

## **2.5 Biodiversity and Landscape Structure: Challenges for Insect Management Strategies in Lychee Orchards in the Mountains of Northern Thailand**

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### **2.5.1 Introduction**

Agriculture is the most important of human economic activities. It differs from most other industries in that it is a biological process: the primary products are organic and the resource base is the physical environment including soil, water and solar energy. However, it must always be remembered that other biological components are present in the environment besides the crop plant. A variety of organisms including other plants, animals and microorganisms, representing what is referred to as “biodiversity”, are part of the complex agro-ecosystem. What is the relevance of this biodiversity and what are the ways of dealing with it? In the context of agricultural production, global environmental change and the protection of natural resources, several aspects need to be considered.

- (1) The establishment of agricultural production systems requires the clearing and preparation of land, thus reducing natural biodiversity in a specific area. In the humid tropics, increasing pressure on land resources due to increasing population results in the reduction of forest areas. The loss of biodiversity due to the decline of such habitats is a well-known fact, and numerous studies deal with the consequences of tropical forest disturbance and fragmentation for fauna and flora (LAURANCE, 2000; WILLOTT et al. 2000, VASCONCELOS et al., 2000; DAVIS, 2000; HAMER AND HILL, 2000).
- (2) Once established, the agro-ecosystem represents an artificial ecosystem that requires constant human intervention. This

regularly includes a further reduction in biodiversity and changes in natural ecosystem processes. Chemical pesticides replace natural controls on the populations of weeds, herbivores and pathogens. Nutrient and energy flows are altered since plant biomass is harvested and soil fertility is maintained with fertilizers and not by natural decomposition. Thus, the inherent regulation mechanisms of natural communities are lost. Although intensification of management has boosted crop yields, undesirable environmental effects undermine the benefits of modern agriculture. They include environmental and social effects and the costs of pesticide use, soil erosion and salinisation. In addition, the effects on the surrounding environment lead to further reduction in natural biodiversity, largely through eutrophication of terrestrial and aquatic ecosystems by the overuse of fertilizers.

- (3) In recognition of the consequences of agricultural intensification, attempts are increasingly being made to develop sustainable agricultural systems. Although the term “sustainable agriculture” lacks a commonly agreed definition, in the context of biodiversity it includes two major aspects. Firstly, a sustainable agricultural system protects the integrity of natural systems, so that negative impacts on natural biodiversity are minimised. Secondly, it incorporates the ecological advantages of natural biodiversity into the production system in order to restore the scattered elements necessary to provide homeostasis of the agro-ecological community.

### **2.5.2 Effects of Pesticide Use in Lychee Orchards and Dominant Harmful Insects**

The present ecological situation in the mountainous regions of Southeast Asia reflects two main problems concerning natural resource management. First, there is the need to develop and establish sustainable land use systems, which fulfil the demands of the farmers and reduce the ever increasing pressure on the