CHAPTER 4

Characteristics of the Study Area and Selected Communes

The study area is generally described in this chapter. Some general information is delineated relating to geographical and topographical characteristics, climate, soils and water resource. Especially, information on agricultural production and maize cultivation contributes to illustrate changes in livestock, crops and especially maize production in the study area recent years. This chapter also illustrates the characteristics of three selected communes, representing for three types of topography and cropping system in the area. The description in characteristics of selected communes and surveyed households will contribute to further elucidate the characteristics of maize farmers and their production life in the study area.

4.1 General characteristics

4.1.1 Geographical and demographical characteristic description

Dakrong was a highland district of Quang Tri province, located 50 kilometer far from province center. The district located in coordinates from 16017'55" to 16049'12" North latitude and from 106044'01" to 107014'15" East latitude. Dakrong territory spread over an area of 122,332.21 ha, having western borders with Lao PDR (Department of Natural Resources and Environment, 2013).

The topography of the district was complex, mainly high rocky hill with the dense of limestone density on the entire territory of the district. Steep and dissected topography created many difficulties in transportation and production development, especially in agriculture. This topography also gave high vulnerability for people and their manufacturing activities when it often occurred flash floods in the rainy season and drought in the dry season (poorer water holding capacity than other areas).
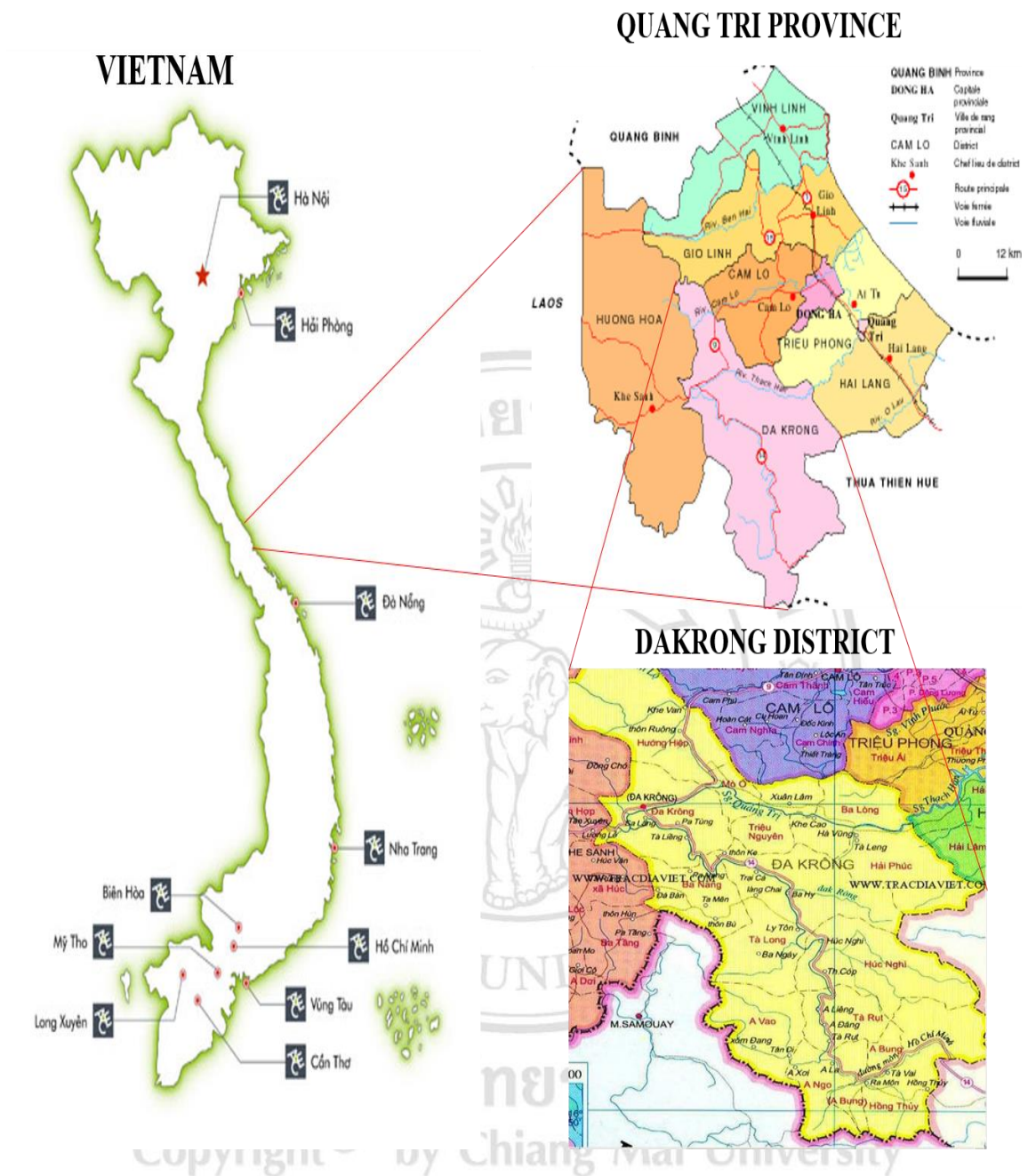
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Figure 4.1 Study area map in Quang Tri province and Dakrong district.

The district had thirteen communes and one town with a population of 39,876 people and 8,286 households. The labor force of the district was quite abundant, around 23,382 people, occupying 58.64% population. However, almost labors were working in agricultural sector (86.7%) and living in the rural area (91%) (District Statistical Office, 2013).

One of noticeable characteristics that need to be mentioned in Dakrong district was low standard living and high poverty rate. As result from key informants, there were approximately 30% of households lacking food for 2-3 months per year. In particularly, there were 5 communes bordering Lao PDR which located far from district center (from 20 to 30 kilometers). The resident life in these communes was very difficult. Their agricultural production was mainly for subsistence. In term of income, in 2013 income per capita of the district was only 7.7 million dongs (equivalent 360 USD), equaling one fifth of income per capita of the whole country (1.960 USD). Besides, the district's poor rate was very high, occupying 30.56% in 2013 although this poor rate had been decreasing significantly under the support policies of government every year (Figure 4.2).
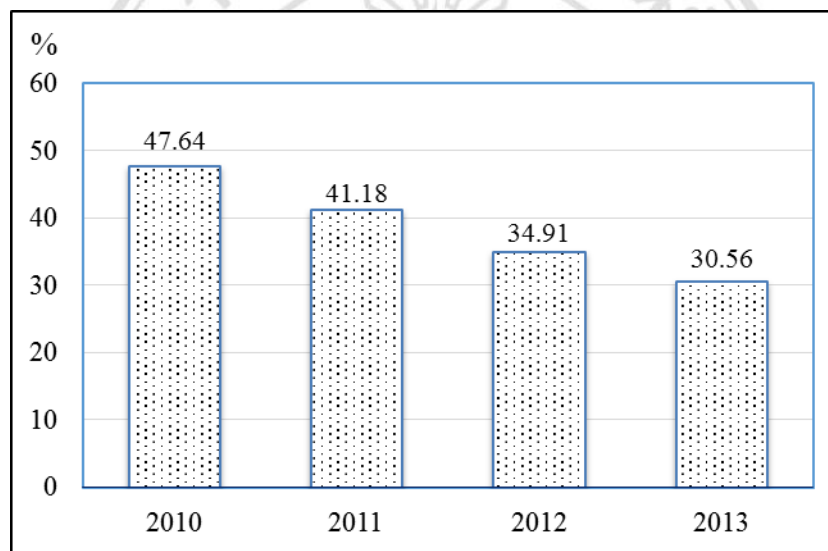

Figure 4.2 Poor rate in Dakrong district from 2010-2013 (%)
Source: District Statistical Department, 2013.

In fact, Vietnam government had so many support policies such as food aid, support loan for the poverty, extension policies, etc. However, the improvement in socio-economic life here was quite slow compare to other areas. According to head of communes, the main reason was that, almost people here were the ethnic minorities (82%), includes Van Kieu people, Pa Ko people and Pa Hy people. They had low education, low farming experience and low capacity to adapt to the market economy, etc. Thus, until now the socio-economic development in the area still has been considered as a difficult task of local authority.

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4.1.2 Climatic characteristics

Dakrong climate had the same characteristics of as in Quang Tri province and Central region – one of hottest areas in Vietnam. There are two distinct seasons in Dakrong, the rainy season with storms and tropical cyclones characterized by heavy rainfall and strong winds, occurring from September to January; and the dry season with little rain, lasting from March to early of August (Figure 4.3).
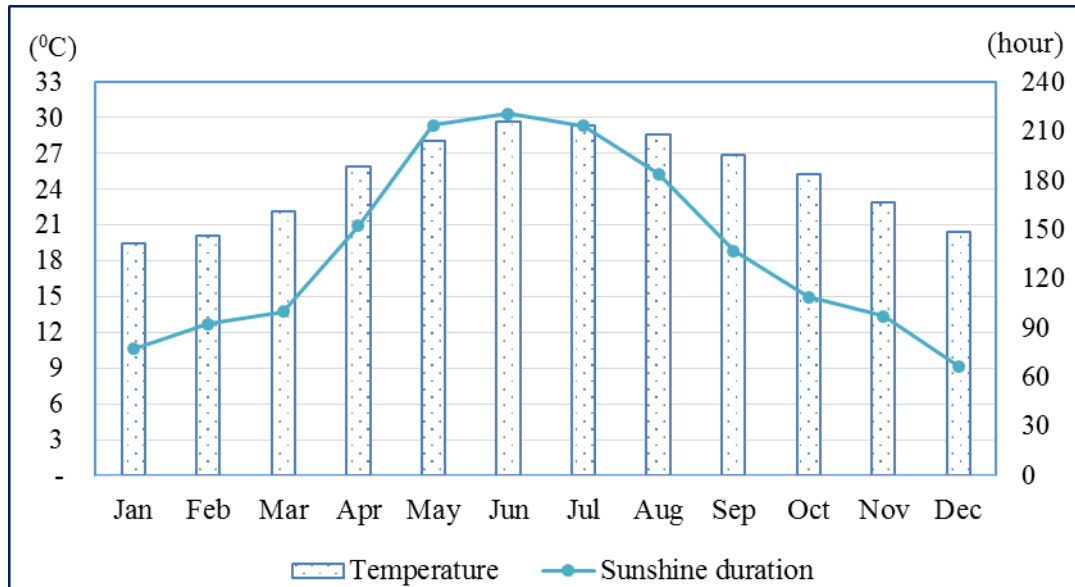

Figure 4.3 Monthly average temperature and number of sunshine hours
in Dakrong District from 2000 to 2012
Source: Hydrometeorological Center of Quang Tri Province, 2013.

The recorded monthly average temperature in Dakrong was not much high, under 30^{0}C in almost months of the year (Figure 4.3). However, the daytime temperatures especially in the dry season, was quite high. It fluctuated from 34-39°C in the summer season. The highest daytime temperature was recorded in this season was over 40°C (Hydrometeorological Center, 2013). Besides, the average number of sunshine hours in Dakrong was quite high in the period of April to August (over 160 hours per month), reaching a peak at June (almost 230 hours, Figure 4.3). The high temperature and long sunshine duration combined with the hot dry wind which be blown from the southwest for about 40 to 60 days a year (ADPC, 2003) from April to July, making these months became the hottest period in the year.
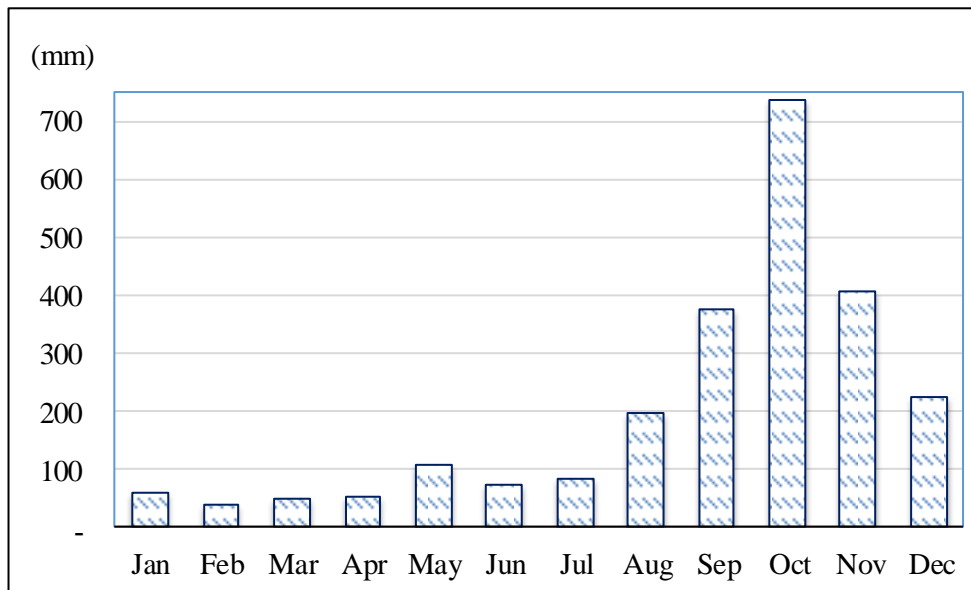
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Figure 4.4 Distribution of average rainfall during the months of the year
in Quang Tri Province from 2000 to 2012 (mm).

Source: Hydrometeorological Center of Quang Tri Province, 2013.

Rainfall was unevenly distributed in the month of the year in which, rain mainly occurred from September to December (Figure 4.4). The highest rainfall concentrated on October, over 700mm, accounting for nearly 1/3 of the total annual rainfall. However, in the dry season, rain fall was quite low, under 100mm/month in average. It combined with high temperature to generate prolonged drought in the area.

During the year from 1989 to 2012, it showed a highly fluctuation in total annual rainfall and annual average temperature in Dakrong district. The total rainfall fluctuated from 2,000 mm to over 3,000 mm through the years. While, annual average temperature although had more obvious fluctuations, it still followed a rising trend. Except for year 2011 with the average temperature was lowest (under 23^{0}C), another years witnessed the significantly increasing in temperature from 23.5^{0}C in 1989 to almost 25.5^{0}C in 2012 (Figure 4.5).
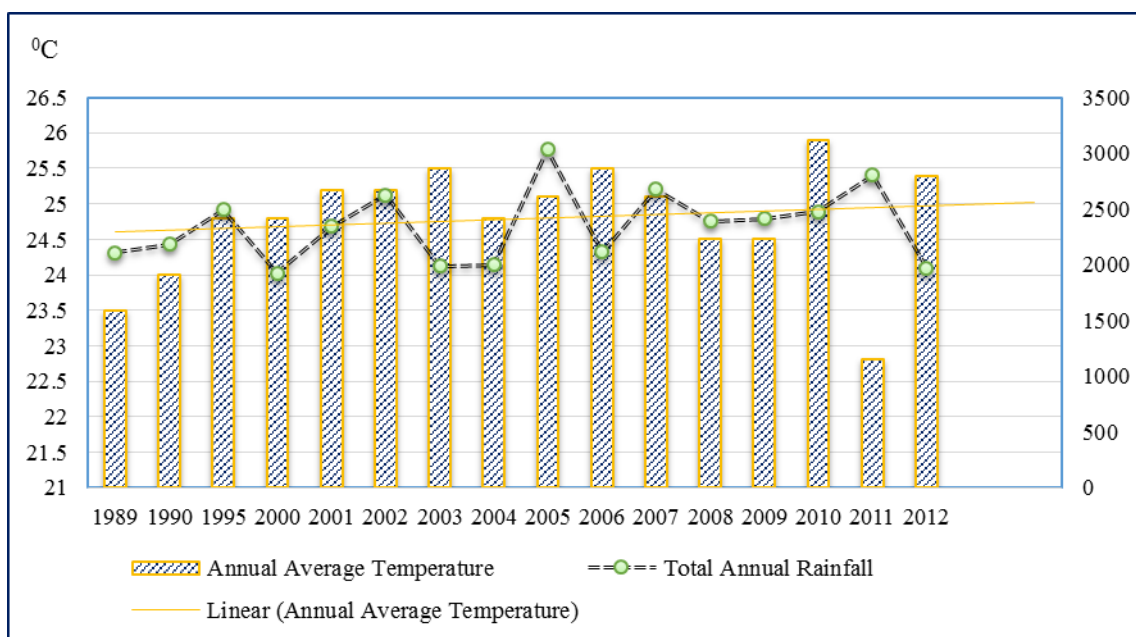
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Figure 4.5 The distribution of annual rainfall and average temperature
in Quang Tri Province from 1989 to 2012 (^{0}C).
Source: Hydrometeorological Center of Quang Tri Province, 2013.

Regarding climate hazards, Dakrong district had faced all severe climate phenomena of tropical climate area such as, drought, flood and flash flood, storm and cool spells. The occurring time of these phenomena showed in Table 4.1.

Table 4.1 Climate hazards in the study area.

Type of climate hazard	Occurring time	Influence on crops
Drought	April to July	Strongest impact
Cold spells	December to March	Second strongest impact
Flood and flash flood	Late August to October	Moderate impact
Storm	August to September	Moderate impact

Source: Focus group discussion, 2013.

It can be seen that, the climate hazards occurred during the year in Dakrong district. In which, the results of group discussions showed that drought and cool spells seemed to be the biggest problems in the area, following by flood and storm. These above climate hazards impacted on agricultural production, damaged directly on almost crops, made low productivity and low profit for farmers in Dakrong district (Table 4.2).

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Table 4.2 Effects of remarkable climate risk events and its impacts on crops in the area

Year	Climate phenomenon	Description	Consequence
2003	Drought	This was one of the most severe drought years. People had not enough water to drink because the rivers and wells were dry. Crops and grass on the field were burn 100% at the period of June to August.	Lately sowing maize and other crops in summer season lost completely productivity (100%). Early sowing crops lost more than 50% productivity.
2004	Drought	It was a milder drought year. Crops were burn but still gave productivity.	Maize productivity and upland rice decreased by 40%. Lowland rice, peanut and cassava was impacted slightly.
2005	Normal year	No high temperature and dryness in summer season and no cool spells in the winter season.	High maize productivity, other crops were growing well.
2006	Drought	This was also a one of severe drought years. Crops planted in the hill area were burn 90% and could not give productivity	Maize and upland rice were lost more than 70% productivity.
2007	Normal year	No high temperature and dryness in summer season and no cool spells in the winter season.	High maize productivity, other crops were growing well.
2008	Cold spell	It was one of the most serious cold spell years. Temperature at some point time downed to below 7°C. Animals dead, crop's seeds could not germinate after sowing in the spring season.	Farmers had to replanted maize, rice, green bean and peanut in the spring season. Summer crop might deploy later. Farmers who no replanted were lost 40-70% crops' productivity.

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Table 4.2 (Continued)

Year	Climate phenomenon	Description	Consequence
2009	Heavy storm	High winds accompanied by heavy rain and sharply flood water, downing from the rivers.	This climate phenomenon mainly impacted on perennial crops and animals. Annual crops had harvested before the storm occurred.
2010	Drought	Drought occurred with a milder degrees in comparison with drought in 2003 but it lasted by a longer time (from early of March to August), thus, at the end of summer season (July to August) no crop could be survived.	Farmers could not grow maize and other food crops in the summer season. Some households tried to grow maize in this season but the productivity lost by 80%.
2011	Cold spell	This cold spell less impacted on animals because the lowest temperature was not as low as in 2008. However, this cold spell had strong impact on crops because it took place in a long time period (from December (2010) to February (2011)).	Rice, peanut, maize gave very low productivity. Maize productivity was lost more than 60%.
2012	Normal year	No high temperature and dryness in summer season and no cool spells in the winter season.	High maize productivity, other crops were growing well.

Source: Focus group discussion, 2013.

During the year from 2003 to 2012, it was observed drought occurred around 4 years and faced with cool spell two years. Obviously, the abnormal change of weather caused many difficulties for farmers in the area not only in maize production but also in other farming activities.

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4.1.3 Land use and water resources

As can be seen from the Figure 4.6, almost land area of the district was forestry (75.41%) and unused land (19.29%). Other kind of land such as specialize land (land used for building of infrastructure, roads, public construction, etc.), residential land or aquaculture land occupied a small percentage (less than 1%).
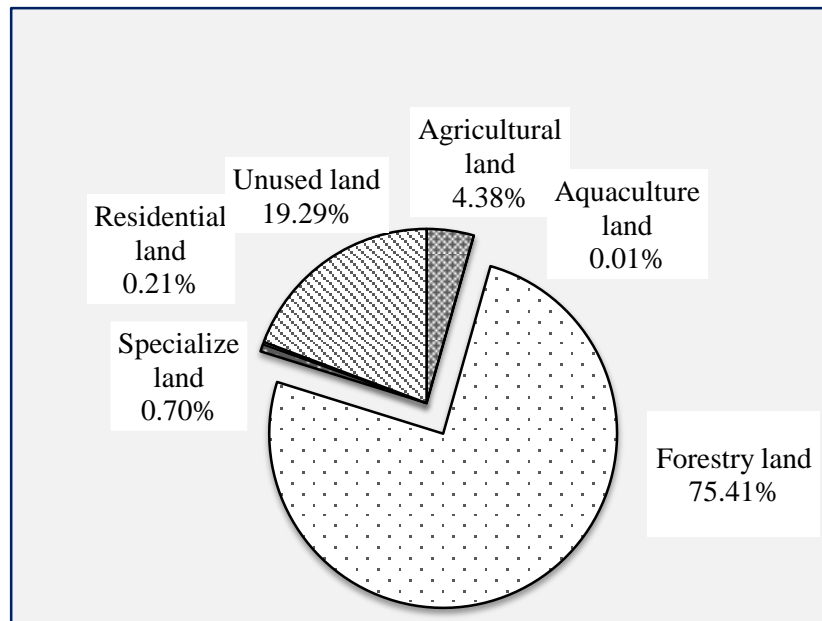

Figure 4.6 Land use distribution in Dakrong district (2012)
Source: District Statistical Department

As mentioned above, almost people in the district work in agriculture sector, however, in 122,444.64 ha of natural land area, agricultural land use only occupied 4.38% (5,363.41 ha), in which flat land accounted for only 19.9% (District Statistical Office, 2013). Almost area was hilly and mountainous land which was not suitable for developing agricultural production. Soil for agriculture was devised into two types (1) basaltic soils distributed on the hill and near the forests, (2) alluvial soils distributed along the river. Soil quality tended to decrease over time due to erosion (on the hill) and the deposition of sand (in the river).

Surface water resource mainly came from two river which are Ba Long and Dakrong river, and stream system. However, the water volume of this river system changed following the season. In the summer, it was usually dry and not capable of providing irrigation water. Recent year, under the development of the hydropower plants, the

ability of supporting irrigation water of the river was more limited.

4.2 The agricultural sector and maize production

Although agricultural land area was quite small, agriculture still played a very important role in economy of the district. The value of agricultural production in 2013 accounted for 69.9% of the total production value of the district (District Statistical Office, 2013).
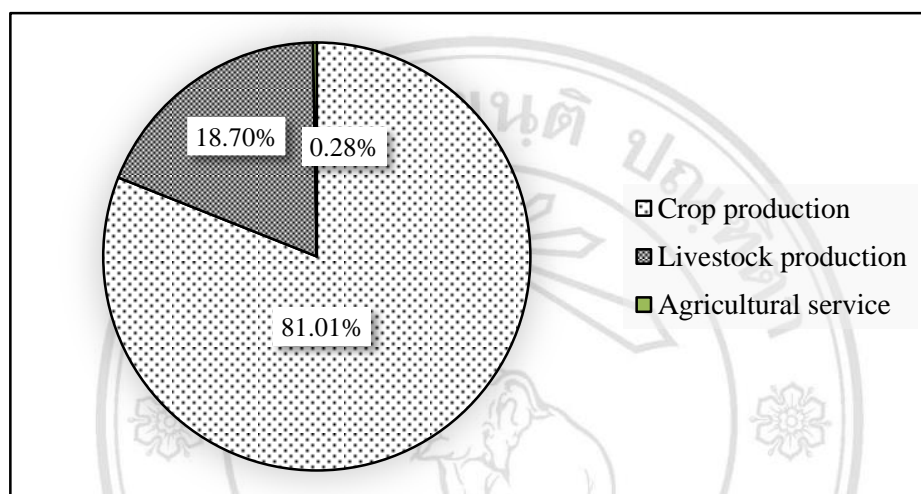

Figure 4.7 Production value of fields in agricultural sector in Dakrong district (2012)
Source: District Statistical Department, 2013.

Agricultural production primarily focused on two fields which are livestock and crop production. The production value distribution of these fields was showed in Figure 4.7

As the results, crop production occupied a big share in the total of agricultural production value in Dakrong district (81.01%), livestock production value accounted for nearly 19% and a very small contribution belonged to agricultural service field.

4.2.1 Livestock production

Livestock in the district had the slightly increase from 2000 to 2012. However, the period of 2010 - 2012 witnessed the fluctuation in number of livestock. In 2011 accepting for poultry, the number of animals decreased significantly due to the prolonged cold spell. It recovered in 2012 and has remained stable in quantity of animals until now.

Table 4.3 Number of livestock in the district over the years (animal head).

Animal	2000	2005	2010	2011	2012
Buffalo	4,333	5,282	6,100	5,314	5,713
Cow	2,934	4,011	5,150	4,806	5,331
Pig	6,193	10,893	8,050	7,756	8,521
Goat	1,245	3,465	3,750	3,676	3,150
Poultry	43,230	53,140	42,100	45,869	52,009

Source: District Statistical Department, 2013.

With farm households in Dakrong, livestock, especially, cattle played an important role in supporting manure and draft power. It came from the low level of production of farmers here and the limitation in applying tractors in slope land area. This was the reason why farmers in Dakrong still maintain the number of cattle and almost households were raising these animals.

4.2.2. Crop production

In the district, comparing with other crops, paddy rice and maize' yield increased rapidly from 2000 to 2012 (Table 4.4).

Table 4.4 Yield of crops in the district over the years (1000 ton).

Crop	2000	2005	2010	2011	2012
Paddy rice	1.58	2.79	3.01	3.00	3.68
Upland rice	1.40	1.55	1.11	0.95	0.97
Maize	0.70	0.78	1.23	1.67	2.97
Cassava	4.55	5.80	8.41	22.37	11.08
Peanut	0.44	0.80	0.73	0.96	0.94
Beans	0.18	0.23	0.44	0.29	0.28
Vegetables	1.00	1.35	1.10	1.19	1.54

Source: District Statistical Office, 2013.

Rice and maize yield rose 3 times and 4 times, respectively after 12 years. Especially, maize yield grew up quickly in the period of 2010-2012, by around 1,700 ton which doubled its yield in 2005. This change came from the application of new

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production techniques (seeds, fertilizer, planting techniques, etc.) and expanding of cultivated area in this stage.

The most notable change was upland rice yield, growing down by 300 ton from 2005 to 2010 and continued decreasing in the period of 2010-2012. This crop was reduced area and replaced by maize and some other crops because upland rice gave lower productivity and less profit than these crops.

Besides, some crops in Dakrong had by leaps and bounds yield change in some years such as cassava (2012) and beans (2010). It was explained by changing in area under impacting of market price. The farmers often increased planting area when these products' price grow up. However, the price dropped down one year later thus, they had to reduce the area, leading to reducing in yield of these crops.

4.2.3 Maize production

The survey results showed that maize was one of the most important crop after rice in the study area. Maize was grown in all communes of the district. It was grown in two seasons (1) spring season was from November and December to March and April and (2) summer season was from April and May to August and September.

Maize land area increased significantly from 2000 to 2012 (by over 60 ha per year). Especially, cultivation area increased quite quickly in the spring season, nearly 500 ha after 12 years, doubling the increasing of cultivation area in the summer season (250 ha). It can be explained that, under the impact of drought, farmers reduced amount of land in growing maize to use for planting another crops such as: peanut, cassava which had low drought risk than maize (Figure 4.8).
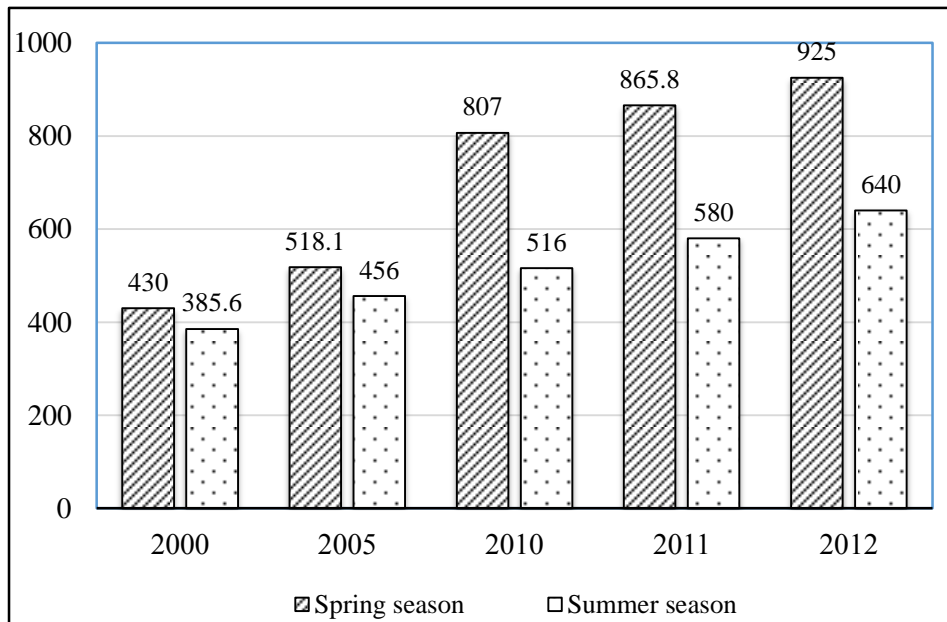
Figure 4.8 Maize cultivated area in two seasons over the years in Dakrong (ha)

Source: District Statistical Department, 2013.

Along with the increase in cultivated area, maize yield in the study area grew up significantly year by year (Figure 4.9).
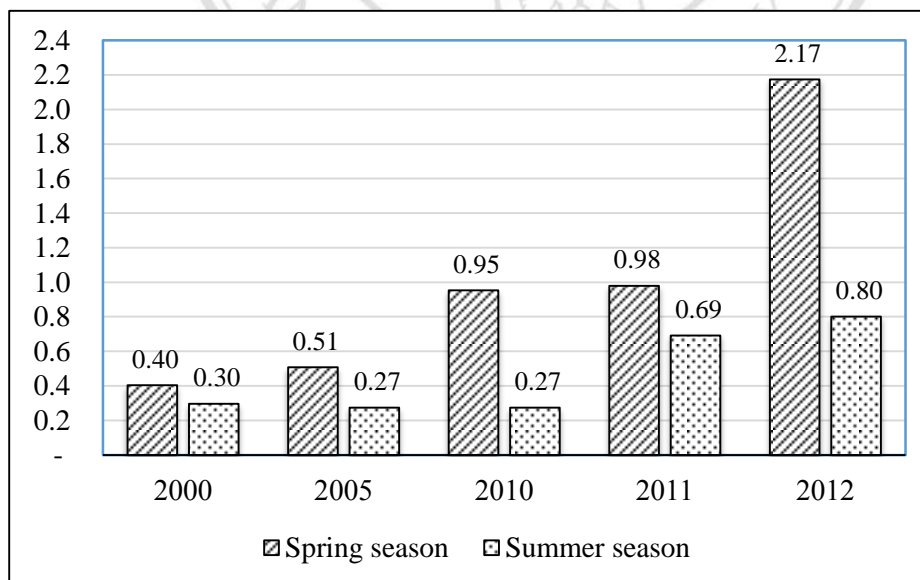

Figure 4.9 Maize yield in two seasons over the years in Dakrong (1000 ton).

Source: District Statistical Department, 2013.

The period of 2010 to 2012 maize yield in two seasons had much change under the impact of climate variability. In 2010, the severe drought had strong impact on maize yield not only in the summer season but also in the spring season. The maize yield this year, especially in the summer season was quite low, only 270 ton (0.52 ton per ha). Whilst, in 2011 cold spell became the main factor impact on maize yield in the spring season, making maize yield in this season was only a haft of its in 2012. As mentioned in climatic characteristics section, the weather in 2012 was quite good. Therefore, maize yield of this year was very high comparing to the previous year (0.8 ton and 2.17 ton in the summer season and the spring season, respectively). This indicated that the weather factor had strong influence on maize production in Dakrong district.

In term of technique, almost farmers in Dakrong largely had produced maize basing on their experience. Especially, farmers who were ethnic minorities mainly growing maize on the hill without fertilizers, watering or applying care processes according to technical requirements. In recent years, Agricultural and Rural Development department (ARDD) and Extension Station conducted many training courses for maize farmers related to production techniques. Especially, ARDD opened a training course "Maize Cultivation Techniques Adapting to Climate Change" for 300 farmers in 2011, and 6 training courses related to cultivation techniques in 2012. The content of these training courses included (1) nutrient for maize, (2) maize variety selection for each season, (3) seasonal calendar, (4) farming practices on slope area, (5) inter-cropping techniques, etc. (Key informant interview, 2013). These training courses contributed to increase gradually awareness of farmers about climate change and measures to cope with climate change impacts.

Regarding seeds, from 2010 to 2015 the poor farmers in the highland area of Quang Tri province has been being sold good maize seeds with low price from seed governmental companies under Seed Subsidy program. However, seed supply was limited (2 kilogram per household per year and only for the poor), other farmers had to buy from outside or selecting seeds by themselves if needing more seeds.

4.3. Summary characteristic of household survey

4.3.1 Selected communes

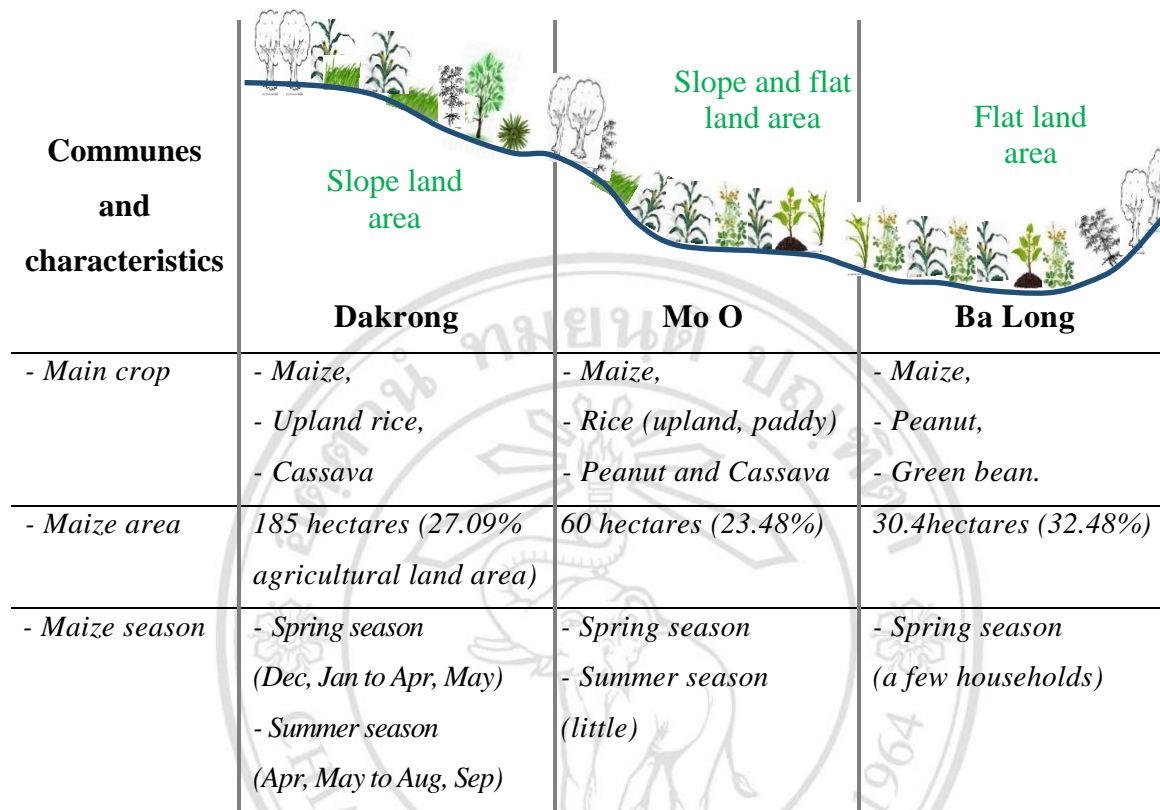| Communes and characteristics	Dakrong	Mo O	Ba Long
- Main crop	- Maize, - Upland rice, - Cassava	- Maize, - Rice (upland, paddy) - Peanut and Cassava	- Maize, - Peanut, - Green bean.
- Maize area	185 hectares (27.09% agricultural land area)	60 hectares (23.48%)	30.4hectares (32.48%)
- Maize season	- Spring season (Dec, Jan to Apr, May) - Summer season (Apr, May to Aug, Sep)	- Spring season - Summer season (little)	- Spring season (a few households)

Figure 4.10 Summary of topography and cropping in the selected study area.
Source: Focus group discussion and secondary data, 2013.

The research selected three communes in Dakrong district which represented three types of terrain distribution and socio-economic characteristic (Figure 4.10). Darkrong commune represented high terrain with 100% of the population (5,045 people in 2013) were ethnic minorities where maize mainly grown on the hill in two season (spring and summer) with the total area of 185 ha (occupied 27.09% of agricultural land area). Mo O commune represented medium terrain, having 73% ethnic minorities and 27% ethnic majorities (in the total of 2,061 people in 2013) who grew maize mainly on the spring season on both the hill and flat land (60 ha or 23.48%). Whilst, Ba Long commune exactly opposite when 100% maize were grown at the flat land area by ethnic majorities (2,982 people in 2013). They almost grew maize on the spring season (30.4 ha or 32.48%).

This distinction contributed to provide more indicators in evaluating the differences in

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drought perception as well as adaptation capacity of maize households in the study area that presented in the previous sections.

4.3.2 Characteristics of maize households

1) Social characteristics

Result showed that, the average age of the household's head was quite high (about 45 year old), and the difference in famers' age among communes was very significant (P value < 0.01). While the education level of these farmers was quite low, under 5 years in school. Especially, Dakrong commune, where had 100% ethnic minority, was only 3 years in school (P value < 0.01) (Table 4.5).

Besides, farmers in three selected communes expressed the high experience in production with nearly 24 experience years in farming and almost 23 years in maize production. Farmers in Dakrong commune had lowest farm experience, around 18 years, while in Ba Long commune was around 28 years, highest in three communes (P value < 0.01).

The result also indicated that, the household size was as medium scale (5.38 people per household) with almost labors worked in agricultural sector (2.38 in the total of 2.60 household labors). Additionally, sixty percent of household heads were men, highest rate was in Ba Long commune (65%) and lowest rate was in Dakrong commune (53.3%), however, this difference was not statistical significant (P value > 0.05).

The poor rate was an important indicator in evaluating household's socio-economic characteristic in Vietnam, under which rural household's monthly income per capita below 400,000 dongs (equivalent around 19.8 USD) was classified as poor. According to this classification, the poverty rating in the selected communes was high (31.1%). Especially, Dakrong commune where 100% of survey data was ethnic minority and about 50% was under poverty rate. The following by Mo O commune (75% ethnic minorities) with 33.3%, whilst, Ba Long – an ethnic majority commune had much lower in poverty rate, only 10%. The relation between poverty rate as well as ethnic type and commune were very significant when extrapolating from 180 samples to the whole district (P value < 0.01).

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Table 4.5 Social characteristic of household in Dakrong (N =180).

Farmers' Characteristic	Unit	Mean	Commune			P value
			Dakrong (N=60)	Mo O (N=60)	Ba Long (N=60)	
Age	Year old	44.55 (12.37)	39.63[c] (11.83)	44.30[b] (13.85)	49.68[a] (9.66)	0.000[***]
Education	Year in school	4.54 (3.61)	2.38[c] (3.60)	4.85[b] (4.19)	6.32[a] (2.88)	0.000[***]
Farm experience	Year	23.51 (14.00)	17.93[a] (11.18)	24.43[a] (14.35)	28.1[b] (11.63)	0.000[***]
Maize experience	Year	22.69 (12.71)	17.50[c] (11.34)	22.93[b] (13.63)	27.58[a] (11.88)	0.000[***]
Gender distribution	% male	60	53.3	61.7	65.0	0.405
Household size	People	5.38 (1.75)	5.33 (1.83)	5.10 (1.50)	5.70 (1.87)	0.167
Household labor	People	2.60 (1.11)	2.33[a] (0.86)	2.40[a] (0.83)	3.07[b] (1.40)	0.000[***]
Agricultural labor	People	2.38 (0.99)	2.28 (0.88)	2.28 (0.87)	2.58 (1.17)	0.158
Household type	% poor	31.1	50.0	33.3	10.0	0.000[***]
Ethnicity	% minority	58.3	100.0	75.0	0.0	0.000[***]

Note: [(***)] the difference among groups is significant at 0.01 and 0.1 level, respectively.

[(a), (b), (c)] the different letters show the significant difference between two groups at the 0.05 level.

Source: Household survey, 2013.

2) Agricultural production and economic characteristics

The household farm size in selected communes was quite large (11.57 sao per household). Specifically, in the average each household in Bo Long owned around 12.5 sao, followed by Mo O commune, around 12 sao and Dakrong commune 10 sao, (P value < 0.1) (Table 4.6).

In farming system, paddy rice, upland rice, maize, cassava, peanut, green bean, vegetables and perennials were the main crops of research households. In which, maize was grown as a popular crop by farmers in Dakrong with maize area of 4.9 sao/household. In Mo O and Ba Long commune maize area were lower, 2.96 sao and 2.80 sao, respectively (P value < 0.01).

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Table 4.6 Land-use of households in Dakrong (sao) (N = 180).

| Farmers' Characteristic | Mean | Commune | | | Level of significance |
		Dakrong (N=60)	Mo O (N=60)	Ba Long (N=60)	
Farm size	11.57	10.07[b]	12.11[ab]	12.53[a]	0.088[*]
	(6.55)	(5.31)	(6.95)	(7.10)	
Paddy rice	1.15	0.07[b]	2.78[a]	0.60[b]	0.000[***]
	(1.97)	(0.41)	(2.50)	(1.06)	
Upland rice	1.14	2.88[a]	0.53[b]	0.00[b]	0.000[***]
	(2.10)	(2.07)	(2.09)	(0.00)	
Maize	3.57	4.90[a]	2.96[b]	2.80[b]	0.000[***]
	(2.64)	(3.38)	(1.90)	(1.90)	
Cassava	3.45	5.72[a]	3.88[b]	0.76[c]	0.000[***]
	(4.76)	(4.15)	(5.98)	(1.75)	
Peanut	3.71	0.00[a]	3.34[b]	7.78[c]	0.000[***]
	(4.75)	(0.00)	(2.47)	(5.59)	
Green bean	2.26	0.00[a]	0.60[b]	6.18[b]	0.000[***]
	(3.89)	(0.00)	(1.64)	(4.42)	
Vegetables	0.04	0.00[a]	0.00[b]	0.13[b]	0.001[***]
	(0.21)	(0.00)	(0.00)	(0.35)	
Perennial crops	0.37	0.89[a]	0.20[ab]	0.02[b]	0.088[*]
	(2.26)	(3.61)	(1.42)	(0.13)	

Note: [(***), (*)] the difference among groups is significant at 0.01 and 0.1 level, respectively.
[(a), (b), (c)] the different letters show the significant difference between two groups at the 0.05 level.
(1 sao = 500 m^2).
Source: Household survey, 2013.

Other crops either were grown in popularity in this commune but not common in other communes such as paddy rice almost was grown in Mo O with land area of 2.78 sao per household, much greater than that in Dakrong and Ba Long commune, 0.07 sao and 0.60 sao, correspondingly (P value < 0.01). Similarly, upland rice and cassava mainly were grown in Dakrong and Mo O commune whilst, green bean and vegetable largely cultivated in Ba Long commune (P value < 0.01). The difference came from the soil characteristic as well as the farming habits of farmers in these communes.

Table 4.7 Household income structure in 2012 (N=180).

Income sources	Value (1000 Dongs)	Ratio (%)
Crops	14,068	52.18
Livestock	3,261	12.10
Forestry	2,256	8.37
Non-farm activities	7,281	27.01
Other	93	0.34
Total income	26,958	100.00

Remark: 1 USD = 21,000 dongs.

Source: Household survey, 2013.

Comparing with another area, households in Dakrong district had lower income (almost 27 million dongs per year). Their income created by 4 major sources: crops, husbandry, forestry and non-farm activities. In 2012, crops occupied largest sharing in household income (52.18%), coming from selling maize, cassava, peanut and beans product. Non-farm income accounted for second share ratio, about 27%, mainly came from hired labors (stevedoring, timber transport, etc.) and handicrafts (brooms, leaf hats, etc.). Whilst, livestock especially animal livestock faced more difficult due to forest area getting narrower year by year. Livestock income was only ¼ crops' in 2012 (12.10%). Similarly, in come from forest exploitation and afforestation occupied a small proportion by the above constraint (8.37%). Other income sources such as salary, away from home working, etc. occupied a very small share (under 1%) (Table 4.7).

3) Maize productivity and households' purposes in maize production

Results from Figure 4.11 once again indicated that, maize productivity in the study area suffered strong effect of climate factor. In the spring season, it reached 150 kg/sao whilst, in the summer season under impacting of hotter weather, maize productivity was only 111 kg/sao. Especially, in drought year, maize productivity dropped by above 54%, from 144.39 kg/sao in normal year to 65.94 kg/sao in drought year. This was the reason why all of farmers in the study area believed that drought is the most serious problem impacting on their maize production.
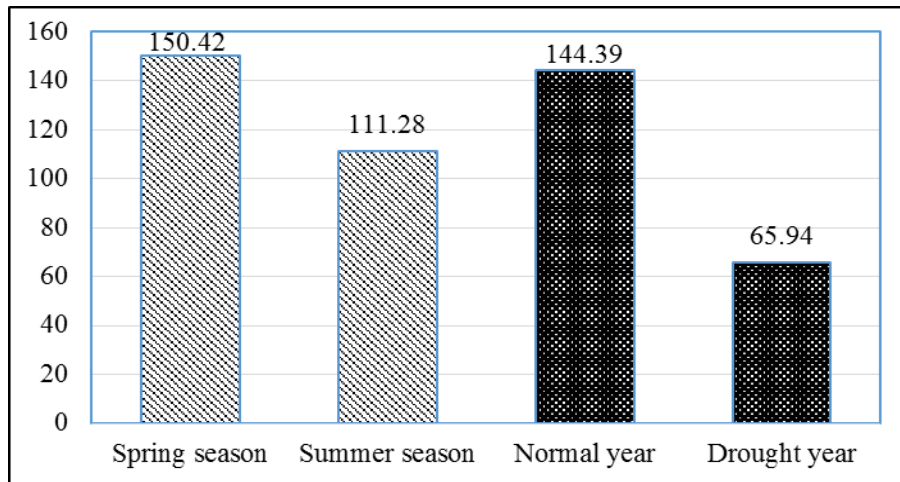
Figure 4.11 Maize productivity of household (kilogram/sao) (N=180).

Source: Household survey, 2013.

Although, maize was an important crop in household farming system in the study area, "the first objective" in maize production was quite different among communes, household types and other socio-economic characteristics of the households (Figure 4.12).
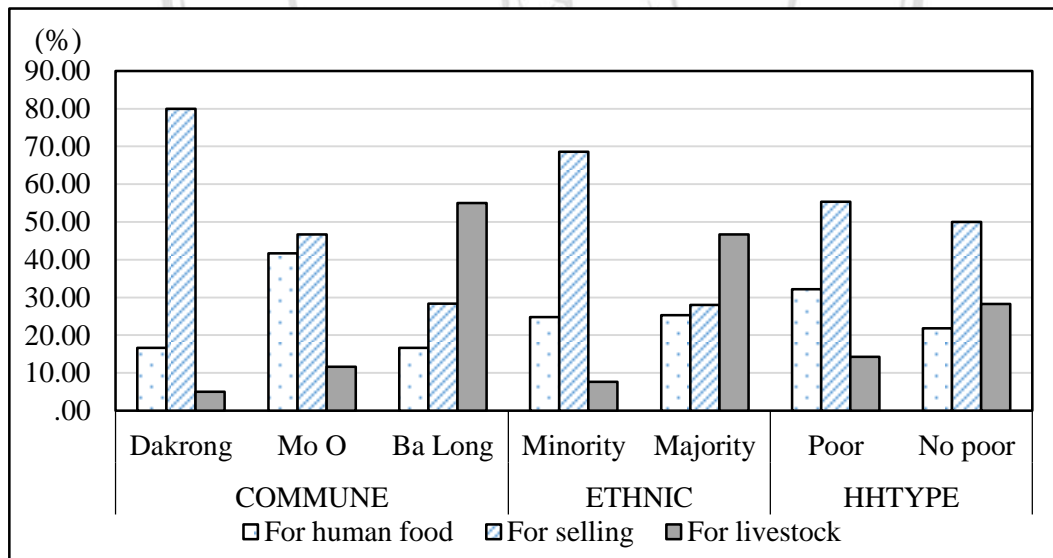

Figure 4.12 First objective in maize production of the farmers (%) (N=180).

Source: Household survey, 2013.

Majority of farmers in Dakrong commune (nearly 80%) grew maize for selling as first objective whilst almost 60% of the farmers in Ba Long commune firstly used maize product for breeding. Mo O where farmers grew maize in both flat land and hill land had balance in food and selling objectives (around 40% household aimed to each objective).

Similarly, a small percentage of the ethnic minorities and poor families used maize for producing bread as the first choice, but rather for food and selling. Especially, most of ethnic minority households (almost 70%) grew maize for market where they got cash to cover the difficult life.

4) Farmers' approach to maize production techniques

The survey result indicated that, the proportion of farmers approached agricultural technologies not so high, over 40% for whole district. Especially, only 30% farmers in Dakrong commune had opportunity to approach to maize production technologies such as: tillage, seed rate and plant geometry, nutrient management, seasonal calendar, irrigation, weeding and inter-cropping, etc., from Agricultural and Rural development Department and Agricultural Extension Station.
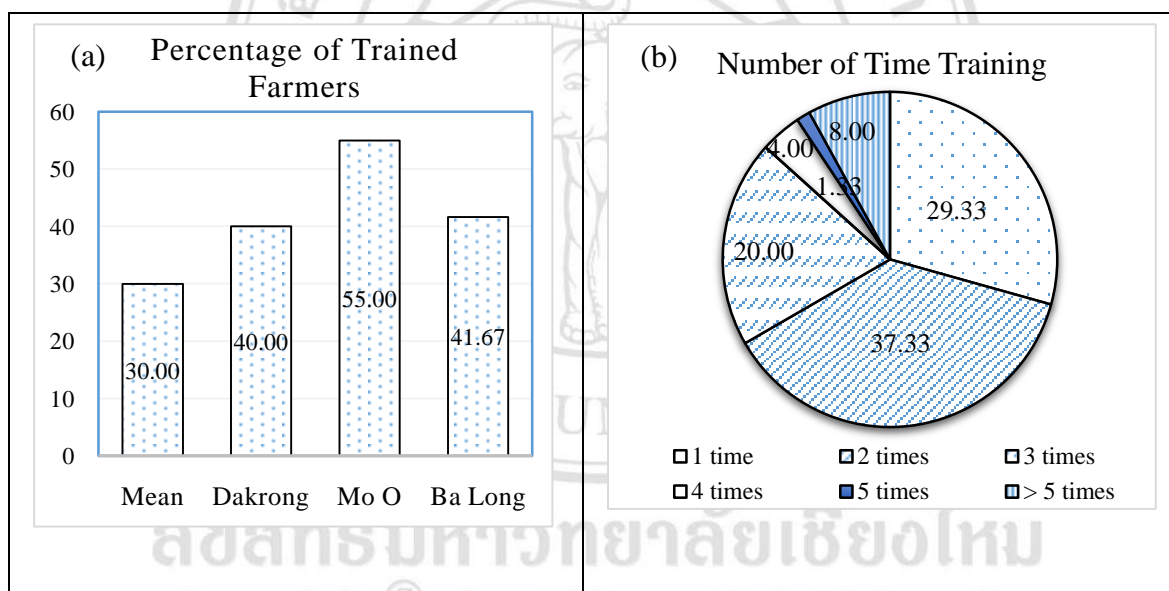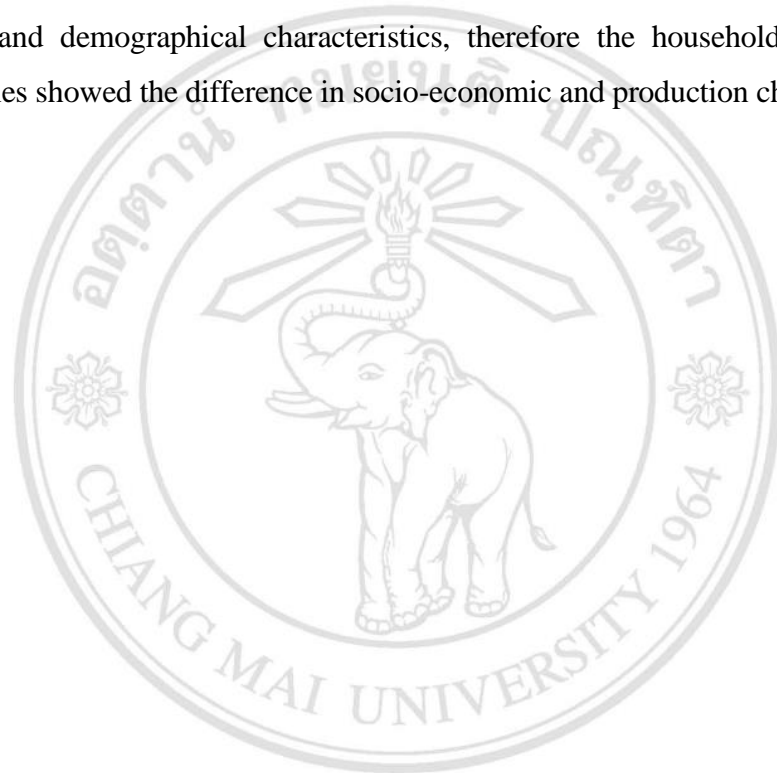

Figure 4.13 Farmer's maize production technologies approach (N=180).
Source: Household survey, 2013.

The result also showed that almost trained farmers participated in 1-3 maize production training courses (occupying over 85%) which organized by Agricultural Extension Station and Agricultural and Rural development Department. However, when these trained farmers were asked "whether you have been applying new techniques after training?" most of them answered that they just applied 40-50% for the simple techniques, such as: seed rate and plant geometry, season. Some other techniques were

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ignored such as inter-cropping, irrigation, etc., because they required higher investment or were not familiar with farmer's production habits.

In brief, Dakrong district had specific socio-economic characteristics of a highland area. In general, the agricultural production as well as maize production in the district was less developed. Agriculture attracted nearly 90% of social labor force, but the income or production value from this sector in the whole district as well as surveyed households was lower than other sectors. Three selected communes reflected the differentiation in geographical and demographical characteristics, therefore the household survey from these communes showed the difference in socio-economic and production characteristics.