CHAPTER 1
INTRODUCTION

Since 1960's, the green revolution in terms of introduction of semi-dwarf modern varieties along with irrigation and chemicals has had a tremendous impact on increase of world's rice production. Recently, as per capita incomes in rice-consuming countries rise and as yield constraints are overcomed, grain quality becomes increasingly important for both traditional exporting and importing countries. People recognized that improvement of rice quality would bring benefits to both consumers and producers in several aspects. For these reasons, many alternative ways are being sought for improving rice grain quality, and breeding and the various crop management practices including fertilization, drainage, harvest and post harvest technologies are among most promising.

The environmental influences on quality of rice grain both milling quality (i.e. head rice recovery) and nutritional quality (i.e. protein content of rice grain) have been investigated, particularly with respect to the effects of nitrogen, water management, drought, low or high temperature, pest, disease, soil type, mineral content of soil and irrigation water (Juliano, 1985; Jongkaewwattana, 1990; Wright and Warnock, 1983; Gomez et al. 1985; Huang, 1990; Tatiya, 1995; Opastrakul; 1995). Thus, the effects of environments on rice grain quality are multidimensional.

In the majority of rice growing area in Yunnan namely Kunming, Chuxiong, Yuxi, and Baoshan, rice fields are characterized as phosphorus (P) and zinc (Zn) deficient (Wang and Qiu, 1993). It has long been known that applying P and Zn fertilizers is beneficial for improving grain yield in the rice growing areas of Yunnan where P and Zn deficiency is commonly environmental stresses limiting crop production

(Yang, 1992). The effects of P and Zn on grain quality have also been documented by previous works, especially that P and Zn are believed to be associated with seed formation and grain texture of cereal crops (Shi, 1988), amylose content of grain, and improvement of grain protein content in rice (Ogawa et al., 1979; Micheal et al., 1980; Marschner, 1986; Zhang, 1993; Chinese Academy of Agricultural Sciences, 1984; Jyung et al.,1975) or in other cereal crops such as wheat and barley (Afudaoning, 1992; Lian, 1989). To improve high quality rice breeding by effectively using abundant rice germplasm of Yunnan, an essential question is raised at this point by breeders: how much quality variation are given by genotype, and how much quality variation are affected by the nutritional status of P and Zn in rice plant.

Presently, rice breeders have begun to pay more attention toward grain quality besides of high yielding characteristics of rice plant. One important criteria which can be used to verify the relative importance or priority given various rice grain properties in a breeding program is consumer's perference. The hedonic model has been applied to quantify consumer demand for rice grain quality characteristics (Unnevehr et al., 1985; Juliano et al., 1989; Abansi and Duff, 1993). Now breeding and research efforts can be devoted to more economically important grain properties.

Rice market systems in China has changed dramatically since 1992, and the free trade market system has increased the number of rice varieties available in local domestic markets. Considering rice consumption, when more rice becomes available in the market and income increases, consumers' demand for superior quality rice is increased. As Yunnan is a typical region where multi-ethnic people are habituated with diversified biophysical conditions and different socioeconomic background, consumers' demands for quality of rice may differ from region to region as well as from culture to culture. In

Chinese domestic market, consumers preferences for rice quality have been usually given little attention (Zhang, 1991). Although the standardized methods for rice quality evaluation have been employed by Chinese Agricultural Ministry by given a list of indication on important criteria for rice quality, they may not reflect the properties for which consumers will actually pay a price premium in the market. By clearly identifying the quality characteristics value by consumers, the results could provide rice breeders with specific targets for improving quality breeding and research priorities.

This study is designed to examine the effects of genotypes, P and Zn fertilizer applications on rice yield as well as quality characteristics. It will also estimate implicit prices for characteristics that define rice grain quality at consumer level. Specifically, objectives of this study are as follows:

1. To assess quality characteristics of predominant rice varieties grown under different biophysical conditions, and examine genotypic variations in grain quality.

2. To evaluate the contribution of the P and Zn fertilizer application to grain physicochemical properties (shape/size, chalkiness, hardness, yield of brown rice, milled rice recovery, head rice recovery, amylose content, protein content, and Zn content) which related to rice appearance, milling, cooking-eating, and nutritional qualities.

3. To identify genotypic and crop management interactions for rice grain quality.

4. To find out the interrelationship between rice grain quality components and price of rice in the domestic market, and identify the importance of rice quality characteristics in terms of consumer's preferences as well as market demand.