

CHAPTER V

LITCHI PRODUCTION SYSTEM IN BACGIANG PROVINCE

This chapter deals with understanding of litchi production system in the study area. Characteristics of the system such as current situation of litchi production in the study area, status of litchi orchards of the surveyed farms (e.g. farm size, tree age and density, irregular bearing, and productivity and output), and litchi cultivation practices are discussed in detail. In addition, economic aspects in the system (e.g. consumption, price and credit access) are also mentioned. Given the information on litchi production system, identification of the factors influencing litchi productivity was made to construct the models of evaluation.

5.1 Environment and factors influencing litchi production in the area

Briefly looking at the production system (Figure 9), it can be seen that effects on litchi production of the individual farm in the study area are very complicated. They can be classified into two main groups, environmental factors (external factors) and farm internal factors. Environmental factors that were considered to influence litchi production system of the region consist of physical, economic, social, biological and institutional aspects outside the control of the households. Farm internal factors encompass of what that are in control of individual farms such as awareness of cultivation practices, production inputs, farm resource endowment and other activities. These factors affect litchi productivity of individual farm and induce the deviations of litchi yield among the farms. In order to construct the models for evaluating factors influencing litchi productivity and technical inefficiency, not all but main environmental factors as well as farm internal factors were taken into account. Therefore, litchi yield of the individual farms and specific-farm technical inefficiency were considered to be affected by the factors as hypothesized (see Section 6.1).

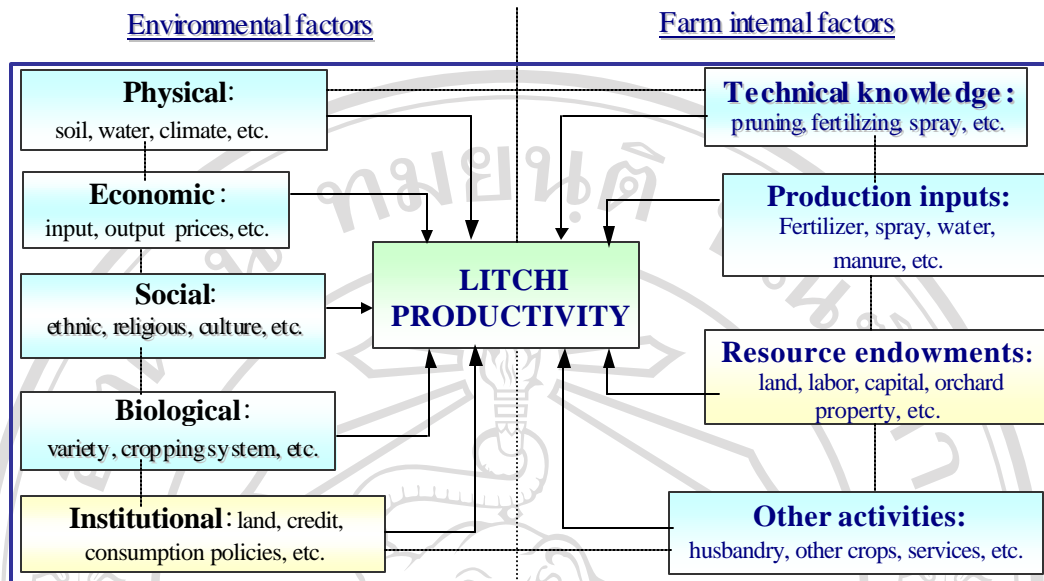


Figure 9 The system of internal and external factors affecting litchi productivity

5.2 Present situation of litchi production in Bacgiang

In recent years, together with guidelines and policies of the Government on investment and development in agricultural and rural sectors, Bacgiang province has progressed its economic structure towards bringing into play its comparative advantages. Being a midland and mountainous province with a great potential for fruit tree development, Bacgiang has concentrated on the development of orchards, in which litchi is considered as a main crop. In 2001, the province had about 40,174 ha of fruit tree, of which litchi occupied about 78 percent of the total fruit tree area. Production distribution of fruit trees in the province is presented in Table 8. In 2002, litchi output of the province reached 50,300 tons.

The provincial authorities have set a priority for diversity of fruit trees. Beside litchi, longan, custard-apple, persimmon, pineapple and some others have developed. Except for the litchi, in 2001 whole province planted 1,269 ha of fruit trees that produced an aggregated output of 4,766 tons of fresh fruits. The purposes of fruit tree diversity are to increase farmer income and reduce losses, as litchi gets risky.

Table 8 Fruit trees production situation in Bacgiang, 2001

Crop	Planted area (ha)	Productive area (ha)	Productivity tons ha ⁻¹	Gross output (tons)
Citrus -orange -lemon	396	369	3.8	1,394
Pineapple	970	757	4.2	3,180
Banana	1,005	921	10.7	9,840
Mango	245	108	3.8	414
Litchi and longan	33,774	20,058	1.7	33,810
Sugar apple	1,846	1,638	2.6	4,183
Persimmon	604	384	2.9	1,090
Others	1,334	1,149	4.9	5,610
Total	40,174	25,384	n.a	59,521

Source: Bacgiang Statistics Department, 2002

In the area, most of orchards were mono-culture with litchi only (90 percent), some households intercropped some kinds of other fruit trees with litchi as follows:

- Litchi - persimmon- custard apple,
- Litchi - watermelon- pumpkin,
- Litchi - pineapple,
- Litchi - longan, and
- Litchi - annual crops such as soybean, groundnut, pea, etc.

In the study area, although 24 cultivars were planted, only 3-4 cultivars were favorable, namely "Vaichua", "Uhong" and "Thieu-Thanhha". Particularly, Thieu-Thanhha variety accounted for about 90 percent of litchi planted area (Dan *et al.*, 2002).

Litchi area and production distribution among districts of the province were also various. In the year 2000, the whole province had 20,275 ha of litchi with the yield of 20,248 tons, but these figures in 2001 were 33,774 ha and 33,810 tons, respectively. Litchi planted area and output concentrated mainly in Lucngan district that accounted for Lucngan about 11,235 ha, equivalent to 55.4 percent of the total provincial litchi area and 18,414 tons, equivalent to 90 percent of litchi gross output of the province in

the year 2000. Lucngan was leading in both litchi area and yield in the province with 43 percent of the bearing area and 57 percent of gross output in 2001. Besides, litchi was being expanded to some other districts such as Lucnam and Yenthe (Figures 10 and 11). The data on the distribution of litchi production in the province are presented in Table 9.

Table 9 Litchi production in various districts of Bacgiang province, 2001

District	Planted area (ha)	Productive area (ha)	Productivity (ton ha ⁻¹)	Gross output (tons)
Bacgiang town	25	15	2.5	37
Lucngan	12,689	8,610	2.2	19,220
Lucnam	6,056	4,343	1.1	4,726
Sondong	4,102	1,056	0.9	981
Yenthe	5,613	3,148	1.1	3,348
Hiephoa	731	245	2.5	623
Langgiang	1,512	1,070	1.6	1,693
Tanyen	1,823	1,021	1.6	1,610
Vietyen	107	40	2.9	117
Yendung	716	360	2.8	1,005
State sector	400	150	3.0	450
Total	33,774	20,058	1.69	33,810

Source: Bacgiang Statistics Department, 2002

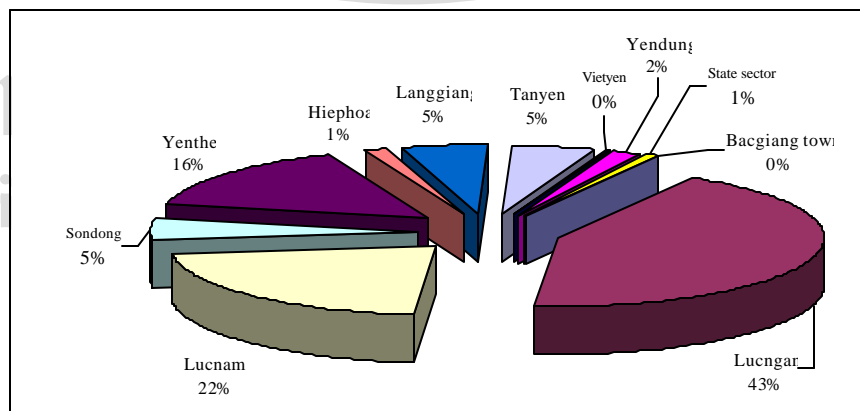


Figure 10 Distribution of litchi productive area in the province, 2001

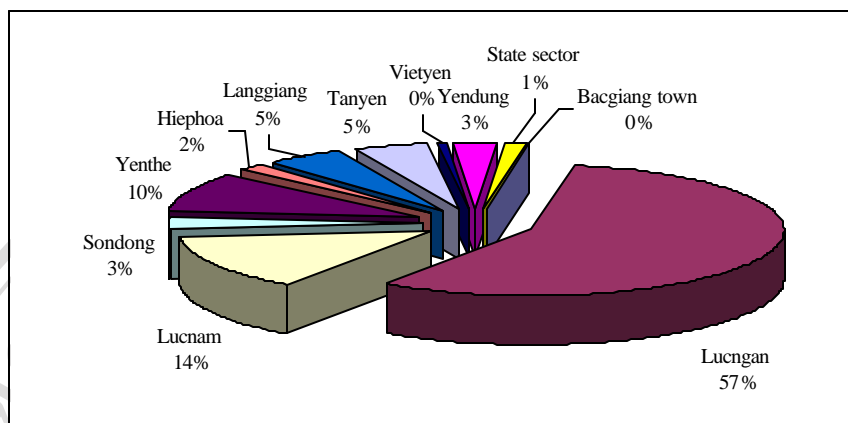


Figure 11 Distribution of litchi output of the province, 2001

In recent years, Bacgiang has formed the largest concentrated orchard area in the North of Vietnam. Litchi has been confirmed as the most important crop for the hunger eradication and poverty alleviation, and economic development in the province. Besides Bacgiang, other neighboring provinces such as Quangninh, Haiduong, Langson, Thainguyen, Hoabinh, Hatay with the suitable natural conditions have been expanding their litchi areas.

Litchi production in Lucngan

Lucngan district located about 90 km northeast of Hanoi with a natural area of about 1012 square kilometers is home to 184,000 people living in, of which Kinh group comprises about 51 percent of the local population, while 10 other ethnic groups commonly living in the mountainous areas of the district comprise the rest.

Nowadays, Lucngan district is known as a big center for litchi production in Vietnam. Litchi was introduced into the district in the 1960s by the farm families migrating from nearby Haiduong province. Although litchi tree developed well in Lucngan soil, due to lack of proper conditions of production such as land policy, credit and market, its production was not expended during 1980s, even during this time some families cut down their litchi trees to grow staple food crops like corn and

cassava. Before 1986, Lucngan was with bare hills and 65 percent of population living under the poverty line. Since 1987 about the beginning of the “Doi moi” or the economic renovation period in Vietnam, litchi has developed primarily. Since then, litchi growing has transformed the local people’s life. In 2001, whole district had about 12,673 ha of productive litchi and harvested 22,698 tons of fresh fruit with a worth of 253 billion VND. Today, thousands of local people are employed in litchi production and 90 percent of Lucngan's population has a living standard above the poverty line, with many quite well off (Thin, 2001).

Data in Table 10 indicated that, from 1991 to date, litchi production in Lucngan has increasing trends in the planted area, total output and yield. Litchi planted area in 2001 was 8.45 times higher than that in 1991, meanwhile total output increased 17.4 times, and its yield also grew about 2.8 times. Especially, during 1998-2001 period, Lucngan litchi planted area, gross output and yield grew amazingly.

Table 10 Litchi planted area, output and yield in Lucngan district, 1991–2001

Year	Land area planted to litchi (ha)	Total output of litchi (tons)	Litchi yield (tons/ha)
1991	1,500	1,300	1.40
1992	1,830	1,400	1.40
1993	2,050	1,800	1.45
1994	2,488	2,000	1.62
1995	3,000	2,250	1.50
1996	4,000	4,599	1.70
1997	5,278	4,582	1.58
1998	7,687	4,858	2.49
1999	9,522	15,868	4.86
2000	11,235	18,414	3.96
2001	12,673	22,698	3.80

Source: Lucngan Agricultural and Land Management office, 2002

Note: Yields are calculated using land area with productive trees, not total planted area

5.3 Characteristics of litchi orchard in the surveyed households

5.3.1 Farm size

Litchi orchard is considered as the main property of farmers in the study area that their family lives rely on. Therefore, litchi dominated over other crops with the share of 77.2 percent of agricultural land of the respondents. The average litchi land per household was 0.74 ha, of which the productive area was 95.66 percent. The largest litchi farm was 2.45 ha, while the minimum was only 0.14 ha. About 77.5 percent of the sample households held less than 1 ha of litchi planted land. About 45 percent of the surveyed households with the small farm size (<0.5 ha) held only 20.8 percent of litchi planted land of the sampled farms, while only 7.5 percent of those households with the large farm size (>1.5 ha) held 21.1 percent of that land (Table 11).

Table 11. Size distribution of litchi farms

Farm size	% of holding area	% of households
<0.5 ha	20.78	45
0.5 to <1 ha	33.28	32.5
1 to <1.5 ha	24.83	15
>=1.5 ha	21.11	7.5
Total	100	100

Source: Survey, 2002

The unequal distribution of litchi planted land among the surveyed farms is expressed by a Lorenz curve as shown in Figure 12. The situation occurred since in early 1990s, farmers were encouraged to rent more land. Due to lack of capital and labor for farm establishment, many farmers dared not register, only farmers who loved risk rented large land size and borrowed money to invest into litchi growing.

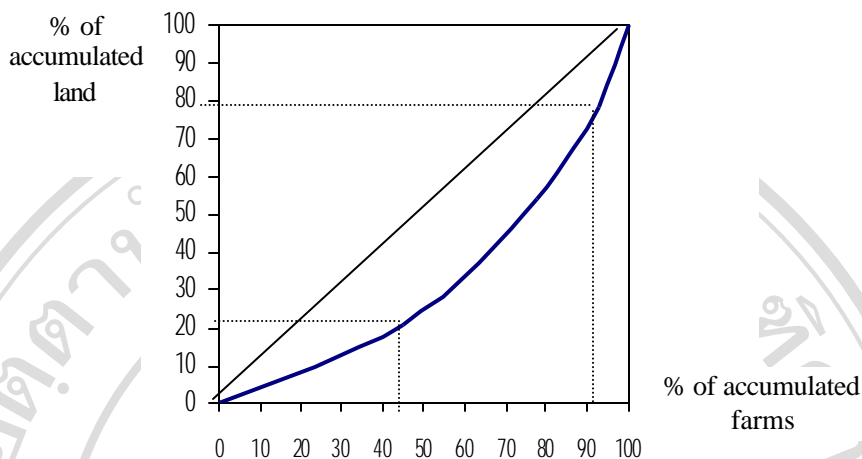


Figure 12 The Lorenz curve of litchi planted land distribution of the surveyed farms

5.3.2 Tree age and tree density

Average productive tree age of litchi orchards of the surveyed farms varied from 5 to 15 years with an average of 9.26 years. About 50 percent of the surveyed farms had average litchi tree ages ranging from 7.8 to 10.4 years, and each 25 percent of the remaining households had average litchi tree ages under (1st quartile) and above (3rd quartile) this range (Table 12). In general, the variation of average productive tree age among the households was not too large.

Table 12 Density and age of litchi trees of the surveyed farms

	Min	Max	Ave.	SD	1 th quartile	Median	3 rd quartile
Tree density (trees sa ⁻¹)	3.33	20.00	11.03	4.02	8.08	10.00	13.50
Tree age (years)	5.00	15.08	9.26	2.03	7.81	8.78	10.44

Source: Survey, 2002

Average tree density of litchi orchards in the surveyed households varied from 3.3 to 20 trees sa⁻¹ with an average of 11, equivalent to 305 trees ha⁻¹. It was found to be

highly concentrated around its mean value. About 50 percent of the sample farms had average tree densities that ranged from 8.1 to 13.5 trees sao^{-1} . Each 25 percent of the remaining households had the density of less than 8.1 trees sao^{-1} and over 13.5 trees sao^{-1} , respectively (Table 13).

More detail statistics on the tree age groups for the whole surveyed households are presented in Table 13. Litchi trees that were considered as the productive trees include the bearing trees that were from 4 years old up. The oldest trees were found to be 34 years old. The range of tree age was classified by the even interval of 4 years. It was found that the group of 8-12 years was a leading one with the shares of 56.4 percent of the productive area and 52.8 percent of the total productive trees; followed by the group of less than 8 years with those shares of 30.1 percent and 37.4 percent, respectively. The group of over 22 years old (23-34 years) occupied little part with 1.04 percent of the productive area and 0.43 percent of the total productive trees.

Table 13 Frequency distribution of the productive trees and area by tree age groups, based on the aggregated data of 80 surveyed farms

Tree age group	Area		Tree	
	m^2	%	#	%
<8	170,502	30.11	5,970	37.39
8-12	319,128	56.35	8,428	52.79
13-17	50,408	8.90	1,153	7.22
18-22	20,350	3.59	346	2.17
>22	5,900	1.04	69	0.43
Overall	566,288	100	15,966	100

Source: Survey, 2002

5.3.3 Irregular and alternative bearing

Irregular and alternative bearing is sometimes called biennial fruiting. It often varies from year to year and from household to household. In Lucngan, the trees blossom in early spring (February - March), and the fruit is profusely harvested over

one month period in late spring (May - June). However, a tree may not bear fruit every year, reportedly only about 60 percent of trees often bears fruit in a given year (Vandaveer and Faculty of Economics and Rural Development, 1999). This may reflect climatic factor during the flowering period and management practices. Sometimes it could be caused by a heavy bearing in the previous year. The most serious problem in litchi production was reported as irregular and alternative bearing, which caused a considerable reduction in litchi yield.

Most of the surveyed farms revealed that crop year 2001 was unsuccessful. Average canopy proportion of irregular bearing per farm was 39.9 percent, and about 75 percent of those farms had more than 30 percent of irregular bearing. Even some of farms had this proportion of until 90 percent. In 2002, the respondents reported that it was a normal year of production with an average of 17.9 percent of irregular bearing proportion, meaning that cross-sectional data of crop year 2002 of the sample is acceptable for the study. This proportion of the sample farms in 2002 varied from 2 to 40 percent, of which 75 percent of the farms lost equal or less than 25 percent (Table 14).

5.3.4 Yield and productivity

In 2002, it was found that the fruit productivity per ha was very different among the sample households. It varied from 2.98 to 23.15 tons ha⁻¹ with an average of 10.9 tons that was relatively high as compared with that of the whole country (2 tons ha⁻¹) and about a half of the sample households had productivity of less than 10 tons ha⁻¹. The average litchi output of a surveyed household in 2002 was 1.85 times greater than that in 2001 (Table 14). This increase was partly due to the decrease in irregular bearing as reported by the farmers and there were also other factors that contributed to the increase such as tree age, weather condition, and management practices.

Table 14 Litchi fruit output, yield and irregular bearing in 2001-2002

	Gross output, 2001(kg)	Irre. bearing, 2001(%)	Gross output, 2002 (kg)	Irre. bearing, 2002 (%)	Productivity, 2002 (kg/ha)
Min	200.0	5.0	1,800.0	2.0	2,976
Max	11,000.0	90.0	17,000.0	40.0	23,148
Average	3,420.0	39.9	6,317.3	17.9	10,908
SD	2,029.3	18.0	3,094.7	8.88	4,785
1 quartile	2,000.0	30.0	4,000.0	10.0	7,036
Median	3,000.0	40.0	6,000.0	19.0	9,902
3 quartile	4,525.0	50.0	7,250.0	25.0	14,329

Source: Survey, 2002

5.4 Litchi cultivation practice

Bacgiang in recent years has chosen an appropriate orientation of a farm economy based on fruit trees development suitable with its advantages of hilly and mountainous potential richness. The provincial authorities have had the guidance for diversifying orchard systems to exploit these advantages for the objective of hunger eradication and poverty alleviation, in which litchi is a pivotal crop.

Majority of litchi orchards in the area is cultivated on slightly sloping land (about 8⁰ - 25⁰) since litchi requires well-drained condition if it rains heavily. In recent years due to economic returns gained from litchi tree, some farmers in the area have switched the paddy fields of one crop capability into litchi planted areas. But this situation no longer exists due to the paddy land constraint and the guidance from the government to food security issue (Lucngan People's Committee, 2002).

5.4.1 Pruning and training

Pruning is a common method for fruit trees in general, and litchi in particular. The purposes of pruning for litchi are for tree to use nutrient efficiently, to exercise crop control, to facilitate pest and disease control, and to facilitate harvesting. Pruning

is a thinning process that concentrates the vigour of the tree in those parts, which will produce the most crops over a number of seasons, and cuts away the other portions. Pruning is a work done frequently. For the litchi orchards in the establishment period (<4 years), this work should be done after each budding but for mature litchi orchards pruning occurs after each harvesting season. Young plants should be trained to establish good tree structure, avoiding sharp crotch angles. One litchi tree fully developed and symmetrical is better than two or more trees crowded together, competing for space and sunlight (College of Tropical Agriculture and Human Resources, 1997).

Regarding cultural practice, it was found that in the past, training and pruning were rarely applied to litchi orchards and only pest-affected shoots were removed. The situation has changed since litchi growers in the area became aware of the importance of these techniques through advises and guidance given by extensionists. Most farmers now have knowledge of taking care of litchi tree. Results from the survey in 2002 show that 100 percent of the selected farms had pruned after harvesting season. However, labor used for this work varied from farm to farm due to the tree age and canopy size. Labor used for this work by the sample farms accounted for about 12 percent of total labor used for the whole crop (Table 15).

5.4.2 Labor utilization

Commonly, the work for taking care of litchi during a season include breaking up the earth, weeding, fertilizing, pruning and training, watering, chemical spraying, and harvesting. The litchi farmers in the area used mainly manpower no oxen power was used. Data in Table 15 showed that the source of labor used was mainly from family labors, estimated about 90.5 percent of total labor used. Hired labor source accounted for only 9.5 percent of the labor source. The hired labor was employed mainly for harvesting that accounted for 78.7 percent of the total hired labor. The work that needs highest labor force was harvesting (37.15 percent), followed by land (breaking up the earth) and weeding (25.54 percent), pruning (12.13 percent), fertilizing (10.48 percent), spray (8.14 percent), and finally watering (6.55 percent).

Table 15 Labor use for taking care of litchi orchard in the surveyed households in 2002

	Family labor		Hired labor		Total labor	
	(mandays)	%	(mandays)	%	(mandays)	%
Land&weeding	3,953	27.64	85	5.64	4,038	25.54
Fertilizing	1,652	11.55	4	0.27	1,656	10.48
Pruning	1,810	12.66	108	7.17	1,918	12.13
Chem. spray	1,273	8.90	14	0.93	1,287	8.14
Watering	926	6.47	110	7.30	1,036	6.55
Harvesting	4,688	32.78	1,185	78.69	5,873	37.15
Total	14,302	100	1,506	100	15,808	100

Source: Survey, 2002

5.4.3 Farm-yard manure

Level of fertility of the soil in which fruit trees are being grown needs to be maintained timely. Growers regularly use manure in orchards for that purpose. The amount of manure use varies with the age of plant. Young trees (4 years) need less manure as compared to the mature trees (10 years). The main reason reported by respondents is that the roots of the mature plant were widely spread around the main trunk, therefore, these trees needed more nutrients from the soil. The results from the field survey showed that almost all the households raised livestock (93.75 percent), but their breeding scales were very small, commonly only 1-2 pigs in the piggery (50 percent of surveyed households). Thus in fact only 28.75 percent applied liquid manure to litchi (Table 16), since amount of manure was very limited. Farmers often spend farm-yard manure to apply for their paddy plots, only the households with larger livestock breeding scales applied manure to litchi orchards. The respondents reported that they followed two methods of manure application to litchi: 1) applying fresh manure, and 2) watering liquid manure. Almost all the respondents who followed method of watering liquid manure frequently to litchi orchard reported that they yielded high yield, even some of them applied very little chemical fertilizer.

Table 16 Pig breeding scale and liquid manure application to litchi orchards

	Pig breeding scale in the farm (heads)			
	(>5)	(3 to 5)	(1 to 2)	(0)
% of farms	15.6	27.15	50	7.25
% of farms applied liquid manure	15.6	13.15	0	0

Source: Survey, 2002.

5.4.4 Fertilizer

Crop nutrient removal data could be used as a basis for estimating fertilizer requirements. Annually, litchis often bear a big amount of fruits, it means that the big amount of nutrient was extracted out from the soil, so it is essential to supplement the responsive nutrient to the land. From the chemical point, litchi does not require a particularly fertile soil. However, it requires a high nitrogen level and a moderate level of phosphorus, potassium and calcium (Batten, 1982).

Litchi orchards are seldom profitable without annual fertilization. Fertilizer should be applied to litchi trees at the times: 1) Before blossoming (at this time, apply about 25 percent amount of N, K and 1/3 amount of P), 2) Fruiting (50% amount of K, 25% amount of N and 1/3 amount of P) and 3) After harvest, apply the rest (Tuc, 1995). For young trees up to 3-4 years, apply a complete fertilizer beginning after the hardening of the first growth flush after transplanting. Subsequent applications should be made after hardening of each succeeding flush, or every two to four months. Stop applying fertilizer in the spring of the third or fourth year, when the tree is large enough to bear a crop the following year (College of Tropical Agriculture and Human Resources, 1997).

Apply fertilizer to bearing trees immediately after fruit harvest. If rainfall is limited, apply irrigation water at that time to promote vigorous flushes. Do not apply fertilizer during the winter since this stimulates winter flushes that spend nutrients

and affect badly on blossom differentiation. It was recommended that the winter flushes should be cut down; bearing trees need less P than developing trees since the maturity trees often have a well root system; the mixed fertilizer formulations of N:P:K such as 5:7:6 or 5:10:3 are appropriate (Dan *et al.*, 2002).

Table 17 Chemical fertilizer application to litchi (kg/ha)

	N	P ₂ O ₅	K ₂ O
Min	0.0	0.0	0.0
Max	532.4	833.3	916.7
Aver.	191.9	179.1	214.0
Stdev	127.3	166.5	146.3
1 th Quartile	98.4	81.9	110.4
Median	168.7	139.4	181.6
3 rd Quartile	238.8	230.4	260.9
% of farms applied	98.75	87.5	97.5

Source: Survey, 2002

Nitrogen: The results shown in Table 17 indicate that 98.75 percent of the sample households applied nitrogen under both single and mixed formula and the pure amount of each type of fertilizer was aggregated. The amount of nitrogen varied from 0 to 532 kg ha⁻¹ across all 80 households with an average of 192 kg ha⁻¹. The variation of amount of nitrogen application among growers was large with a standard deviation of 127 kg ha⁻¹.

Phosphorus: 87.5 percent of respondents used this fertilizer under the mixed formula (N:P:K) of 5:7:6 or 5:10:3, or Superphosphate Lamthao (18 percent P₂O₅). The amount of phosphorus (P₂O₅) applied among the 80 sample farms ranged from 0 to 833 kg ha⁻¹ with an average of 179 kg ha⁻¹. About 75 percent of the selected households applied lower than 230 kg ha⁻¹. The variation of amount of P₂O₅ application was quite high with a standard deviation of 166 kg⁻¹.

Potassium: Along with nitrogen and phosphorus application, 97.5 percent of the surveyed farmers applied potassium to litchi under the mixed fertilizer (N:P:K) or Kali Sulphate (58 percent K_2O). The amount of potassium (K_2O) applied among the surveyed households also varied from 0 to 917 kg ha⁻¹ with an average of 214 kg ha⁻¹. About 75 percent of the respondents reported of application less than 261 kg ha⁻¹.

In general, the application of chemical fertilizer to litchi among the producers varied greatly due to the differences of their litchi orchard status i.e. tree age, density, awareness of fertilizer application of farmers and their financial capability as well.

5.4.5 Irrigation

The litchi can tolerate drought very well but does not tolerate flood so well, so a good drainage system is very necessary to litchi orchards. Litchi requires well-moistured soil type, consequently it needs to be watered regularly during active growth period. Over-irrigation is generally more harmful for litchi fruits than under-irrigation since it can bring about young fruit drops. If the weather is dry the litchi trees need to be watered regularly, especially in each budding and after each fertilizing (Dan *et al.*, 2002). The frequency and amount of irrigation depend upon climatic conditions, soil type, age of trees, and the number of trees per ha. Litchi orchards should be given restricted watering in winter to limit winter buds that have disadvantages for blossoming differentiation by the time later on (Tuc, 1995). Most of producers in the study area irrigated the orchards once a week in summer and after every 15 to 20 days in winter. Farmers identified that watering during blossoming to harvesting is very essential. The sources of irrigation of the selected growers was found that 8 percent of the litchi growers used canal irrigation and 40 percent used tube well water and 31 percent used water from small ponds, 22 percent applied both canal and tube well irrigation for the litchi orchards.

5.4.6 *Spray*

The findings showed that 100 percent of the sample respondents applied from 2 to 8 sprays with an average of 5.25 sprays to control the pests and diseases. The average cost per hectare for spray ranged from 280 thousand VND to 3,750 thousand VND ha⁻¹ with an average of 996.4 thousand VND. About 54 percent of total sprays for pests and diseases were applied for protection purpose, and the rest was applied for treatment purpose. Timings of spray often concentrate on each budding (2-3 times), before blossoming (1-2 times), fruit differentiation (1-2 times), and before harvesting about two weeks (1 time).

5.4.7 *Harvesting*

In the study area in 2002, harvesting season of litchi fruit began from mid-April with early ripening varieties and finished until the end of June with late ripening varieties. But profuse ripening output concentrated from mid-May to mid-June with main crop varieties. In general, the surveyed farmers planted mainly one variety (Thieu-Thanhha) and each farm normally has some litchi trees that belong to early and late varieties. Litchi fruits after removal from the trees were graded by size and color. Big size and nice color fruit panicles were selected and bundled to sell for fresh fruit consuming demand with higher price, and smaller and out of panicle ones were selected to sell for consuming, drying and processing with lower price; the price difference of this grading was about 1.2 times. After grading, litchi fruits were bundled and arranged into bamboo baskets and then they were transferred to the market. Since litchi harvest duration was short in crop year 2002, farmers coped with difficulties in consuming and preserving a great deal of output as well as litchi price pressure in the market. During the harvesting season, most of the households had to hired more labors for breaking fruit panicles and bundling.

5.5 Economic aspects in litchi production system

5.5.1 Consumption

The fruits only ripen on the tree and have a very short shelf-life without refrigeration. They are harvested after their skins turn red. Green fruits do not ripen satisfactorily after removal from the tree. Fruits should be removed from the tree by cutting or breaking the branch off just above the panicle bearing the fruits. After harvest, fruit skin color turns reddish-brown in a few days if not refrigerated. Refrigeration at 0–5⁰ C and storage in plastic bags can prolong fresh fruit color and flavor for about two weeks (College of Tropical Agriculture and Human Resources, 1997). Fruit to be stored in refrigeration should be broken off the panicle, leaving a bit of stem attached. If the fruit is pulled from the stem, the skin may break, resulting in dehydration and possibly spoilage.

In Bacgiang, the cooled stores for fresh fruit preservation are very few. There are only some fruit processing plants with small capacities that cannot meet processing demand of a great deal of litchi fruits in a short period. In crop year 2002, a great deal of fruits after harvest was marketed and consumed domestically under fresh form (70 percent), of which northern part (45-55 percent), central and southern parts (10-15 percent). The rest included fresh and dried forms (30 percent), of which two-thirds were dried, was destined to China and other countries such as America, France, Singapore, Hongkong, etc. The market share of the central and southern parts was small due to lack of appropriate transportation means such as cars equipped the cooled store (Bacgiang Department of Agriculture and Rural Development, 2002).

5.5.2 Litchi price

In recent years along with rapid expansion in litchi area, Vietnam litchi output has also increased significantly. Bacgiang and Haiduong are two major provinces in litchi production. Total litchi outputs of the two provinces in 2002 increased nearly 2 and 3 times, respectively as compared with that in 2001. This situation brought

happiness to the litchi growers but increase in output affected negatively on the market aspect. Lately, litchi price has decreased continuously. If the average price of one kg of litchi in 1999 was about 8,000 VND, then in 2000, 2001 and 2002 its prices were 6,000 VND, 5,500 VND and 3,400 VND, respectively (Bacgiang Department of Agriculture and Rural Development, 2002). With the price of 3,400 VND kg⁻¹, the producers still somewhat benefited and farmers also affirmed growing litchi had more benefits than growing rice.

During the field survey, practice indicated that litchi farmers faced a very bad market situation. Litchi price in the market fluctuated every day. During the early days of harvesting (from mid-April to mid-May), litchi price was about 4.5 - 5.5 thousand VND kg⁻¹. The late variety ripened from middle to the end of June. During the late harvesting season, litchi price seemed to be better; its price reached about 6.2 - 7.0 thousand VND kg⁻¹. In general, output harvested during the early and late season occupied a small part, estimated about 10-15% of gross output.

From mid-May to mid-June, litchi fruit profusely ripened, every household in the area had ripening litchi fruits. Luangan during these days became a big market because it consumed litchi fruits not only for the local people but also for other growers from the nearby districts of the province and even for other nearby provinces such as Quangninh, Langson, and Haiduong. During this period, the interviewees reported that the price they received was only 2.4 - 3.8 thousand VND kg⁻¹. The supply was over demand, so many households sold their products to litchi drying ovens with very cheap prices (about 2.4-2.8 thousand VND kg⁻¹ that was a little bit higher than the price of 1 kg of milled rice). Lots of farmers had to build drying oven by themselves to dry their litchi fruits and to keep for selling later because fresh litchi fruit is spoiled very quickly.

5.5.3 Access to credit

Formal credit not only provides loan for the litchi farmers to meet the intensive need and to expand the production scale, but also brings to them insights about litchi

cultivation techniques as well as access to new advances in litchi production throughout information spread to them. Therefore, access to credit is considered as a useful way of transferring knowledge to the farmers, particularly the farmers who are living in the mountainous area like Lucngan. In recent years, to speed up fruit tree production development and to meet the capital demand for production of the people, Bacgiang Agricultural and Rural Development Bank, Bank for the Poor, the Fund for Hunger eradication and Poverty Alleviation as well as other organizations have actively mobilized loan from various sources to satisfy the borrowing needs of the local people via the bank systems at district level. The banks have tried to adjust interest rate with appropriate levels, especially the bank provided the preferential interest levels of less than 1 percent per month for the poor.

From the survey, it was found that in crop year 2002, 52.5 percent of the respondents borrowed money from the banks with an average amount of 12.8 million VND. The highest borrower was with an amount of 65 million VND while the lowest one was with an amount of 5 million VND. The monthly interest rate of borrowing varied from 0.6 to 1.1 percent depending on different times. The terms of lending are often short (less than 1 year) and medium (less than 3 years). The procedure of borrowing was also simplified. Almost all the borrowed farmers reported that bank loan allowed them to improve their litchi production since their fertilizer application was on time and gave them a chance to access useful knowledge on litchi cultivation techniques.