss by 30% this typical event, even by 50 to 70% in big floods that happened in 1998, 1999, 2006, 2009</p>	<p>Limited:</p> <p>Lack of access to information of weather forecast</p> <p>Lack of equipments and techniques to harvest faster</p>

68. Upland farmers are threatened by two major climate risks: Prolong hot and dry weather from April to June and prolong heavy rain potentially leading to flash flood during the period of September to November. As presented in table 5 above, upland farming activities are highly exposure to these threats because they happen every one to two years. Although the sensitivity of upland farming system is not very low because crops selected to grow in this area are all drought resistant, prolong hot and dry weather which can last continuously one to two months seriously impact productivity. In addition irrigation system is not widely available in the area. When there is no rain, people do not have any way to water their fields. As a result, coping capacity of local community to prolong hot and dry weather is rather limited.
69. On the other hand, prolong heavy rain potentially leading to flash flood in October and November can seriously affect rice harvesting. It takes local people at least one month to complete harvesting. If flash flood comes any time during this time, crop yield will be significantly reduced. Long duration of harvesting exacerbates system's vulnerability to climate change.

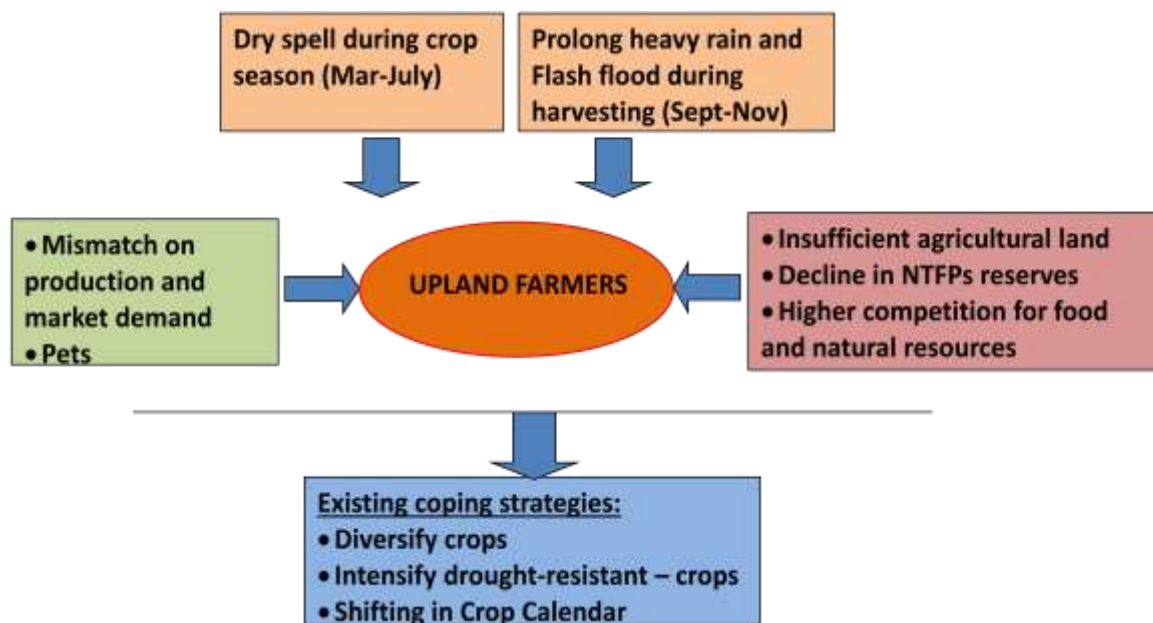


Figure 5. Upland farmers' vulnerability

70. Apart from these two major climate threats, upland farming is also negatively affected by heavy rainstorms that can affect newly-sown seeds; pestilent insects; soil degradation and decline in cultivated land area. Cultivated land is sloping. Rainstorms, therefore, can easily sweep away newly-sown-seeds. People have to re-sow seeds all over again. Unfortunately, some households even ran out of seeds. These households had to borrow or asked for seeds from their relatives, neighbors, or friends. Besides, in-depth interviews with villagers revealed that any crop that needed to re-sow seeds had lower yield than normal crop.
71. Pestilent insects are non-climate threat that plays a key part in crop loss as local communities have never been using pesticides. Living in remote area and being familiar with traditional farming techniques, people do not know how to use pesticides. More importantly, they cannot afford using pesticides.
72. Soil degradation along with decline in cultivated land area, as presented above, are two other non-climate threats that collectively exacerbate people's vulnerability to climate threats.
73. Coping capacity of upland farmers in general is limited. Lack of capital seed prevent them from trying new seed varieties that might be able to cope with droughts and floods better. Lack of tools and equipment in doing farming also increase their sensitivity and limit their coping capacity. For example, harvesting time last long partly because of the lack of tools and equipments. Shortening harvesting time will reduce rice crop's exposure to long lasting heavy rain and flash floods.
74. According to the elders living in studied area, the weather has been changing a lot. Nowadays, they cannot predict when would be the best time for sowing seeds or harvesting rice. Accordingly, people have to shift their crop calendar every year. If hot and dry weather lasts too long, they have to wait till rains coming. As a result, this coping strategy is really unreliable and not very efficient in coping to weather changes.
75. In coping to rice deficiency, local people have diversified their crops with drought resistant varieties like beans, corns. Trading activities have also been developed for income-generating

activities. However, because of the lack of information, lack of access to market, lack of knowledge, local people are disadvantaged in the market. Furthermore, there have been some mismatches between market demand and their production. Cinnamon was an example when people could not sell cinnamons even though they had already spent several years in taking care of cinnamon.

76. Consequently, upland farmers are the most vulnerable group to climate change. With limited coping capacity, high sensitivity due to topographical conditions, upland farmers have to face these threats almost every year.

#### 77. Paddy cultivating farmers

Table 6. Paddy cultivating farmers' vulnerability

Exposure	Sensitivity	Coping capacity
Prolong hot and dry weather from April to June <u>Frequency:</u> every one to two years	Rice productivity loss by 10% - 15% varying accordingly to duration of dry spell	Medium coping capacity because irrigation system are mostly available to existing paddy fields
Prolong heavy rain and potential flash flood during the period of September to November <u>Frequency:</u> every one to two years	Rice productivity loss by 30% - 50% in big floods happened in 1998, 1999, 2006, 2009	Limited: Lack of early warning system

Paddy cultivating farmers account for a small population since paddy fields are very limited. Although local people prefer paddy to upland rice cultivation, paddy can only be cultivated where irrigation is available and the land is not too sloping.

78. The same as upland farming, paddy cultivation is highly exposure to prolong hot and dry weather from April to June and prolong heavy rain and potential flash flood during the period of September to November. Nevertheless, unlike upland rice cultivation, paddy crops are not as highly sensitive to these climate threats as upland rice because they are cultivated in flat area where water can be hold better than in sloping area. In addition, it is also less damaged by flash floods compared to upland rice. Paddy farmers can also cope with prolong hot and dry weather from April to June better since most of paddy fields are located in places near irrigation system. However, coping capacity of paddy cultivating farmers is limited because their access to early warning system is limited. If floods suddenly come, local people do not have any equipment to quickly harvest rice.
79. Other than climate threats, paddy cultivating farmers are also threatened by non-climate threats: pestilent insects; soil degradation and decline in cultivated land area. Regarding to pestilent insects, paddy farmers can cope better than upland farmers because they have been trained to use pesticides. Furthermore, the government has program that support paddy farmers by subsidizing pesticides and seed rice every year.

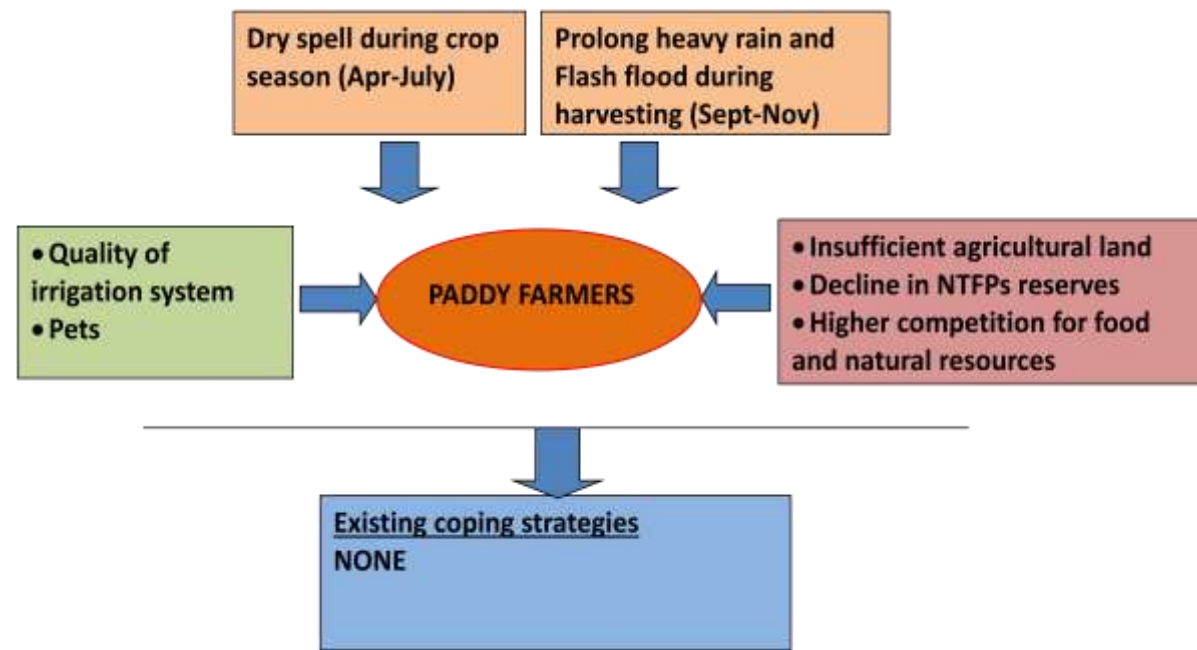


Figure 6. Paddy Farmers' vulnerability

80. In summary, paddy cultivation is more suitable because it is not as vulnerable to climate threats as upland rice crop. Paddy cultivating farmers can cope with climate and non-climate threats better than upland farmers. Unfortunately, paddy fields are very limited. Local people are proposing to develop paddy cultivation as much as possible, using natural water sources like small streams.

## V. FUTURE CHANGE SCENARIO ANALYSIS

### 1. Plausible future of sector and community:

81. Trends of future change that may affect livelihood:

- Infrastructure development, i.e. road, leads to easy access to market and increase in tourism activity
- Increase population leads to serious situation in resources allocation
- Over exploitation of natural ecosystems, particularly over harvesting of NTFPs which is driven by needs for more household income as well as better access to market, leads to more scarcity of natural resources to support household income
- Strict conservation policy leads to restriction to do shifting cultivation and consequences in more severe soil degradation and lower yield in upland rice production.
- Key climate change trends that may affect risk of the key sectors are:
  - Higher risk of having floods in the rainy season
  - Hotter weather in the summer negatively affecting crops

#### *Future risk and vulnerability of key sectors*

82. As the context of community may change under socioeconomic dynamic and development, risks and vulnerability of key sectors will also change overtime upon change in both socioeconomic condition as well as future climate pattern.

Key livelihood group	Current risk	Future risk	Concerns on future context of community on coping
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			capacity & options
Upland farmers	- Prolong hot and dry weather from April to June  - Prolong heavy rain and potential flash flood during the period of September to November	Hotter weather in the summer negatively affecting crops  Higher risk of having floods in the rainy season	Controlled shifting cultivation  Limited farmland  Limited availability of NTFPs  Opportunities to develop trading activities for income generating activities
Paddy farmers	- Prolong hot and dry weather from April to June  - Prolong heavy rain and potential flash flood during the period of September to November	Hotter weather in the summer negatively affecting crops  Higher risk of having floods in the rainy season	Limited irrigation and suitable land for paddy production  Limited availability of NTFP

83. This future change scenario is just one out of many different scenarios that presents tendency of changes in future climate. Though it cannot be considered as firm foundation for policy making process, it draws valuable attentions among policy makers that development strategies might not work sustainably in a long run if likelihoods of socio-economic and environmental changes are not taken into account.

## 2. Community's Adaptive Capacity and Adaptation Options

84. Upland farmers diversifying livelihood towards enhancing trading is appropriate and sustainable in the long-run. Beans and corn crops are short-day varieties that can be easily switched to another crop type in case market demand for beans and corn declines. The biggest problem to this livelihood group is the unsustainable method of collecting NTFPs. Uoi bay's reserve will soon be exhausted if villagers keep cutting down the whole tree. Though gathering Uoi is not annual and regular source of income, its contribution to households' cash income is quite significant.

85. Crop diversification with drought-resistant-short day varieties can work sustainably in the future for upland farmers if their access to market is improved.

86. Rubber plantation is currently very promising to local communities since it ensures a regular income in a long-run. Cultivated land area used for rubber plantation is extending and expected to double in the next few years. However, bad experience of cinnamon plantation should also be taken into consideration as industrial trees require large area of cultivation and long period of time before harvesting.

87. **Livelihood diversification** is primary strategy of study communities responding to rice inefficiency and lack of cash income. In the case of Cady commune, thanks to advantage of being located along the Ho Chi Minh trail on the main route traveling between the North and the South, trading activities has been developed with selling agriculture products. Traditionally, in order to meet their basic needs, the Ka Tu prefers exchanging products to trading for money. They rather give their products for free to their relatives, friends and neighbors when they are in









need. This traditional custom has been rapidly changed in Cady commune because of outsiders' influences brought by transportation advantage. In the past, local communities cultivated only crops that met their food demand. Nowadays, people diversify crops that can be sold for money. Beans and corn crops are the two main agriculture sources of cash income to the Ka Tu in Cady commune. There are two main reasons that beans and corn crops have been largely developed in this area. First, these crops are well resistant to hot and dry weather. They are not sensitive to dry spell as upland rice. These crops are short-day varieties which can be harvested before September. As a result, they are not exposed to long-lasting heavy rain and flash flood (Figure 2). Second, demand, especially for beans is currently quite stable. Villagers in Cady commune can easily sell their products either to local middle men or traders from low land. Apart from cons, beans, agricultural products, rattan, Uoi and Loongboong are collected the most by villagers in Cady commune in comparison to A Tieng and A Vuong commune thanks to transportation advantage.

88. As a matter of fact that A Tieng and A Vuong commune are not located in the places that are convenient for trading, less than 20% villagers in these communes regularly involve in selling their products to middle men or traders. Except for rarely valuable product that is in high demand like Ba Kich in A Tieng commune, villagers in A Tieng and A Vuong have to either bring their products to the market in the nearest town or sell to middle men with very low price. It would take at least four, five hours to even one day of walking to the nearest town. As stated by interviewed villagers, selling is thought of only in cases they run out of rice and money to buy rice or they urgently need money. Consequently, crop diversification with rubber and Ba Kich has been undertaken by villagers in A Tieng commune to cope with rice deficiency and lack of cash income. Although, rice deficiency in this commune is not as serious as the cases of A Vuong and Cady commune, more than 60% of the population annually experience rice deficiency. Unlike Cady commune, diversifying livelihood towards trading activity is not applicable in A Tieng due to its disadvantaged location because national main road does not pass through the commune. As outsiders' impacts on local community is much lighter compared to the case of Cady's community, the Ka Tu's customs remain so strongly that selling is not their favorite livelihood activity. In addition, in-depth interviews with A Tieng's villagers revealed that the Ka Tu men do not like working as hired labours. They feel ashamed if their friends and relatives discovered about their paid jobs. These customs restrict the Ka Tu in A Tieng and A Vuong commune from livelihood improvement. Fortunately, cultivated land area per capita is quite large that enable villagers engaging rubber plantation project of Nam Giang Rubber Company. The company rent cultivated land from villagers and provides them seedlings, fertilizers for free. Villagers get payment for planting and taking care of rubber trees according to number rubbers planted on their pieces of land. They are also shared profit with the company when rubbers are matured enough for latex extraction. Rubber plantation has great potential of providing a stable amount of income. More importantly, it is not exposed to climate threats that were mentioned earlier. Villagers do not worry about output demand of rubber like what they had experienced with Cinnamon and Acacia because it is guaranteed by the rubber company. One problem that should be taken into account is potential impacts of rubber area's extension on rice production and food security. Villagers are now very much interested in signing contracts with Nam Giang Rubber Company, therefore a lot of cultivated land have been used for rubber plantation. Being located in disadvantaged location, food security plays a critical role that needs to be considered in decision making.
89. As earlier described, Ba Kich is a high value herbal that is in great need and can be sold with high price. The national government has invested in developing Ba Kich by giving technical training and seedlings. However, very few people have succeeded with planting Ba Kich due to its difficult cultivation techniques and scarce source of seedlings. Less than 7% of the commune's population engages in planting Ba Kich though it can potentially provide great cash income.

90. Among these three studied communes; A Vuong has the most disadvantaged conditions for livelihood diversification. This commune is located in a geographically unfavorable location. In coping to food insecurity and lack of cash for basic needs, villagers in this commune intensify agriculture activities as much as possible in order to meet household's food demand. Nearly 100% of households in A Vuong commune grow cassava with large area. Cassava is considered as rice's alternate in rice deficiency months. When villagers urgently need small amount of money, they can sell dried cassava to middle men at US\$ 0.1/kg. 73% of interviewed villagers reports that they also engage in collecting rattan with smaller scale compared to villagers in Cady commune. Although cassava is not exposed to climate threats, their contribution to cash income is very little. A Vuong commune is expecting national government's interventions in developing wet-rice crop. There have been few households started engaging in rubber plantation by signing contracts with Nam Giang Rubber Company. This model might not be largely applied in A Vuong commune as in A Tieng commune since cultivated land area per capita in A Vuong commune is much lower (one third or one half in average) than in A Tieng commune.
91. In summary, adaptation strategies of studied communes are shaped and restricted by topographical and geographical conditions, socio-economic conditions, social and cultural customs. So far, autonomous strategies have been passively applied with the only aim of coping to food insecurity and lack of cash income for basic needs. Effectiveness and sustainability of adaptation strategies have not been taken into account by both government and local communities.






## Summary: Rapid climate change risk and adaptation assessment at Quang Nam Province, Viet Nam

Sector at risk	Climate Threat	Impact from climate change	Socio-economic pressure, natural and policy change	Coping mechanism - Adaptation	Coming change	Other recommendations
1. Farmer Upland rice crop in Cady commune	1. Rainstorm in May & June	 1. Rainstorm in May & June badly affect on newly sown seeds  <b>Indicator:</b> 1.1. Number of very heavy rainy day indicated by rainfall higher than 90 mm See Figure 1. No change in a number of heavy rainy days in May-June	1. Decline in cultivated land area caused by: - Hochiminh highway and hydro power plant projects - Shifting cultivation is restricted within distributed land 2. Decline in soil quality because of cultivation technique and natural condition of cultivated land 3. Hunting is forbidden 4. NTFPs reserve is declined 5. Limitation of diversifying livelihood due to The Co Tu's custom	1. Doing two rice crops: Sticky rice from May to September and Ordinary rice from June to October 2. Diversifying crop in order to increase household's income to overcome rice deficiency months 3. Drying rice by fire not by sunshine	Sustainable Rattan production project funded by Japanese government with small scale	- Local rice variety need to be studied about its quality since its productivity is very low - The government should support the community in livelihood diversification
	2. Long lasting hot and dry weather in May & June	 2. Long lasting hot and dry weather in May & June badly affect rice seeds growing  <b>Indicator:</b> 2.1. Number of days with rainfall lower than 2mm See Figure 2. shorter dry period in the year with longest dry period  2.2 Number of days with temperature higher than 37°C See Figure 3. longer long lasting hot in May-June				
	3. Long lasting heavy rain	 3. Long lasting heavy rain that potentially leads to flash flood in September and				



Sector at risk	Climate Threat		Impact from climate change	Socio-economic pressure, natural and policy change	Coping mechanism - Adaptation	Coming change	Other recommendations
	that potentially leads to flash flood in September and October		October threaten rice harvesting <b>Indicator:</b> 3.1 Number of very heavy rainy day indicated by rainfall higher than 90 mm See Figure 1 More frequent very heavy rainy day occurrences in future				
2. Bean crop in Cady commune	Cold weather in Dec & Jan	→	1. Cold weather in Dec & Jan negatively affect on productivity of bean crop <b>Indicator:</b> 1.1. Number of days with temperature lower than 10 <sup>0</sup> C degree See Figure 5. There is no occurrence of cold weather in Dec-Jan in both present and future		There is yet coping strategies		Livelihood diversification is needed to increase resilience
Winter-Spring Wet-rice Crop in A Vuong commune	1. Long lasting heavy rain that potentially leads to flash flood in December	→	1. Long lasting heavy rain that potentially leads to flash flood in December can swept newly sown rice <b>Indicator:</b> 1.1 Number of very heavy rainy day indicated by rainfall higher than 90 mm See Figure 1. There is no occurrence of very heavy rainy day in December in both present and future	1. Decline in cultivated land area caused by: - Hochiminh highway and hydro power plant projects - Shifting cultivation is restricted within distributed land 2. Decline in soil quality because of cultivation technique and natural condition	Always sowing upland rice before 15 March to avoid harvesting in rainy season so that there is still sunshine for drying rice and ensure rice harvesting	- Rural area Development Program funded by the government that will invest in wet-rice production, irrigation system - Rubber plantation jointly contract	- Cultivable land for wet-rice and irrigation system need to be invested by the government - Changes brought by Rural area Development Program need to be carefully taken into consideration in regard of social acceptance and side

Sector at risk	Climate Threat	Impact from climate change	Socio-economic pressure, natural and policy change	Coping mechanism - Adaptation	Coming change	Other recommendations
	2. Long lasting dry and cold weather from December to April	<p>↑ 2. Long lasting dry and cold weather from December to April affect wet-rice growing and flowering leading to low productivity</p> <p><b>Indicators:</b></p> <p>→ 2.1 Number of days with temperature lower than 10°C</p> <p>See Figure 6.</p> <p>There is no occurrence of cold weather in Dec-Apr in both present and future</p> <p>↑</p> <p>2.2. Number of day with daily rainfall &lt; 2mm during month 12-4</p> <p>See Figure 8.</p> <p>A little longer dry period in Dec-Apr</p>	<p>of cultivated land</p> <p>3. Hunting is forbidden</p> <p>4. NTFPs reserve is declined</p> <p>5. Limitation of diversifying livelihood due to The Co Tu's custom and inconvenient trading transportation</p>		with Nam Giang Rubber company	effects
Upland rice crop in A Vuong commune	1. Rainstorm in March and April	<p>→ 1. Rainstorm in March and April badly affect on newly sown seeds</p> <p>→ <b>Indicator:</b></p> <p>Number of very heavy rainy day indicated by rainfall higher than 90 mm</p> <p>See Figure 1.</p> <p>There is no occurrence of very heavy rainy day in March-April in both present and future</p>				

Sector at risk	Climate Threat		Impact from climate change	Socio-economic pressure, natural and policy change	Coping mechanism - Adaptation	Coming change	Other recommendations
	2. Long lasting hot and dry weather from April to July	  	<p>2. Long lasting hot and dry weather from April to July badly affect rice growing and flowering leading to low productivity</p> <p><b>Indicators:</b>                  2.1. Number of days with rainfall lower than 2mm                  See Figure 8.                  no change in dry period indicated by median year</p> <p>2.3 Number of days with temperature higher than 37°C                  See Figure 7.                  longer long lasting hot in Apr-July</p>				
Winter-Spring Wet-rice Crop in A Tieng commune	1. Long lasting dry and cold weather from December to April	 	<p>1. Long lasting dry and cold weather from December to April affect wet-rice growing and flowering leading to low productivity</p> <p><b>Indicators:</b>                  1.1 Number of days with temperature lower than 10°C                  See Figure 6.</p>	<p>1. Decline in cultivated land area caused by:</p> <ul style="list-style-type: none"> <li>- Hochiminh highway and hydro power plant projects</li> <li>- Shifting cultivation is restricted within distributed land</li> <li>- Convert agricultural</li> </ul>	<ul style="list-style-type: none"> <li>- Upland rice is sown before 15 March to avoid harvesting in rainy season so that there is still sunshine for drying rice and ensure rice harvesting</li> </ul>	<ul style="list-style-type: none"> <li>- Elimination of upland rice production</li> <li>- Increase wet-rice crop</li> <li>- Promote rubber plantation</li> </ul>	<ul style="list-style-type: none"> <li>- Changes brought by Rural area Development Program need to be carefully taken into consideration in regard of social acceptance and side effects</li> <li>- Bakich plantation</li> </ul>





Sector at risk	Climate Threat	Impact from climate change	Socio-economic pressure, natural and policy change	Coping mechanism - Adaptation	Coming change	Other recommendations
		<p>There is no occurrence of cold weather in Dec-Apr in both present and future</p> <p>1.2 Number of day with daily rainfall &lt; 2mm during month 12-4</p> <p>See Figure 8.</p> <p>A little longer dry period in Dec-Apr</p>	<p>land into land for rubber plantation</p> <p>2. Decline in soil quality because of cultivation technique and natural condition of cultivated land</p> <p>3. Hunting is forbidden</p> <p>4. NTFPs reserve is declined</p> <p>5. Limitation of diversifying livelihood due to The Co Tu's custom and inconvenient transportation.</p> <p>Hochiminh highway does not cross the commune</p>	<p>- Increase rubber plantation to overcome crop loss</p>		<p>should be paid more attention</p> <p>- Rubber plantation's impact on rice's production should be taken into consideration</p>
<p><b>Upland rice crop in A Tieng Commune</b></p>	<p>1. Rainstorm in March and April</p> <p>2. Long lasting hot</p>	<p>➡ 1. Rainstorm in March and April badly affect on newly sown seeds</p> <p>➡ <b>Indicator:</b> Number of very heavy rainy day indicated by rainfall higher than 90 mm</p> <p>See Figure 1.</p> <p>There is no occurrence of very heavy rainy day in March-April in both present and future</p> <p>↑ 2. Long lasting hot and dry weather from April to July</p>				



Sector at risk	Climate Threat	Impact from climate change	Socio-economic pressure, natural and policy change	Coping mechanism - Adaptation	Coming change	Other recommendations
	and dry weather from April to July	<p>badly affect rice growing and flowering leading to low productivity</p> <p><b>Indicators:</b></p> <p>2.1. Number of days with rainfall lower than 2mm See Figure 8. no change in dry period indicated by median year</p> <p>2.2 Number of days with temperature higher than 37°C See Figure 7. longer long lasting hot in Apr-July</p>				

**Maximum number of very heavy rainy days by month over 30 years (above 90 mm)**

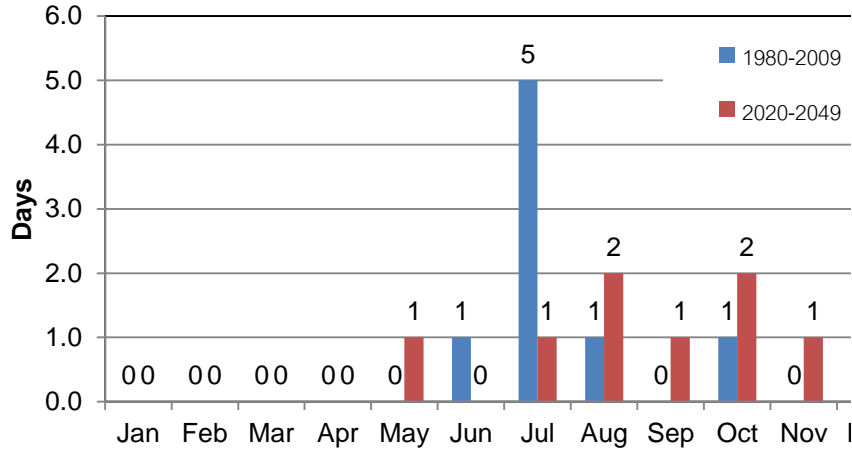


Figure 1. Number of very heavy rainy days

**Number of dry day occurrences (daily rain <3mm) during May-Jun**

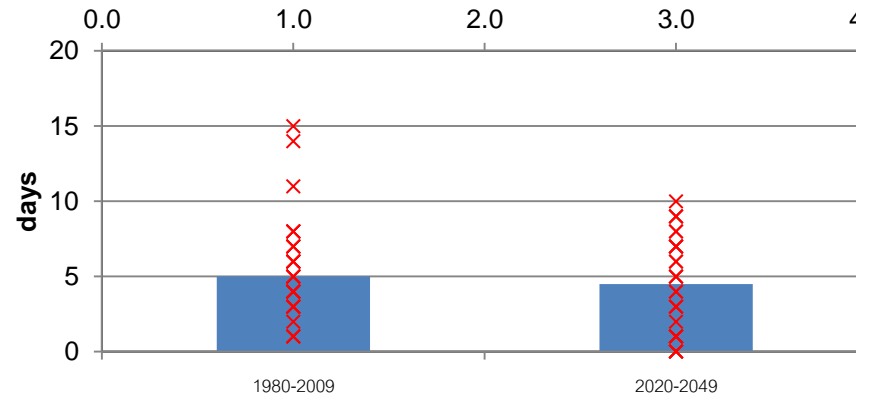


Figure 2. Number of days with daily rain less than 3 mm. (Remark: x indicate value of individual year)

**Daily maximum temperature ditribution by May-June (days / 2 month)**

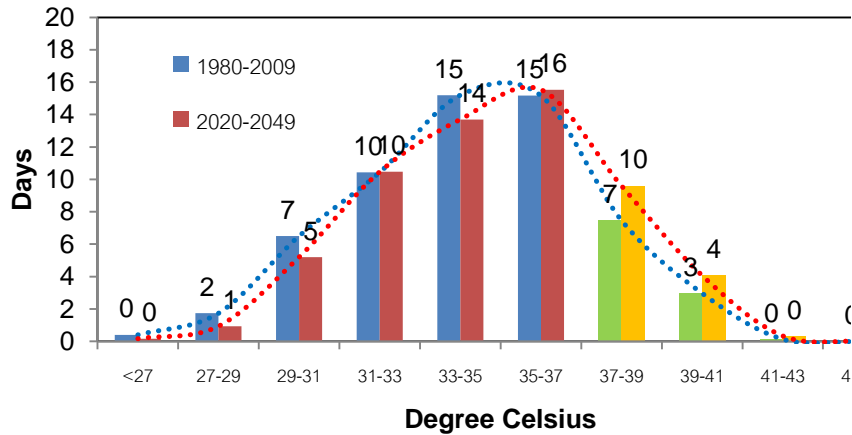


Figure 3. Number of days in relation to maximum temperature in degree

**Daily minimum temperature ditribution during Dec-Jan (days / 2 month)**

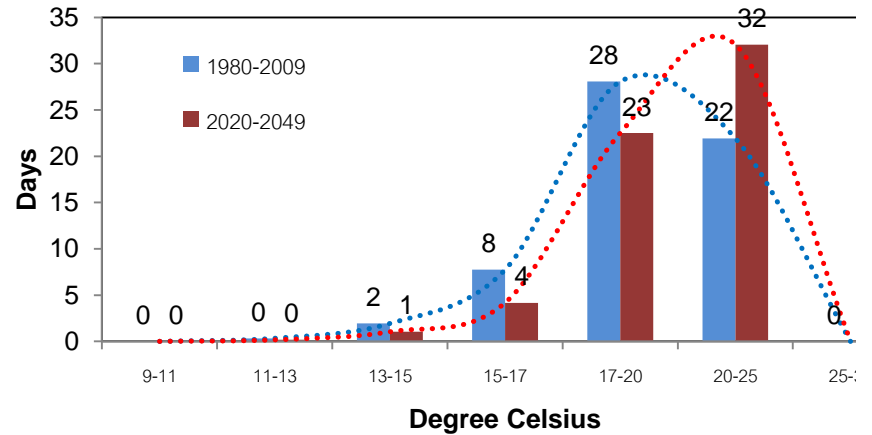


Figure 4. Number of days in relation to minimum temperature in degree

Celsius in May-June

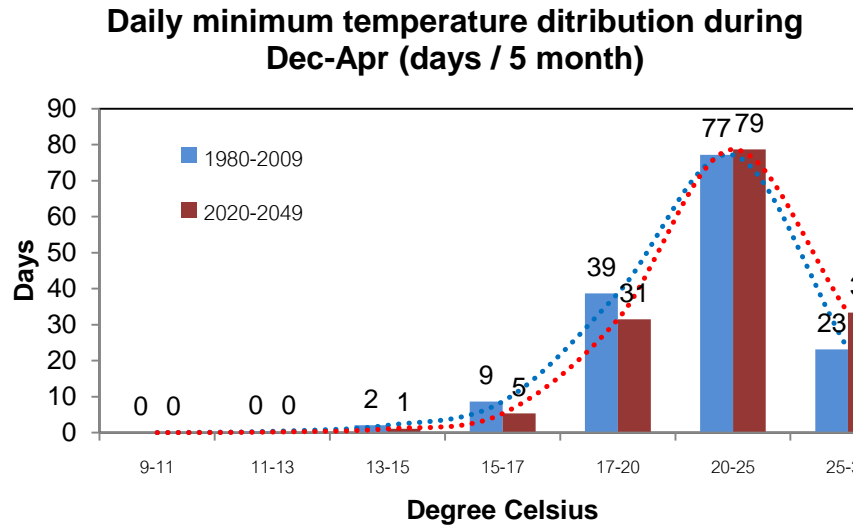


Figure 5. Number of days in relation to maximum temperature in degree Celsius in Dec-Apr

Celsius in Dec-Jan

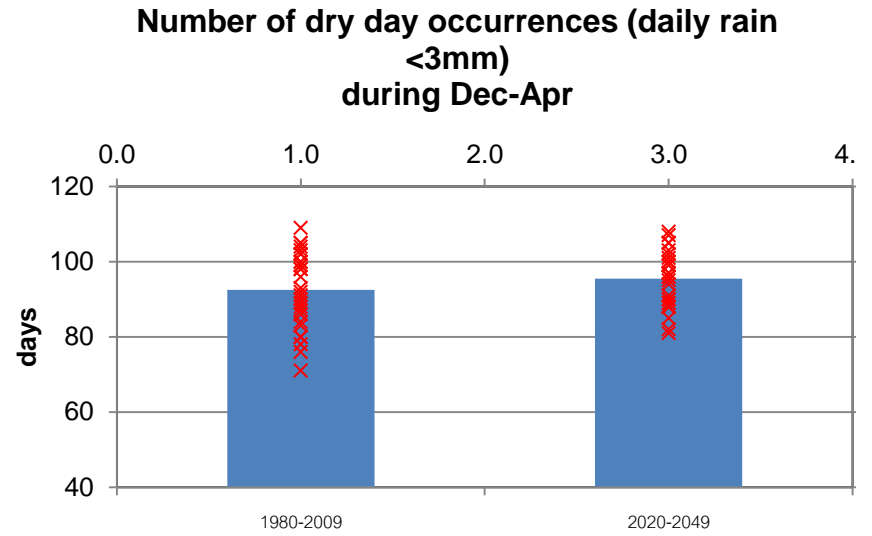


Figure 6. Number of days with daily rain less than 3 mm. (Remark: x indicate value of individual year)

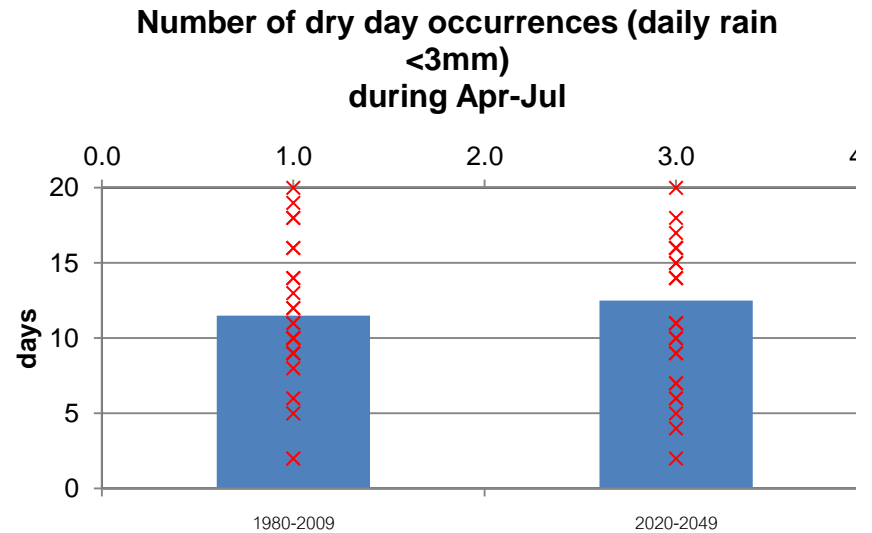
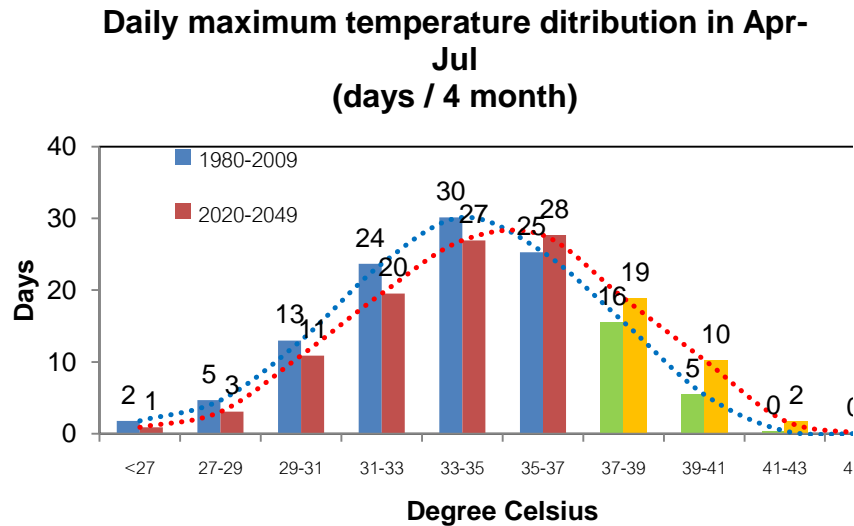
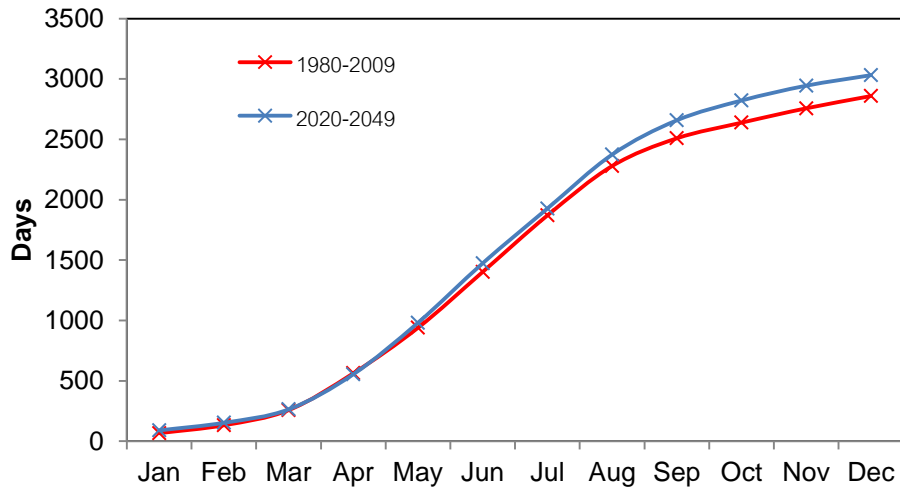


Figure 7. Number of days in relation to maximum temperature in degree Celsius in Apr-Jul

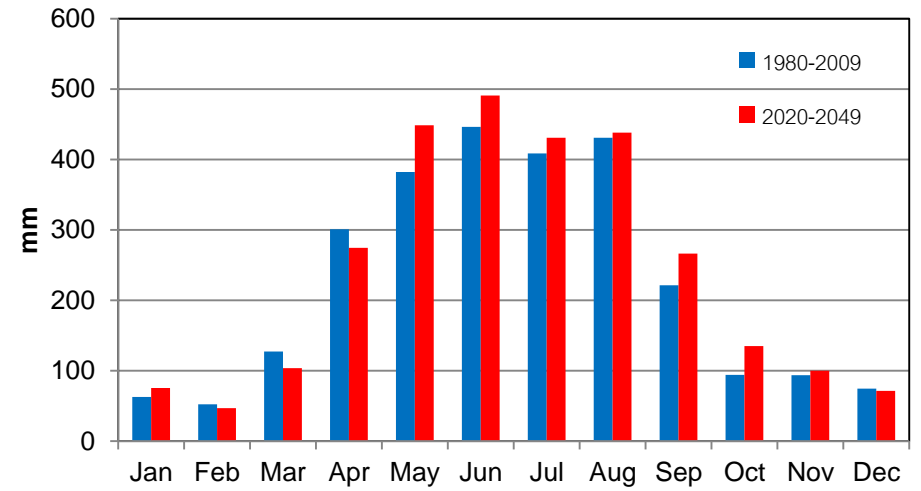
Figure 8. Number of dry days occurrences (daily rain < 3mm) in Apr-Jul

**General Information from scenario**

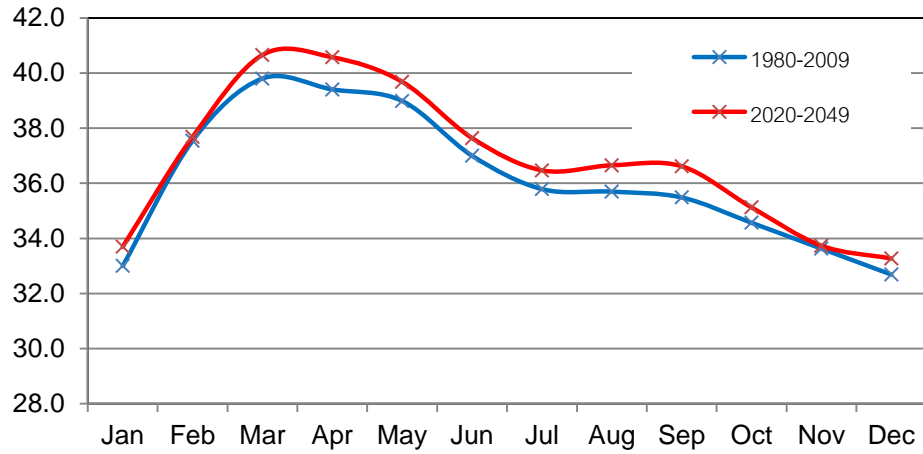
**Average annual accumulated rainfall**



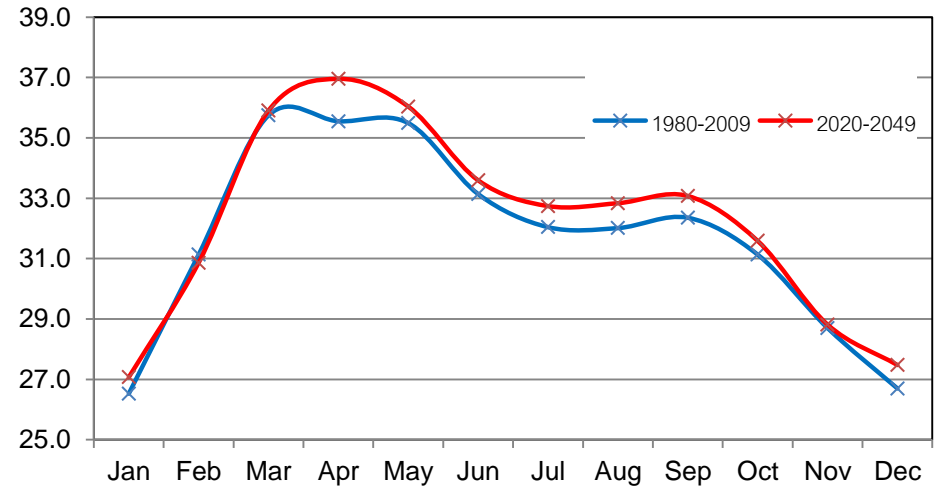
**Monthly rain**



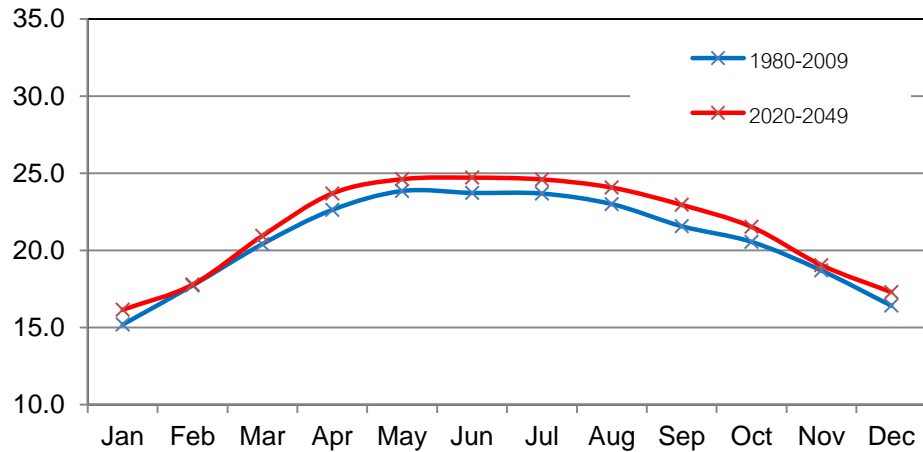
**Mean annual daily maximum temperature on hottest day over 30 years**



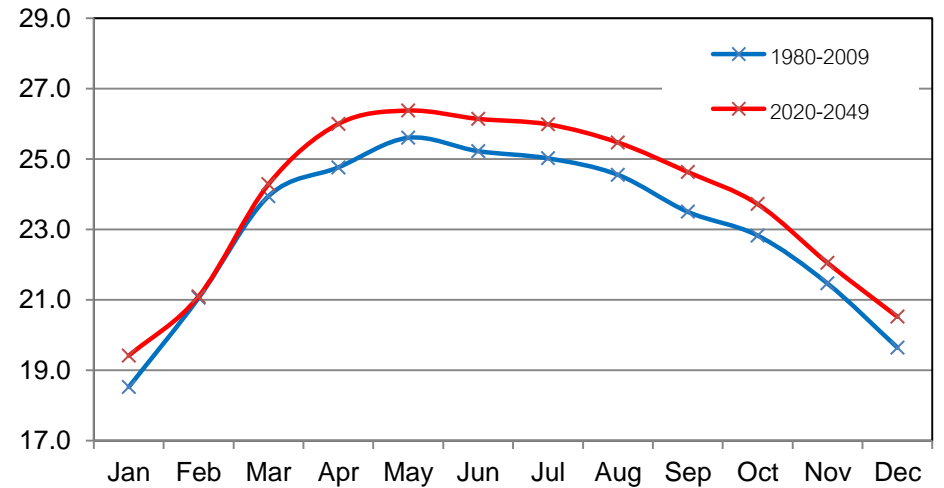
**Maximum temperature average over 30 years**



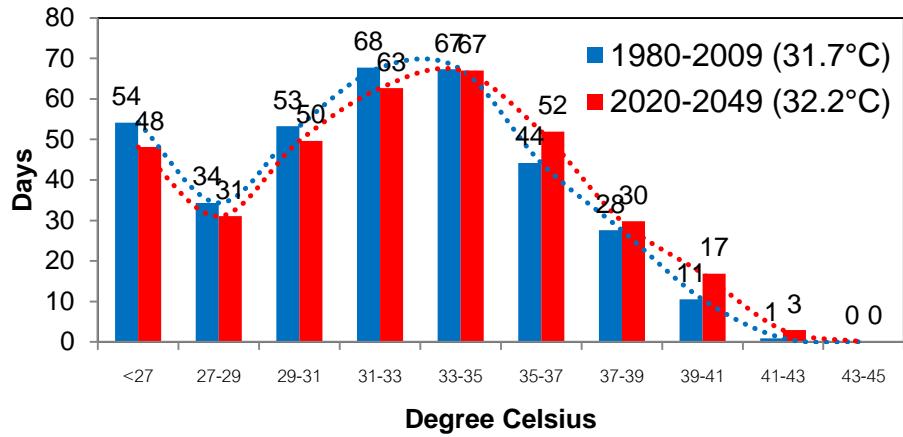
**Mean annual daily minimum temperature on coolest day over 30 years**



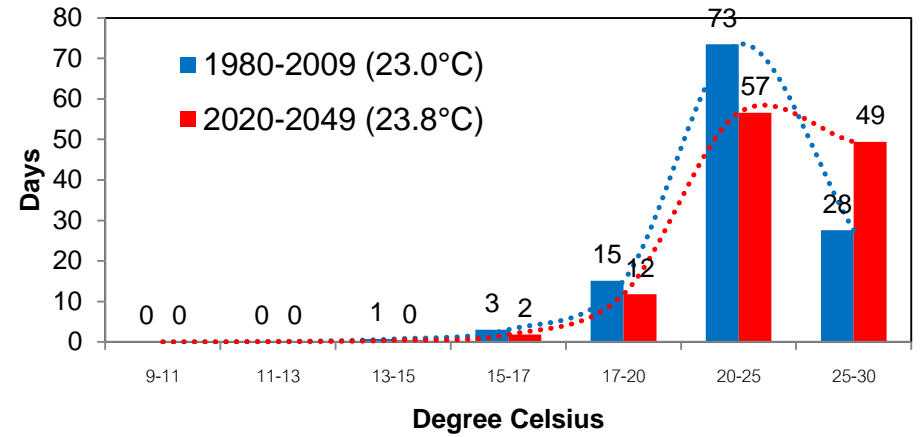
**Minimum temperature average over 30 years**



**Daily maximum temperature ditribution (days / year)**



**Daily minimum temperature ditribution (days / year)**



**Daily rainfall ditribution (days / year)**

