Chapter 40
Exploitation of Heterosis for Shifting the 
Yield Frontier in Rice
S. S. Virmani

INTRODUCTION

Rice \textit{(Oryza sativa} L.), the premier food crop in the world was cultivated in 1995 on about 149 million ha producing 553.6 million tons of grains. It is the staple food for 2.4 billion people in the developing world and is grown mostly in humid and subhumid tropics and humid subtropics where land is intensely cultivated. Most rice growing countries, particularly in Asia where 90% of the world rice is produced and consumed, have done remarkably well in meeting their rice needs during the past three decades using the green revolution technologies; however, the future poses even more challenging and ambitious tasks because by 2030 the world must produce 60% more rice than it produced in 1995 to meet the demand created by increasing populations and rising incomes. This production increase must be achieved on less land, with less labor, less water, and less pesticides, and it must be sustainable. Shifting the yield frontier in rice beyond the level of semi-dwarf varieties is considered an important strategy to meet this challenge. Chinese rice scientists have amply demonstrated that heterosis in rice can be exploited commercially to increase rice varietal yields (Yuan et al., 1994). Results from IRRI (Virmani, 1994a, b; Virmani, 1997), India (Siddiq et al., 1997), Philippines (Lara et al., 1994; de Leon et al., 1996), and Vietnam (Luat et al., 1995; Hoan et al., 1997) also have also confirmed that hybrid rice offers an economically viable option to increase varietal yields beyond the level of semi-dwarf rice varieties. This chapter presents the current status and future opportunities of commercial exploitation of heterosis for shifting the yield frontier in rice.

HETEROSIS FOR YIELD AND PRODUCTIVITY

Ever since heterosis in rice was first reported by Jones in 1926, the presence of significant standard heterosis for yield, yield components and several other agronomic traits has been reported by numerous rice researchers (see recent reviews by Kim & Rutger, 1988; Virmani, 1994a; Virmani, 1996). For commercial exploitation of heterosis hybrid rice varieties have been developed in China since 1975 that showed about 20% yield advantage over inbred varieties (Lin & Yuan, 1980). A farm level study in Jiangsu province in China (He et al., 1987a) showed a 16% yield advantage of hybrid rices over farmers varieties. Studies conducted at IRRI comparing the best rice hybrids with best inbred rices during 1986 to 1995 showed about 17% yield advantage (Virmani, 1996). Significant heterobeltiosis and standard heterosis for yield also has been observed in national programs such

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