CHAPTER I

INTRODUCTION

1.1 Background

Vietnam is located in the southeastern extremity of the Indochinese peninsula and occupies about 331,688 km^2, of which about 25% were under cultivation in 1987. The S-shaped country has a north-to-south distance of 1,650 km and is about 50 km wide at the narrowest point. With a coastline of 3,260 km, Vietnam stretches between latitudes 8.30° and 23.22°N and longitudes 102.1° and 109.24°E. It borders with the world's biggest and most populous country of China in the North, Lao, and Cambodia in the West and Eastern Sea in the East. By these, its geography and climatic conditions are various. In terms of climate, Vietnam has two distinct types as tropical climate in the South, sub-tropical in the North, and a small part of several northern mountainous provinces as temperate climate. Owing to these various, it has an abundant and plentiful system of crops, especially in fruit trees.

From an aided country from international community, in order to develop national economic, Vietnam reformed outdated economic with open door mechanism by launching "Doi Moi" policy in 1986. Like many other sectors, agricultural one has been contributing an important part in whole national economic. This was shown by absorbing 24 millions of labor workers (70% of labor force) and creating products with a value equivalent to 26.3% of GDP and nearly 40% of export (Ministry of Fisheries, 2001). So Vietnam has been becoming a light point in its area as well as in the world by dynamic in economic development and considered as one of the leading exporters in some products like rice, coffee, pepper, and sea products.

Owing to food security that is maintained and stabilized in recent years, Vietnam government set policy to promote agricultural sector by changing low value cropping systems into high value ones such as fruit, industrial cropping systems. These are aim at

improving people living standard, serving for domestic demands and come to export. From above orientations, fruit tree production has been expanding rapidly and improving quality gradually. Area of some major perennial fruit trees such as citrus, mango, litchi, longan and others was about 155,000 ha in 1988. This area was nearly double in 1998, equivalent to about 394,000 ha, and this number was nearly 586,000 ha in 2001 (Vietnam Center for Southern Agricultural Extension, n.d.).

Like many other fruit trees, litchi tree has also been expanding ever-increasingly and improving quality in many passing years, but commercial production has just expanded rapidly around 10 recent years when there has been a strong demand in domestic and foreign market. The expansion has been taking place mainly in the upland and lowland zones of northern provinces such as Bacgiang, Haiduong, Quangninh, and Thainguyen. Up to year 2001, the total area under litchi of Vietnam was about 61,545 ha, with 42,457 ha under bearing trees and the total production was 118,000 tons (Vu *et al.*, 2003).

Besides advantages, however, there are many constraints to deter litchi farmer's efforts in litchi cultivation and production such as low price, unstable productivity, unfavorable weather, and especially in pests. So looking for solutions that regulate and solve these constraints effectively has been being considered as an urgent requirement in research task as well as in production practices.

1.2 Overview of world litchi production

Litchi is a subtropical fruit tree, considered as a high economic valuable and favorite tree by high sugar content that ranges from 7 to 21%, depending on climate and variety. Other nutrient values are also included such as about 0.7% protein, 0.3% fat, 0.7% minerals (particularly Ca and P) and are reasonable sources of vitamins C (0.064 g/100 g pulp), A, B_1 and B_2 (Singh, 2001). So litchi is considered as one of major crops in many countries and cultivated widely in the world. Nowadays there are as many as 13 major litchi cultivated areas in the world in different continents such as Asia, Australia, America, and Africa (Institute for Tropical and Sub-tropical Crops, n.d.).

However there are only several major countries to cultivate this tree such as China, India, Thailand, and Vietnam.

1.2.1 History and original provenance of the litchi tree

Litchi or lychee (*Litchi chinensis* Sonn.) that originated in southern China and northern Vietnam belongs to the *Sapindaceae* family (Figure 1.1). The main cradle of origin of litchi is believed to be between latitudes 23° and 27°N in the subtropical parts of southern China, northern Vietnam, and Malaysia.

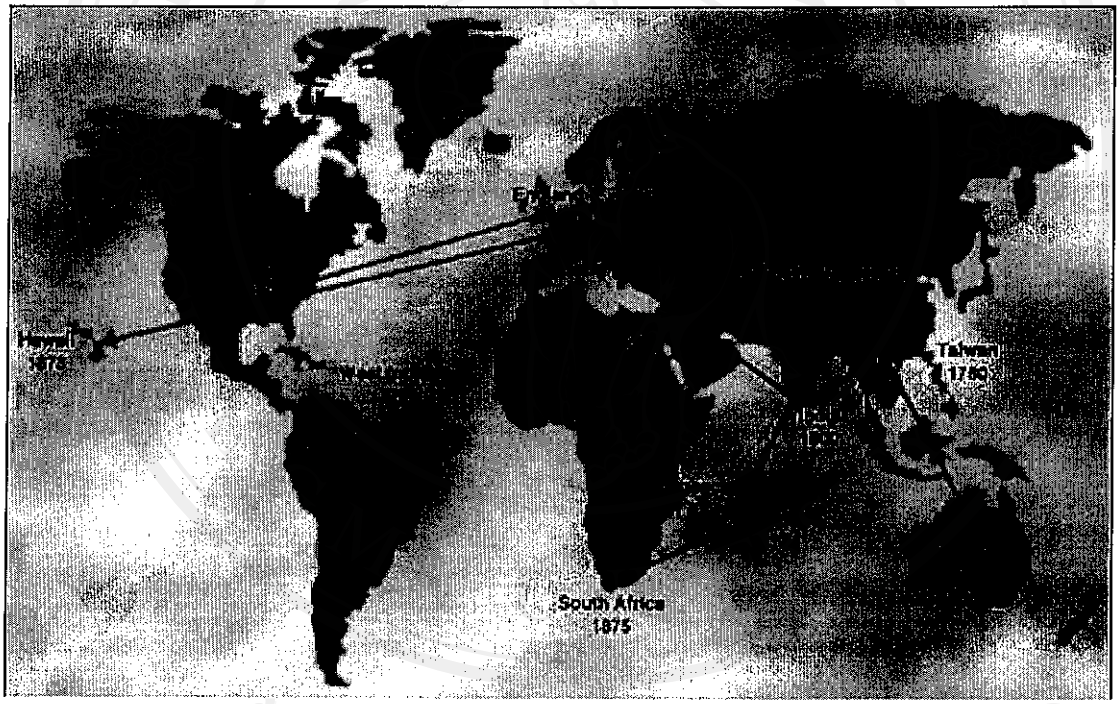

Figure 1.1 Origin and distribution of litchis
Source: Institute for Tropical and Sub-tropical Crops, n.d.a

It seems to have been in cultivation since about 1500 BC by people of Malayan descent. China, and Vietnam have a long history of litchi cultivation for some thousand years and from China it reached Burma (Myanmar) by the end of 17th century. India, and Thailand grew litchi about 100 years later. Continuously, it was Madagascar and Mauritius in around 1870 and Hawaii in 1873 by a Chinese trader. Litchi was introduced in Florida, from India, between 1870 and 1880, in California in 1897.

Australian probably cultivated litchi in 1954 by an introduction of Chinese migrants. It reached in Israel sometimes between 1930 and 1940.

1.2.2 Situation of world litchi production

Nowadays the litchi cultivates and distributes in many countries in the world such as Australia, China, USA, India, Israel, Madagascar, Mauritius, South Africa, Taiwan, Thailand, and Vietnam (Figure 1.2).

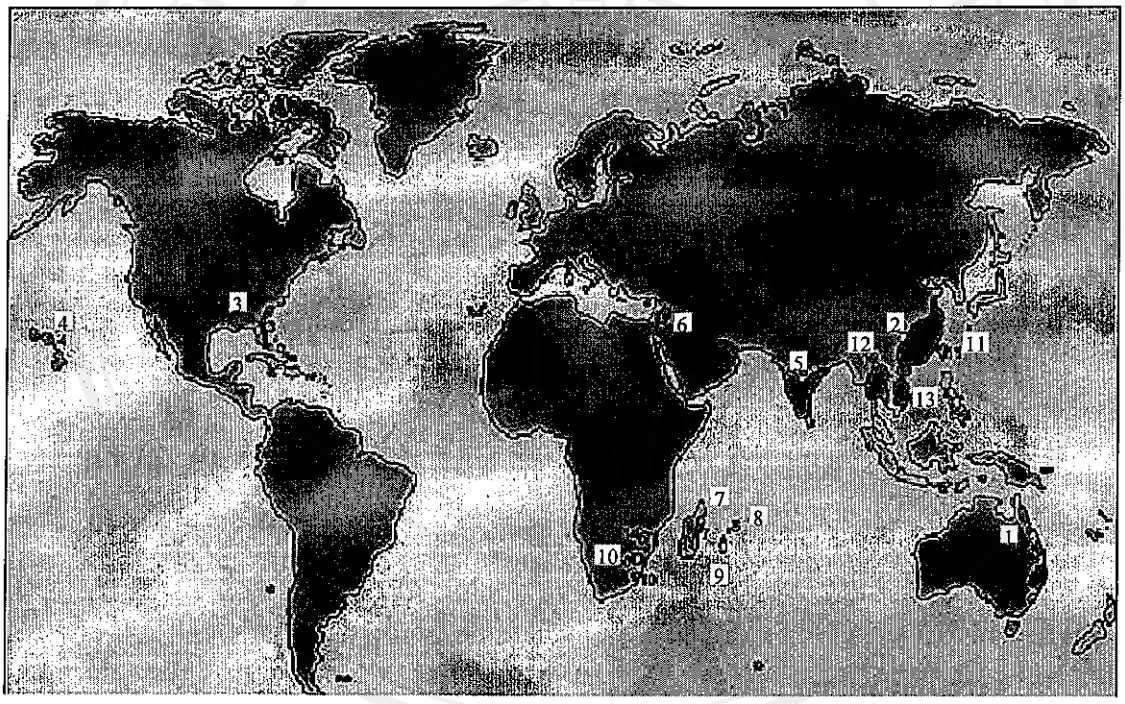

Figure 1.2 Worldwide litchi production areas
Source: Institute for Tropical and Sub-tropical Crops, n.d.b
Notes: 1. Australia, 2. China, 3. Florida, 4. Hawaii, 5. India, 6. Israel, 7. Madagascar, 8. Mauritius, 9. Reunion, 10. South Africa, 11. Taiwan, 12. Thailand, 13. Vietnam

However commercial production concentrates only several major countries such as China, India, Thailand, and Vietnam, but litchi area and production were quite difference among these countries (Table 1.1). In 1999, China's litchi output was about 1,266,900 tons from 580,000 ha. Guangdong Province is the most important area for litchi production in China. Other provinces where litchi grows well include Guangxi, Fujian, Hainan and Yunnan (Xuming, 2003). In India, current production of litchi is

about 429,000 tons from an area of about 56,200 ha in 1999. It is grown mainly in some states such as Bihar, West Bengal and Uttar Pradesh. Besides of these, it is also grown in limited scale in Tripura, Orissa, Punjab, Himachal Pradesh, Assam and the Nilgiri hills in the south (Mitra, 2001). In Thailand, northern provinces of where the climate is classified as sub-tropical are mainly grown areas of litchi. The major concentrations are in Chiang Mai, Chiang Rai, Phayao and Nan provinces in the north and a small part of Samut Songkhram province in Central Thailand (Anupunt and Sukhvibul, 2003). The production of fresh litchi fruit in Thailand during 1999 was 85,083 tons from 22,200 ha (Mitra, 2001).

Table 1.1 Litchi area and production of some major countries in the world, 1999

No.	Country	Litchi planted area (ha)	Production (ton)	Productivity (ton/ha)
1	China	580,000	1,266,900	2.2
2	India	56,200	429,000	7.6
3	Vietnam	35,352	50,000	2.4
4	Thailand	22,200	85,000	3.8
5	Taiwan	11,961	108,668	9.1
6	Bangladesh	4,750	12,755	2.7
7	Nepal	2,830	13,875	4.9
8	Australia	1,500	3,500	2.3

Source: FAO, 2001

Northern Vietnam includes part of the geographical area where litchi originated. This species has been grown for many centuries in the areas near Hanoi, but commercial production has only expanded rapidly in the past ten years. Major concentrations are Bacgiang, Haiduong, Quangninh, and Thainguyen provinces. The total area under cultivation is about 35,352 ha with the total production were 50,000 tons in 1999 (Vu, 2001). In Taiwan – a province of China, most litchi orchards are distributed and mostly grown on slope land in central and southern Taiwan (Teng, 2003). The total area under cultivation in 1999 was 11,961 ha, with 11,580 ha of bearing trees and 108,668 tons of total production (Menzel, 2002). In Bangladesh, litchi is grown in Dinajpur, Rangpur

and Ragshahi districts. The total area under cultivation in 1999 was 4,750 ha with 12,755 tons of total production (Siddiqui, 2001).

In Australia, commercial litchi production commenced only from the 1970s although this tree was introduced into about 60 years ago. Currently, there are about 350 growers with a total area of 1,500 ha and an annual production of about 3,000 tons. Major producing areas are northern Queensland with about 50% of commercial plantings, southern Queensland with 40%, and the balance in northern New South Wales (Menzel, 2002).

1.2.3 Litchi production in Vietnam

1.2.3.1 Litchi area and production

Litchi is also considered as originating in Northern Vietnam. According to some ancient documents and bibliographies, the litchi was grown for 2000 years ago in Vietnam. This could be proved by existence of many wild litchi trees in forests of central and northern provinces (Tran, 1999). Wild trees have been found growing at low elevation in the Bavi Mountains and forests in Tamdao district, Vinhphuc province and Tuyenhoa district, Quangbinh province. Sweet-smelling and good appetite fruit from these areas were reportedly sent to the Emperor of China in Peking (Beijing) over ten centuries ago, several thousand km away (Vu, 1996). Although the litchi appeared in Vietnam long time ago, litchi cultivation movement just began in beginning years of the 1980's, and has expanded rapidly for commercial purpose for recent eight years. At present, litchi is commercially cultivated mainly in some provinces (Table 1.2).

Bacgiang province (about 100 km towards northern side of Hanoi) cultivated a total area of 33,774 ha and production of 65,000 tons. Haiduong province (approximately 60 km towards eastern side of Hanoi) had a total area of 11,200 ha and production of 28,000 tons. Quangninh province (nearly 200 km towards eastern side of Hanoi) held a total area of 6,300 ha and production of 12,000 tons. Thainguyen province (about 130 km towards west-northern side of Hanoi) owned a total area of 7,268 ha and production of 9,100 tons. Besides the decisive provinces of litchi

cultivation above, many other provinces also have expanded litchi-growing area, of course a very modest area. Owing to efforts and contributions of all these provinces, Vietnam's litchi cultivation area reached to 61,545 ha or 42,457 ha of bearing trees and total production of 118,000 tons in year 2001.

Table 1.2 Litchi area and production in Vietnam, 2001

Province	Cultivated area (ha)	Fruited area (ha)	Production (ton)
Bacgiang	33,774	24,000	65,000
Haiduong	11,200	8,200	28,000
Quangninh	6,300	5,000	12,000
Thainguyen	7,268	3,557	9,100
Langson	2,000	1,400	3,800
Others	1,000	600	900
Total	61,545	42,457	118,800

Source: Vu *et al.*, 2003

1.3 Statement of the problem

Like many other crops in agricultural production, litchi farmers intensified inputs such as chemical fertilizers, pesticides ever-increasingly in order to gain more profitability. Paralleling with this, series acute questions have emerged, including devastation of environment, extermination of beneficial insects, insect pests' resistance to insecticides, and their outbreak and serious damage to litchi production. Two of the major problems the litchi farmers need to solve are how to keep litchi yield sustainable and control litchi insect pests efficiently, which are ready to deteriorate seriously the litchi farmer's fruits and making them to be frightened and puzzled in coping with them.

Up to now studies on litchi insect pests are still very humble in Vietnam. Although fruit tree cultivation area has been expanded, losses causing by the pests have been ever increasing and it is considered as a warning to orchardists as well as scientists in this field.

From practices above, it is necessary to stress and take care much more to litchi cultivation practices, especially strategies to manage effectively insect pests in litchi orchards in Vietnam. Besides considering insecticides like an indispensable tool, some of the litchi farmers know of how to apply and combine their local knowledge in managing the insect pests in order to create a powerful and useful insect pest management strategy. So this study was implemented in order to understand clearly about characteristics of the lowland and upland litchi production systems, identify practices and farmer's effective strategies in insect pest control. This has an utmost important significance in insect pest management in litchi production systems in Vietnam. This will help litchi farmers with different gaps of the knowledge and technologies in the whole country to limit unexpected impacts of insect pests, defend production results, reduce litchi production costs, improve overall insect control decision-making at farm level, as well as reduce adverse impacts on environment and human. Another side, the study is also necessary to support all the relevant stakeholders, including the litchi farmers, extensionists, plant protectionists, researchers, input supplier, customers, local, district, and central administrators and policy makers in propagating, disseminating and supporting farmers to cope with insect pests in the litchi production systems efficiently in Vietnam.

1.4 Objectives of the study

Starting from the mentioned problems, the study focuses on some following specific objectives:

1 - To characterize litchi production systems in lowland and upland in Vietnam

2 - To identify important insect pests and determine farmers' control practices

3 - To identify effective strategy in farmer's insect pest management