PRIORITIES TO ADDRESS THE CLIMATE CHANGE IN MAIZE STUDY PROGRAM AT IAS

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Maize production losses due to water deficit, or referred to as drought, increasingly affect the economics and livelihood of millions of people. Significant yield losses in maize due to drought are expected to increase due to temperature rise and rainfall distribution changes unpredictively. The incidence of drought changes with locations and years occur in higher frequency in recent years in maize areas all over the world. Between 2003 and 2005, the World Food Program spent USD 1.5 billion to meet the food deficiencies due to drought and crop failure in Africa (World Food Program, 2006). It is obvious that water resources for agronomic uses become more limiting and human activities would play most important roll in finding ways to cope up with this problem. Drought tolerant maize is considered as one of the best cereal crops that have some advantages in mitigating the drought effects (Heisey and Emeades, 1999). To alleviate the drought effect, particular attention is given to drought tolerant hybrid breeding and water use efficiencies in cultivation practices. At IAS, maize research activities are focused on two subprojects: breeding for drought tolerances and growing maize on rice land in dry season to mitigate the severe ness of water shortage.

Breeding maize for drought tolerance

The study is just at initial step to breeding for drought tolerant hybrids. Since plants can achieve drought tolerance through a number of approaches, which deal with studies on escape, avoidance and tolerance mechanisms. The study must consider key traits in the breeding activities. Attentions were paid to yield, yield components and ASI (anther-silking interval) as target traits for phenotyping.

- Collection and primary screening of breeding materials: inbred lines from different sources have been collected to use in this research. More than 200 inbred lines have been developed and collected in 2009. Out of them, 90 lines passed first screening on the field, only those posses good performance at normal condition were kept to forward to next steps.
- Selected inbred lines were primarily tested for their drought tolerance at seedling stage (5-7 leaves).
- Crossing between recipient lines and tolerant lines to develop new population of breeding: A, B (recipient) x C, D (donor).
- Development of mapping population F_2, double haploids, RILs.
- Phenotyping F_2 population under two water treatments: well-irrigated and poor-irrigated water (stop irrigation 7 day before and after flowering).
- Mapping QTLs for target traits: yield, number of ear per plant, number of kernel per ear, weight of kernel, ASI.
- MAS (marker-assisted selection) were used to identify promising segregants, which included target QTLs controlling drought tolerance. It continued following the method “map as you go” (Dean W. Podlich et al, 2004).

- New selected inbred lines in cross combination with testers were recognized.
- Identifying tolerance of new crosses under drought condition was addressed.

Cultivation of maize on traditional rice land on western plateau

Planting maize as compared to rice cultivation in dry season on high land can save a lot of water and improve water use effiency. Traditional cropping patterns in low land at this region are rice-rice-rice or rice-fallow-rice. We would like to ship these systems into rice-rice-maize or rice-fallow-maize cropping pattern. Maize is intended to plant in dry season only when severe drought often occurs there. The study impact is to help farmer obtain appropriate solutions to improve their income, use less water by cultivating hybrid maize.

- Maize hybrids, which perform well in dry season, would be identified.
- Cultivation technique package to help maize well grow would be recommended.
- Demonstration of new techniques to farmers would be implemented.

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