Country Report : China

Indica Type Hybrid Rice Development in China

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Landmarks of Indica Hybrid Rice R & D in China

- 1964: Initiated by Prof. L.P. Yuan had his group;
- 1970: A wild rice with aborted pollen (WA) was found, CMS became possible;
- 1973: Three lines (A, B, R) were accomplished;
- 1976: Hybrid rice released for commercial production.
- 1981: It was awarded the state Special Innovation Prize.
- Early 1980s Two-line hybrid rice, TGMS/PGMS lines researches started;
- Early 1990s Sub-specific rice hybrids breeding started.
- Late 1990s Super- high-yielding hybrid rice released.
- 2004: World Food Prize awarded to Prof. Yuan
- Recently Hybrid rice covered about 60-70% (14-15 million ha) of rice growing area annually in China.

Initial Stage

(1964 --1975)

- Without suitable MS lines, from 1964 to 1970 was the most difficult stage for indica hybrid rice study.
- "WA" type plant was discovered in 1970 that was the breakthrough of breeding MS and maintainer lines;
- A set of A and B lines, such as 97A, 71-72A, V41A, Nan A, as well as R lines IR 661, IR 665, IR24, IR 26, TY-1 , Gu-154 etc. were developed, and then three-lines (A, B and R) had been accomplished from 1972-1973.
- From 1974 to 1975 indica type hybrids were widely demonstrated in China with total grown area of 138,000 ha.
- For getting enough seed for large scale demonstration and production, thousands of people nationwide were organized to produce hybrid seeds in the off-season in tropical Hainan Island.

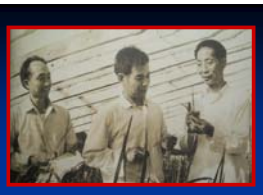
From 1964, Prof. LP Yuan and his group had been started hard work on indica hybrid rice research.

"WA" type CMS plants were found in 1970 in Hainan Island of China.

Fast Growing Stage

(1976--1990)

- Hybrid rice growing area from 0.14 mh in 1976 to 15.64 mh reached the first peak in 1990.
- The Special Innovation Prize for indica hybrid rice was awarded by the state in 1981.
- Basic, applied-basic, applied researches were blooming.
- Nationwide cooperation well organized. 9 times regional and 6 times national meetings for planning and monitoring were held.
- From central to local, Chinese governments gave great support to hybrid rice by all means.



After nearly 20 years of R and D, indica hybrid rice received the Special Innovation Prize of China.

Strategic Adjustment Stage

(1990--2000)

- Hybrid rice growing area was staggering.
- Proposal for 1-2-3 line methods, and inter varietal, inter sub-specific and distance hybrids worked out.
- Two-line hybrids realized, attributed to PeiAi 64 S line.
- First standard of super high yielding: 100 t/ha/day.
- One-line (apomixes) study and chemical emasculation method were stopped.
- Nationwide average yield of F1 seed production reached 2.5 t/ha, and high yield records were 6-7 t/ha in small plot at many locations.

Further increasing the yield was the new target for indica hybrid rice researches carried nationwide in China.

New Development Stage

(2001-- Now)

- Yield potential further increasing, super hybrids gave 16-19 t/ha at small plot, and 10-13t/ha in large area.
- Number and growing area of two-line hybrid increased.
- Top 10 hybrid rice growing provinces recently re-ranked (99% are indica type): Jiangxi, Hunan , Sichuan, Hubei, Anhui, Guangxi, Guangdong, Fujian, Guizhou and Chongqing cover more than 90% HR area in China.
- Private sectors started to play an important role. More and more hybrids released by them.
- International demand is rapidly increasing, mostly in tropical countries.

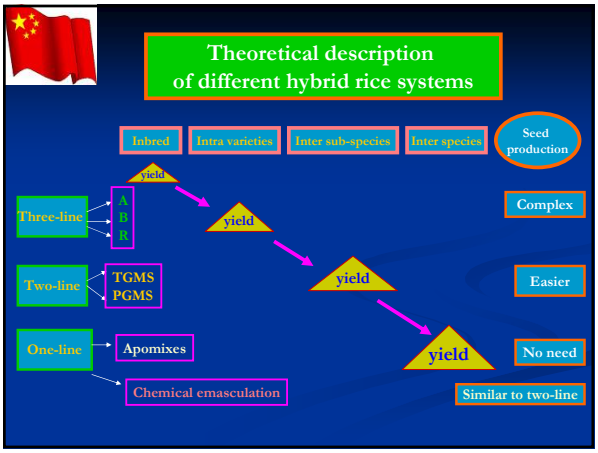
Factors for the success

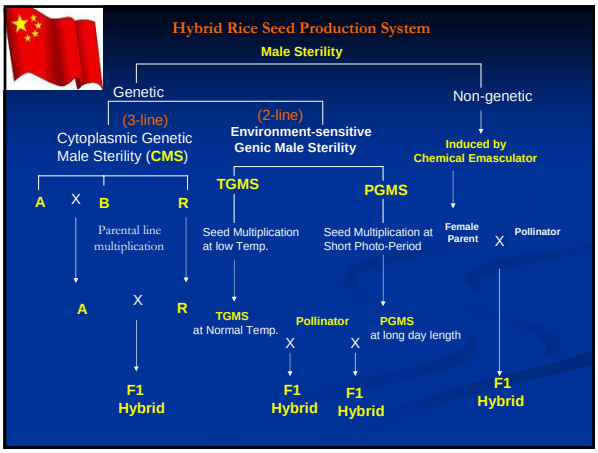
- Government support.
- Nation wide cooperation and collaboration.
- Free share of breeding materials and information.
- Innovations in intensive basic and applied researches.
- Incentive policies for encouragement.
- Dedication from all related scientists and common people.
- International cooperation.

Contributions to the world

- Theoretical breakthrough of heterosis utilization for self-pollinated crops
- Innovation of a complete and integrated technology of hybrid rice.
- Provided germplasms and breeding materials.
- Trained abundant talent human resources worldwide.
- Technical service in many countries through FAO, IRRI/ADB projects and private companies.
- Technological and management experiences of hybrid rice R and D shared wrldwide.
- Provided an important way for food security in the world.

Theoretical description of different hybrid rice systems





Constraints

- Efficiency of breeding and utilization of indica hybrid rice is decreasing.
- Seed production techniques have not been improved further.
- Lack of enough basic and applied-basic researches to further support technological innovation.
- Less effective cooperation at national, regional or even internal in the institutes.
- Not enough systematical hybrid rice technology trainings for the young generation.

Future Outlook

- Sustainable development with further increasing yield and growing area.
- Further increasing seed production yield.
- Combining biotechnology to make more breakthroughs.
- The cooperative spirit should be recovered and strengthened, and harmful competition should be controlled.
- Dedicate more obligations for hybrid rice global development.