

CHAPTER 5

RESULTS OF FIELD SURVEY

Field survey was undertaken from March to May 2002 in three out of nine brigades in the Thanh Ha Farm in order to identify the problems related to management practices in soybean production systems at Hoa Binh Province, Vietnam. The results are presented as follows:

5.1 Description of survey site

Geographical location and history

The Thanh Ha Farm is located in Kim Boi district, Hoa Binh province, and 85 km far from Ha Noi in west-east direction. Its geographical coordination is between $23^{\circ} 32' - 23^{\circ} 40' 23''$ N and $105^{\circ} 32' - 105^{\circ} 40' 23''$ E. Topography is characterized by hill and mid- land with slope ranged from 3 to 15° (Figure 5.1).

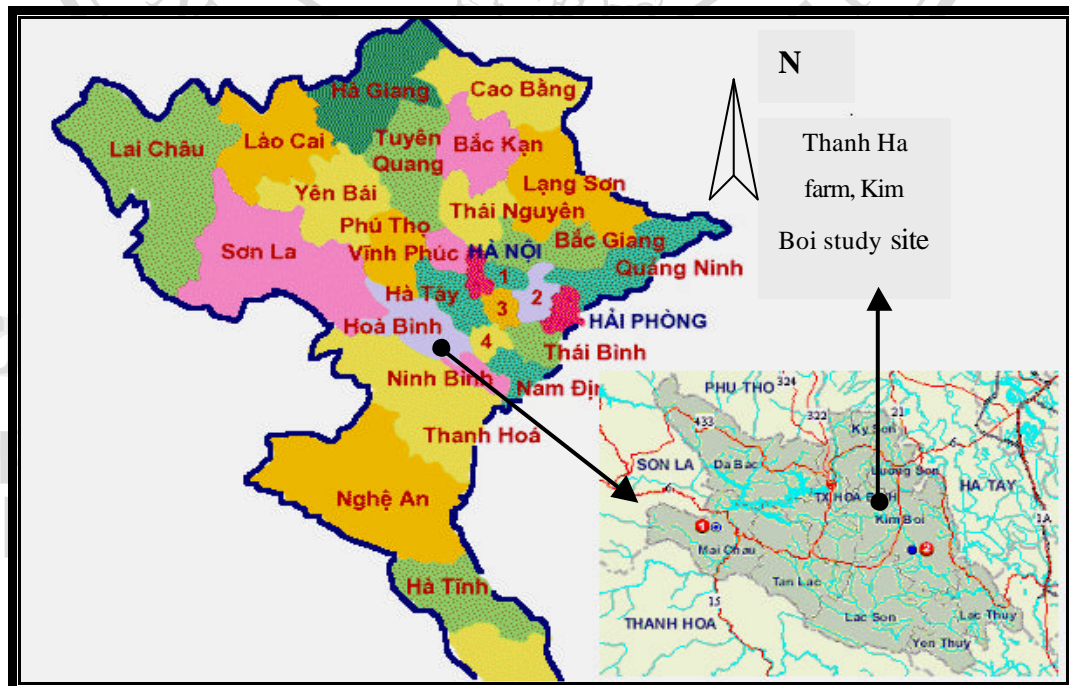


Figure 5.1 Map of study site in Kim Boi district, Hoa Binh province.

The Thanh Ha State Farm was established on 10 December 1960 under the administration of the former Ministry of State Farm. However, it was continuously managed by the army until 1975 and was area coffee and orange were planted. In 1975, the farm was transferred to be National Fruit and Vegetable Company. Since December 1995, the State farm has been under the administration of Hoa Binh province. The farm includes nine brigades and covers an area of 1,630 ha, distributed to 1,470 families who are living and producing there. At present, the rights of the land utilization have been allocated to farm -workers.

Climatic conditions

The climate of the Kim Boi district can be described as ‘a wet-dry monsoonal tropical climate’. The summer lasts from May to October and is characterized by heavy rainfall and hotness.

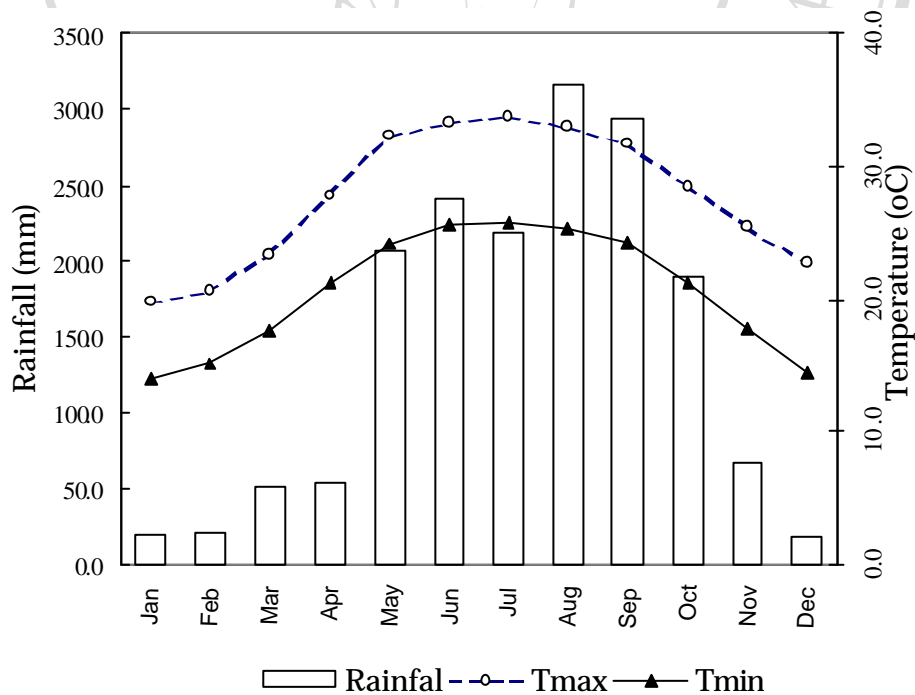


Figure 5.2 Climate in Kim Boi District, mean monthly data from 1990-2000.

Source Meteorological station of Chine district, Hoa Binh province

During these months, rainfall takes an account of 80 percent of total annual rainfall. Peak precipitation is in the months of August and September. Total annual rainfall ranges between 1500 and 2000 mm (Figure 5.2). The average annual temperature is 25°C, with an average maximum temperature of 35°C in August and an average minimum temperature of 12°C in January. The winter prevails in period November to February. A light rainfall covers about 20 percent of annual rainfall. The lowest temperature of 12°C occurs in December and January. The mean monthly temperature ranges from 12°C in December to 22°C in June.

Soil characteristics

Almost all the soil samples in the Thanh Ha farm were belonged to soil type of clay loam. Soil characters were described in Table 5.1.

Table 5.1 Soil data in Thanh Ha farm in Kim Boi district by layers.

	0-15	15-30	30-60	60-90	90-120	120-150
cm.....					
Sand	30.4	26.4	30.8	31.6	41.6	52.8
Silt	29.4	26.6	23.2	27.2	28.6	26.8
Clay	40.2	47.0	46.0	41.2	29.8	20.4
pH _{KCl}	4.8	4.7	4.8	4.8	5.0	4.8
OM (%)	3.17	2.46	1.32	1.22	0.73	0.51
N (%)	0.158	0.123	0.07	0.06	0.037	0.024
P ₂ O ₅ (%)	0.12	0.12	0.10	0.10	0.10	0.10
K ₂ O (%)	0.066	0.040	0.050	0.030	0.050	0.052
Available P (mg 100g ⁻¹ soil)	4.0	2.0	2.0	2.0	2.0	2.0
Available K (mg(100g ⁻¹ soil)	16.7	11.2	11.2	7.7	9.6	6.0
EC mS/cm	0.17	0.12	0.26	0.09	0.10	0.10

Source: National Institute of Agricultural Planning and Projection, 1998.

In general, the nutrient status of most soils in the study area is classified as medium to high. The moderately weathered floodplain soils have a relatively high nutrient status. However, in areas of upland soils which erosion has been severe, soil reaction is more acid, limiting the levels of available phosphorus (2.0 to 4.0 mg 100⁻¹ g) and total phosphorus (0.1 to 0.12 %). In addition, the content of nitrogen, organic matter in the topsoil (0-15 cm) are 0.158%, 3.17 % and 4.8 - 5.0, 0.26 ms cm⁻¹, respectively. Soil reaction of some soils in the study area is moderately acid, with a pH ranged from 4.8 to 5.0; therefore, it is relatively favorable for soybean growth.

5.2 Characteristics of households sample

Social features

Three target brigades, namely 2, 4 and 7 have a total 500 families with total population of approximately 2200 people. The results of interview from ninety households indicated that the average of family members was four to five in all brigades (Table 5.2).

Table 5.2 Demographical information in three brigades in study site.

Category	Brigade 2 (n=30)		Brigade 4(n=30)		Brigade 7(n=30)	
	Mean	SE	Mean	SE	Mean	SE
No of person/HHs	4.2	0.24	4.3	0.26	5.0	0.22
<i>By gender:</i>						
Men	1.9	0.15	2.0	0.17	2.4	0.15
Women	2.2	0.16	2.3	0.17	2.6	0.18
Ratio of men over total persons (%)	46.7		47.0		51.8	
<i>By age:</i>						
<16 yrs old	1.9	0.06	2.0	0.09	2.1	0.12
16 –45 yrs old	1.0	0.14	1.1	0.13	1.4	0.11
45- 55 yrs old	1.1	0.14	1.1	0.15	1.5	0.12
Labor	2.2		2.3		2.9	

It was found that the ratio of men over total family persons was slightly difference among brigades (46.7 – 51.8%). Average labor force in family ranged from 2.2 to 2.9 labors (Labor age is considered between 16 and 55 years old). The quality of labors was high because most of them were farm-workers. Therefore, it can support to agricultural production to get higher productivity than other villages outside of Thanh Ha farm.

5.3 Land use in Thanh Ha farm

Regarding landholding size, almost all farmers have owned considerably land area for cultivation. The most arable land was 22.3 *sao* for brigade 2 but the least of 8.7 *sao* for brigade 7. The results were illustrated that most of their farm operations were still relied on their own land, and more useful with farms for only crop cultivation (Table 5.3). Growers have exploited intensively the capability of land, it was proved that ratio of land use was greater 2.0 times for most households in all brigades.

Table 5.3 Arable land and sown area of household in Thanh Ha farm.

Unit: *sao* (1 *sao* = 360 m²)

Indicators	Brigade 2 (n=30)		Brigade 4 (n=30)		Brigade 7(n=30)	
	Mean	SE	Mean	SE	Mean	SE
Arable land	22.3	0.71	21.9	0.81	8.7	0.32
Sowing area	48.3	1.60	47.6	1.63	19.0	0.65
(Ratio of land utilization)	(2.0)		(2.1)		(2.1)	
Cowpea	0.5	0.02	0.5	0.02	0.2	0.01
Corn	23.0	0.71	22.2	0.67	8.8	0.27
Green bean	0.5	0.02	0.5	0.02	0.2	0.01
Rice	4.2	0.16	4.0	0.20	1.6	0.08
Soybean	7.4	0.24	7.0	0.27	2.8	0.11
Sugarcane	2.1	0.08	2.0	0.08	0.8	0.03
Watermelon	11.1	0.35	11.1	0.36	4.4	0.15

Average sowing area of green bean and cowpea per households was inconsiderably (less than one *sao*) for all of brigades. In contrast, average sowing area of corn was the largest for brigade 2 and 4 (over 22.0 *sao* per household), while average soybean area was the largest 7.5 *sao* per household for brigade 2 and the least for brigade 7 (2.8 *sao* per household).

5.4 The role of soybean in cropping systems

5.4.1 Cropping patterns

Some existing cropping patterns in Thanh Ha Farm are presented in Figure 5.3. The rotations of corn-soybean, cowpea-corn, rice-corn and soybean-mungbean and mono-cultured sugarcane were found in the area, in which, soybean and corn were appeared in three out of six rotations. This implied that soybean has played an important role in the existing farming systems in Thanh Ha Farm.

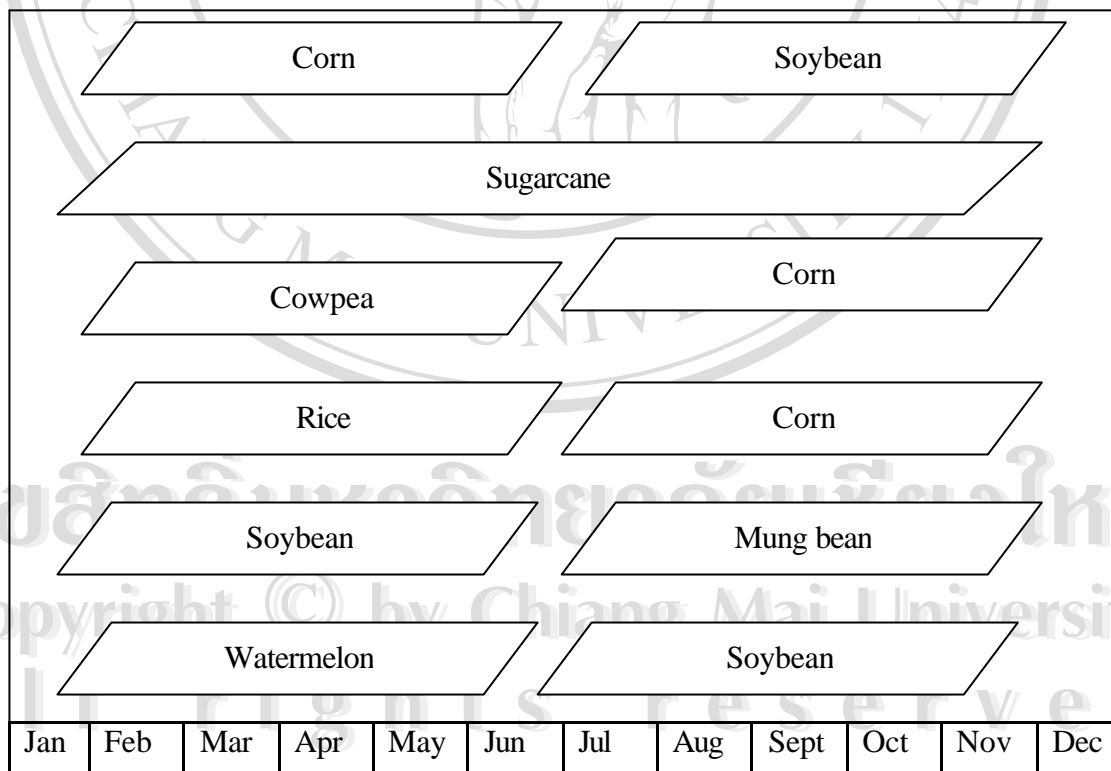


Figure 5.3 Crops and cropping systems in the study area.

5.4.2 Soybean in cropping systems

The economic of the Thanh Ha farm was a typical subsistence oriented agro-economy, which considered crop cultivation as its major part. However, the yields of crops in this area were low because of unsuitable crop, improper farm practice and low inputs. So, adaptable crop selection for this area is urgently meaningful. In which, soybean selection is one of such works because in the study area, soybean was ranked after peanut in the legume crops in terms of economic efficiency.

Table 5.4 Assessment of role of soybean in farming system
(% surveyed farmers)

	Brigade 2 (n=30)	Brigade 4 (n=30)	Brigade 7 (n=30)
<i>Improving soil fertile</i>			
Much	50.0	47.0	77.0
Little	35.0	30.0	11.0
No	15.0	23.0	12.0
<i>Increase profit</i>			
Much	20.0	40.0	45.0
Little	80.0	50.0	55.0
No	-	10.0	-
<i>Drought tolerant</i>			
Good	70.0	60.0	50.0
Normal	20.0	40.0	45.0
Worse	10.0	-	5.0

As mentioned above, soybean was planted in rotation with other annual crops, i.e., corn, mung bean and watermelon, to increase crops a year and to improve soil fertility. Table 5.4 indicated that 47 percent of farmers' answers supposed that soybean improved the soil fertility; their assessment was based on the yield of next crops sown after soybean. In terms of income from soybean production, they reported

that soybean brought more or less income (over 90 percent of surveyed farmers agreed on this).

Furthermore, soybean may be alternative in instead of rice in some areas in Thanh Ha Farm where rainfall does not distribute evenly during months a year. The lack of water has limited the growth of the rice at initial stage of flowering (from February to April), while it again has less affected the soybean growth in the same period.

Similarly, most soybean growers interviewed had a good assessment of drought tolerant characteristics of soybean, 70%, 60% and 50% of soybean growers in respect to brigade 2, 4, and 7 had such opinions (Table 5.4). In addition, soybean also were fairly evaluated by farmers in terms of increasing profitability of the farms, and this was proved that 80%, 50% and 55% of growers in brigade 2, 4 and 7 supposed that soybean might increase slightly profit. This may be because price of soybean was 5,000 VND per kg at survey time.

The rotations in which soybean is existed are more and more expanded in terms of area, and are gradually replacing and dominating other rotations as well as mono cropping patterns in the study area.

In the area, soybean grown after corn, cowpea and watermelon in various rotations was observed. In which, average of sowing area for corn – soybean was the largest (17.8 *sao* per household). Sowing areas according rotations responding with brigades were summarized in Table 5.5.

In general, almost all the cropping rotations in this area had two crops in year (a spring and a rainy crop), but one mono cropping (sugarcane) was realized in the study area. This was because sugarcane had a long growth period. In addition, sugarcane has been existed for over 30 years in the study area. At present, soybean and corn have been competed with sugarcane in this area.

Table 5.5 Sowing areas per household by rotation patterns in Thanh Ha Farm.

Unit: *sao* household⁻¹; *sao*=360 m².

Indicators	Corn-corn	Corn-soybean	Cowpea-corn	Soybean-Mungbean	Sugarcane	Watermelon-soybean
<i>Brigade 2(n=30)</i>						
Mean	29.6	11.1	14.8	10.9	9.9	14.0
SE	2.1	0.6	1.0	0.7	0.7	0.5
<i>Brigade 4(n=30)</i>						
Mean	28.1	10.1	14.0	10.6	8.9	13.0
SE	2.5	1.0	1.0	0.7	0.8	0.8
<i>Brigade 7(n=30)</i>						
Mean	28.8	17.8	21.6	14.9	11.2	13.8
SE	2.6	6.8	8.1	1.9	1.4	0.8

The results of survey indicated that sowing area for corn-soybean as much as double times sugarcane area in three surveyed brigades. This indicated that farmers prefer to grow soybean to sugarcane in study area. Small standard error of sugarcane area occurred while comparing the area of sugarcane (0.7 – 0.8 *sao* household⁻¹), implying that there have slightly differences in terms of area among surveyed brigades.

5.5 Soybean management practice

5.5.1 Soybean variety

The farmers were supplied soybean varieties from various sources, i.e., Vietnam Agricultural Science Institute (VASI), Vietnam Agricultural Genetic Institute (VAGI) and provincial extension stations (Table 5.6). Farmers in brigade 2 mainly have taken soybean varieties from VASI (58% of surveyed farmers), while farmer in brigade 7 received these from provincial extension stations (66% of surveyed farmers).

Table 5.6 Sources of supplying soybean variety in Thanh Ha farm.

Brigade, namely	Source of soybean variety sold (percentage)		
	VASI	VAGI	Extension stations
2	58.0	32.0	10.0
4	30.0	23.0	47.0
7	21.0	21.0	66.0

At present, there is the diversification of soybean varieties, which are being provided by some organizations belong government (Table 5.7).

Table 5.7 Soybean varieties used in the study area as provided by government organization.

Variety name	VASI	VAGI	Extension stations
(%).....		
AK06	10.0	-	
DT 84	30.0	69.0	50.0
VX93	50.0	-	-
TN12	10.0	31.0	-
Hoa Binh	-	-	50.0

There were five major soybean varieties those used to be grown in Thanh Ha farm, supplied by VASI, VAGI and extension stations. Thus, it is so hard to suggest to farmers which soybean varieties are best adaptable the areas and bring the highest productivity in current circumstances, i.e., poor soil and varied climate in the area. Generally, the Vietnam Agricultural Science Institute has supplied four out of them, namely AK06, DT84, VX93 and TN12, except Hoa Binh (local variety).

The results revealed that there were differences in soybean varieties that were used by growers in Thanh Ha Farm (Table 5.8).

Table 5.8 Soybean varieties used, sowing methods, and planting dates in brigades.

	Brigade 7 (n=30)	Brigade 4 (n=30)	Brigade 2(n=30)
	% HHs	% HHs	% HHs
<i>Soybean variety</i>			
Hoa Binh	23.3	16.6	0.0
DT 84	33.3	40.0	50.0
AK 06	20.0	20.0	36.6
Both DT 84+Hoa Binh	13.3	13.3	13.3
Both AK06+Hoa Binh	10.0	10.0	0.0
Using one variety	66.6	66.6	87.7
Using two variety	23.3	23.3	13.3
<i>Method of sowing</i>			
By hill	86.6	76.6	86.6
Transplanting	13.3	3.3	13.3
<i>Planting date^a</i>			
1 – 10 June	16.6	0.0	13.3
10 - 20 June	50.0	66.6	60.0
20 - 30 June	33.3	33.3	26.6

Note: ^afor summer season, HHs=households

Most of surveyed brigades used major soybean varieties, namely AK06, DT 84 and Hoa Binh (local variety); however they used the most DT84 of all due to its advantages such as high yield, medium growth duration, pest resistance and drought tolerance. Therefore, this variety was considered as predominant one in the variety structure in the study area. Over 67 percent of surveyed farmers used one soybean variety with a purpose of reducing the harvesting labor. To avoid the mixture of soybean seed, in other hand, it is also convenient for keeping the seed for the following growing season. In regards with method of sowing, 76 percent has chosen

the hill method for sowing in all of surveyed brigades because this method saves soybean seed as well as labors.

Soybean has been sown in summer with various planting dates, in which, the sowing date between 10 and 20 June was preferred best by the soybean growers. It was illustrated that over fifty percent of soybean growers have chosen this planting date for their sowing season.

5.5.2 Fertilizer application

Farmers applied fertilizers for soybean aiming to get high productivity. Nitrogen was applied at initial stage to supply little nutrient to soybean because in this period, the capability of nitrogen fixation was not apparent, in particular, in circumstance of poor nutrients in soil at the Thanh Ha Farm, then this application was more necessary.

Table 5.9 Fertilizer applications for soybean.

(Unit: kg *sao*⁻¹; 1 *sao* = 360 m²)

Indicators	Brigade 2 (n=30)		Brigade 4 (n=30)		Brigade 7 (n=30)	
	Mean	SE	Mean	SE	Mean	SE
Urea (N)	3.04	0.18	3.04	0.18	3.7	0.18
Phosphorus (P ₂ O ₅)	12.6	0.47	13.8	0.37	15.0	0.33
Potassium (K ₂ O)	4.4	0.22	5.4	0.19	5.3	0.19
Manure	No		No		No	
Times of application:						
1 time (% HHs)	16.6		23.3		10	
2 times (% HHs)	83.3		76.6		90	
Use pesticide (% HHs)	100		66.6		100	

Note: HHs=households

It was reported that rate of nitrogen applied by soybean growers was averagely 3.0 kg per *sao*. In addition, soybean also required the other nutrients such as phosphorus and potassium for its growth, and amount of these fertilizers 12 kg per *sao* and 4.0 kg per *sao*, respectively. In particular, in application of potassium, soybean farmers have applied two times for soybean. Surprisingly, the results also indicated that no growers in surveyed brigades have applied the manure for soybean. Almost all the growers used the pesticides in pest control for soybean.

5.5.3 Irrigation application

In general, almost all the growers in three brigades planted soybean under rainfed conditions, and the figures showed that over 56 percent of respondents in three brigades have not irrigated soybean. The remaining households irrigated soybean by using electric pumps (Table 5.10). Perhaps, this is a reason that has increased the production cost.

Table 5.10 Water management in soybean production.

Category	Brigade		
	No 7 (n=30)	No 4 (n=30)	No 2 (n=30)
No of HHs -irrigation	33.3	26.7	43.3
No of HHs -no irrigation	66.7	73.3	56.7
<i>Type of irrigation:</i>			
by pump (% HHs)	100.0	100.0	100.0
by canal (% HHs)	-	-	-
<i>Times of irrigation:</i>			
1 time (% HHs)	80.0	80.0	76.9
2 – 4 times (% HHs)	10.0	20.0	23.1
> 4 times (% HHs)	10.0	-	-

Note: HHs=households

Regarding number of times of irrigation, the results illustrated over 76 percent of growers in all brigades irrigated one time in the growing season. This may be because they are poor farmers having the income under 150\$US a year.

5.5.4 Soybean yield

Table 5.11 indicated that average yield of 'Hoa Binh' variety was the highest (1,700 kg ha⁻¹ in all three brigades) of soybean varieties, which were used by farmers in the area. However, it had the longer growth duration than other soybean varieties (120 days as compared to AK06 and DT84 of the growth duration of less 95 days).

The yield of DT84 and AK06 was not much different among the brigades. For instance, yield of DT 84 was 1441 kg ha⁻¹ for brigade 2 and highest only 1581 kg ha⁻¹ for brigade 7. Similarly, yield of AK06 was 1350 kg ha⁻¹ in brigade 2 as compared to 1441 kg ha⁻¹ of DT84.

Table 5.11 Yield of soybean varieties in surveyed brigade.

Variety	Unit: kg ha ⁻¹						Average
	Brigade 2		Brigade 4		Brigade 7		
	Mean	SE	Mean	SE	Mean	SE	
AK06	1,351	41.4	1,446	42.1	1,449	43.5	1,415
DT84	1,441	45.4	1,523	45.2	1,582	47.7	1,515
Hoa Binh	1,719	35.8	1,756	27.1	1,776	24.9	1,751
<i>Average</i>	<i>1,396</i>		<i>1,485</i>		<i>1,516</i>		

Material inputs were vividly affected on increasing soybean yield (Table 5.9). In brigade 7 fertilizer dose and application times as well as pesticide-spraying amount was higher than others; therefore soybean yield was also higher than others. We can therefore conclude that yield of soybean in this study site was still as compare to others site as Cao Bang province (average soybean yield 1900 kg ha⁻¹), as result of use of unsuitable soybean varieties and improper farming practices.



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