

4. Integrated Crop Management: The Example of Irrigated Rice in the Sahel

Like farmers everywhere, irrigated-rice producers in the Sahel are regularly confronted with difficult decisions about crop production and input use. Levels of resource endowment, socio-economic profiles, and numerous biotic and abiotic factors affect the choices farmers ultimately make. These choices have important consequences for farm output and incomes, and the general welfare of producers and consumers alike.

WARDA's Irrigated Rice Program aims to improve the productivity, resource use efficiency and profitability of irrigated rice production in West Africa. To this end, the development of components for integrated crop management (ICM) features prominently in the program. ICM research in the Sahel recognizes that irrigated rice cultivation involves an array of component factors from land preparation to harvest and post-harvest management. These factors interact in a range of complex relationships and interdependencies that together determine crop growth, yield and profitability. The program strategy has been to develop, evaluate and adapt options for ICM, recognizing that the farmer will be the ultimate integrator of these various components, including fertilizer, weed and water management practices, the use of improved varieties, and cost-effective harvest and post-harvest technologies.

In terms of soil fertility, ICM research has emphasized improved management of available organic and inorganic fertilizers, whilst weed management options have focused on the combination of chemical and non-chemical measures. Because fertility and weed management are strongly linked to water management, cost-effective and efficient water management options

also comprise a key ICM element. This is especially important for systems where water is 'purchased.' The development and adaptation of improved varieties suited to conditions in the Sahel is another critical component for ICM. Attention has also been given to the important problems of threshing and cleaning. Farmers' organizations, NARES and development agencies have been key partners throughout the entire process of development, testing and dissemination of improved rice varieties.

WARDA's ICM work started in earnest in the early 1990s. The initial objective was to determine yield and productivity gaps in farmers' fields, and to identify key factors contributing to the observed gaps. Field surveys in the Senegal River valley showed yield gaps of more than 2 tonnes per hectare between farmers. Differences between observed and realistic target yields were even higher. Researchers identified the use of unsuitable varieties and poor input-management strategies as principal contributors to the yield gaps. With these results, attention shifted to the development and adaptation of improved varieties and crop management strategies to narrow the gap. On-station and on-farm trials were initiated to test the performance of introduced lines in combination with improved fertilizer and weed management technologies. Results from this work showed significant yield and productivity gains. In the mid-1990s, three improved lines (Sahel 108, Sahel 201 and Sahel 202) were released for use in the Senegal River valley. As a consequence of higher yields, a need for more efficient threshing was identified.



A prototype thresher–cleaner imported from the International Rice Research Institute (IRRI) was modified and adapted, and eventually released as the ‘ASI’ thresher–cleaner. The ASI quickly became a household name among irrigated-rice producers in the Senegal River valley, and has now been adapted for use in Burkina Faso, Côte d’Ivoire, Ghana, Mali and Mauritania.



With these foundations in place, on-farm research activities were initiated in the mid-1990s in the Senegal River valley. Work focused on assessing

and adapting the ICM components to the production environment. Field trials with AGETA (a producer organization in Mauritania) allowed further evaluation and adaptation of fertility and weed management technologies. Results showed significant increases in yields from the use of the ICM components. Yield increases of up to 1 t/ha were obtained from either improved fertilizer or weed management practices. Combining improved fertilizer and weed management resulted in increased yield in the range of 2 t/ha.

Encouraged by the results, in 1999 WARDA instituted an innovative on-farm program in collaboration with small-scale farmers’ organizations and the national research and extension programs in Mauritania. This work used a combination of approaches to better understand the intrinsic linkages between farmers’ socio-economic settings, the quality of the natural-resource base, their choice of crop and resource

management practices, and the productivity and profitability of irrigated rice production systems. Large-plot trials were set up to assess options for ICM in farmers’ fields. Surveys were undertaken to assess farmers’ management practices and to further characterize the production environment. The study concluded that farmers could significantly increase productivity and profitability by use of ICM. A major attraction is that the ICM components emphasize better management of available resources without significant increases in input levels. Farmers in two study sites realized 60% and 85% increases in yields and profits, respectively.

On-going and future research will emphasize the adaptation of the technology options to the broad range of irrigated rice production environments in West Africa. Work is on-going in the Senegal River valley and parts of southern Senegal and The Gambia. New initiatives will be launched in Mali and Burkina Faso in 2003.

Further reading

- Haefele, S., D. Johnson, S. Diallo, M. Wopereis and I. Janin, 2000. Improved soil fertility and weed management is profitable for irrigated rice farmers in Sahelian West Africa. *Field Crops Research* 66: 101–103.
- Poussin, J., M. Wopereis, D. Debouzie and J. Maeght, 2003. Determinants of irrigated rice yield in the Senegal River Valley. *European Journal of Agronomy* 19: 341–356.
- Kebbe, M. and K.M. Miezán, 2003. Ex-ante evaluation of integrated crop management options for rice production in the Senegal River Valley. *Field Crops Research* 81: 87–94.
- WECARD/CORAF, 1999. Strategic Plan. Draft, June 1999.