

# INDUCED MUTATIONS FOR IMPROVEMENT OF RICE (CPR/5/010) D2

## MODEL PROJECT

### CORE FINANCING

YEAR	Experts		Group Activity	Equipment	Fellowships		Scientific Visits		Group Training	Sub-Contracts	Misc. Comp.	TOTAL
	m/d	US \$	US \$	US \$	m/d	US \$	m/d	US \$	US \$	US \$	US \$	US \$
1997	1/0	13,200	0	20,000	6/0	18,900	0/0	0	0	0	0	52,100

First Year Approved: 1995

Total expenditure to 30 September 1996:

\$170,187 (TCF)

**OBJECTIVES:** This project's overall development objective is to increase food security and improve the rural economy. Specifically, the project's aims are (i) to use induced mutation and related biotechnologies to produce new hybrid rice combinations and high-yielding cultivars that are early maturing, have high grain quality, and exhibit resistance to various diseases; and (ii) to facilitate the extension of the new varieties over the widest planting area possible.

**BACKGROUND:** Rice is the staple food for more than half of China's population. An area of 33 million hectares is under cultivation with rice, 50% with hybrids. Mutation induced with radiation can lead to new hybrid rice combinations with decreased genetic vulnerability and improved grain quality. Earlier work led to some promising male sterile lines with high seed productivity, making hybrid seed production more economical. Concomitantly, mutation techniques also resulted in new lines adapted to the early season, when temperatures are much higher than in the second of two annual harvests. These previous accomplishments set the stage for the present project, which began in 1995. It has met with great success in a short time, meriting Model Project status as it moves into the final phase of extension. The China National Rice Research Institute (CNRRI) and the Zhejiang Agricultural University (ZAU) collaborated to develop the improved lines. Selection trials led to decisions to release nine early season varieties, and two new hybrid rice combinations. Better disease resistance, higher yield, and early maturation are some of the characteristics of the new varieties. Induced mutation played an important role in their development. All nine early season lines resulted from either direct mutagenesis or crosses with induced mutants. The range of adaptation across the new varieties allows each rice growing region to choose those best suited to local conditions. A key to the effort's sustainability is the breeding and seed production infrastructure in Hainan, a coastal area with an extended growing season. For example, from November, 1995, to March, 1996, 125 new mutant lines were selected. Of these, 19 merited further evaluation. In the same time period, three tonnes of each of two mutant lines were then produced for multiplication in the normal growing season to support wider field trials and extension. Eleven agricultural institutions as well as several seed companies and stock seed farms took part in the first phase of the extension effort involving multi-location trials. Eighteen organizations conducted model field demonstrations in principal rice growing regions. The next step saw the production of large amounts of seed on 1260 hectares. This effort involved the collaboration of twenty institutions and companies in five provinces. The outcome was impressive. Effective management resulted in the planting of the new varieties on about 600,000 hectares in 1995. That total should reach nearly 1 million hectares in 1996. The Government now requests additional assistance to facilitate the introduction of modern biotechnologies into the rice breeding program.

**PROJECT PLAN:** The principal activity in this, the project's final phase, will consist of assistance in the introduction of newer approaches for accelerating the continuing development of rice mutants with superior yield,

disease resistance, and early maturation. The double haploid technique and DNA fingerprinting procedures will receive particular emphasis. The major outcome, accelerated production of promising new lines, will support continuing extension efforts at increased levels of cost-effectiveness. A detailed workplan is pending receipt of year-end technical reports from the counterparts. The 1996 findings will support decisions regarding the most suitable lines for trials and extension in each of the rice growing regions.

**NATIONAL COMMITMENT:** The Government provides full support for the members of the plant breeding teams at ZAU (8 senior staff) and CNRRI (5 senior staff), including laboratory and field facilities and operating costs. It also defrays that part of the selection and extension effort that is not provided by seed companies. Although exact figures are unavailable, this represents a considerable investment, given the scale of the effort.

**AGENCY INPUT:** The Agency will continue to provide expertise and expert services; training in mutation techniques and related biotechnologies; and organizational assistance for maximizing the effectiveness of sub-contract arrangements.

**PROJECT IMPACT:** Large scale impact is an outstanding feature of this project's implementation. The planting of the new mutant varieties already extended to nearly 600,000 hectares in 1995, a 2.5-fold increase over 1994. The resulting increase in yield amounted to about 263,000 tonnes. At the world market price (then US \$170 per ton), this increased yield corresponded to a value of about US \$40 M. The 1996 acreage is likely to be nearly twice as great. Total harvest figures are not available yet. Since the Chinese trade in rice is mostly internal, it is difficult to calculate the increased profit to farmers. Moreover, while China is usually said to be self-sufficient in rice production, rice importation does take place, especially in the higher quality grades. Thus, the improved quality of the new varieties has the effect of reducing the pressure to meet rising consumer demand for higher quality with imports. This factor comes into play especially for the Spring harvest, when higher temperatures tend to lead to poorer quality grain in hybrid rice.