

CHAPTER 1

INTRODUCTION

Agriculture is the backbone of the Cambodia's economy which accounts for the largest share of the real gross domestic product (GDP) (45-50%) (Nesbitt, 1997) and provides direct employment to nearly 80 percent of total labor force (FAO, 1999). The Cambodian's staple food is rice which is the principal crop of agriculture contributing the largest share, an average 17 percent, in the real GDP deriving from agricultural sector (Nesbitt, 1997). In spite of this, the national average yield of 1.3 t ha⁻¹ is the lowest as compared to those in most countries.

Many constraints have been pointed out to be stumbling blocks to improving the country's rice productivity. These mainly due to poor biophysical conditions and mounting pest damages in the vast lowland rice area, which covers at least 91% of the total riceland (Nesbitt, 1997).

A number of key insects attacking rice production in Cambodia includes brown planthopper, *Nilaparvata lugens* (Stål), green leafhopper, *Nephotettix virescens* (Distant), army worm, *Spodoptera mauritia* (Boisd), common cutworm, *Spodoptera litura* (Fabricius), greenhorned caterpillar, *Melanitis leda ismene* Cramer, caseworms, *Nymphula depunctalis* (Guenee), rice skippers, *Parnara guttata* (Bremer et Grey), semiloopers, *Naranga* spp., gall midges, *Orseolia oryzae*, grasshoppers, rice bugs, *Leptocorisa oratorius* (Fabricius), rice leaffolders, *Cnaphalocrocis medinalis* (Guenee), and stem borers, *Scirpophaga incertulas* (Walker), *Chilo auricilius* Dudgeon, *Chilo suppressalis* (Walker), and *Sesamia inferens* Walker (Nesbitt, 1997). The combined attacks by these pests have often resulted in substantial damages to rice production in the country at alarming levels.

In Cambodia, like many rice-growing countries, green leafhopper, *Nephotettix virescens* (Distant), is registered as one of important pests of rice, primarily because it is widely known as a major transmitter of many viral diseases, especially, the rice tungro disease (RTD). For researchers, *Nephotettix virescens* (Distant) is still deemed as not a major impact on rice production in Cambodia (Nesbitt, 1997), *albeit* its dominance in the rice cultivation system (CIAP, 1992). Yet, if its ascendancy and the increasing adoption of high-input, intensive rice farming taken into account, it is rational to foresee the most likelihood of *N. virescens* to become a major threat any time in the future. It is noticed that fields receive large amount of nitrogenous fertilizers and subjected to indiscriminate use of pesticides are more heavily infested by green leafhoppers (Heinrichs, 1994a; Pathak and Khan, 1994), and even the resistant varieties have often turned out to succumb to tungro infections after a few years of intensive cultivation (Azzam *et al.*, 2000).

However, being one of yield-reducing factors in rice production, this damaging species of green leafhopper is very often considered as a main target for various control measures that results in varying degrees of success. The conventional applications of insecticides implemented by most farmers, for example, are indeed thought as effective practices in controlling *Nephotettix virescens* in a number of situations. But, in most cases, these kinds of practices are quite harmful to natural enemies, whose roles have, according to Suzuki *et al.* (1996); Pathak and Khan (1994), been generally analyzed as an indispensable step towards the development of integrated pest management of rice tungro disease transmission.

In an attempt to dwindle numerous deleterious effects of these conventional pest management practices and safeguard the beneficial biological agents existing in the systems, recent quest for sound crop protections in Cambodia has been emphasized on the implementation of integrated pest management (IPM) approach. It has been credited as an effective, viable alternative for realizing sustainable rice production without entering pesticide treadmills (CIAP, 1997). The central principles of IPM are based on the ecological concept and adhered to a principal objective of utilizing all appropriate compatible measures as a synergy to maximize the efficiency

of pest control measures so as to minimize crop loss. However, these methods are perceived pragmatically effective only when a sound knowledge on the dynamics of pest and natural enemies in different rice cultivation systems, where different pest management practices are implemented, is made available, with which changes in cropping practices can be made possible so as to disfavor the pest status while, at the same time, favor the beneficial ones (CIAP, 1994).

In this sense, it is cut-and-dried to accentuate that a better understanding of population dynamics of *Nephotettix virescens* and its key natural enemies as influenced by various pest management options is of priority being indispensable for the establishment of biological control for sustainable and eco-rational rice tungro disease management. Therefore, studies conducted with reference to this holistic premise should always be given special attention. This study was thus carried out with an aim to fill out, in part, the gap of knowledge of the aspects referred to above by attempting to investigate how the populations of both the green leafhoppers and the natural enemies and their diversity are affected and fluctuated when different pest management practices are used.

Overall, the study was undertaken with an objective to draw a finding on the effect, biologically and economically, that derive from the rice pest management practices on the green leafhopper, *Nephotettix virescens* (Distant), and its natural enemies. To achieve this, the study's specific objectives are:

- To investigate the Cambodian farmers' perceptions of pest problems and control practices.
- To study the population dynamics of *Nephotettix virescens* (Distant) and species diversity of its natural enemies under field conditions.
- To compare and analyze economic returns and labor use of the farmer-practiced and IPM-based pest management system.