Enabling Successful Livelihood Diversification for the Rural and Urban Poor in Sub-Saharan Africa

Women are closely involved in vegetable cultivation and sale in sub-Saharan Africa

A dynamic rice-based agriculture in Africa will depend on successful diversification into high-value commodities, such as vegetables and fish. The Africa Rice Center is exploring these new R&D paradigms with its partners, in line with its Strategic Plan's emphasis on increasing resource use efficiency for more productive, profitable and socio-economically viable rice-based production systems.

The rationale for diversification is simple. By adopting rice-vegetable and rice-fish systems, farmers can diversify their source of income, improve their nutrition, create new marketing opportunities and reduce production risks.

Diversification can also help increase resource-use efficiency and the sustainability of the system by breaking the negative soil, nutrient, water use and pest buildup trends associated with continuous rice cultivation.

Promoting Integrated Rice-vegetable System in West Africa

Vegetables are the most affordable and sustainable source of micronutrients in diets and could, therefore, play a vital role in SSA, where it is estimated that vitamin and mineral deficiencies are costing the region's economy more than $2.3 billion in lost productivity.

Vegetables are increasingly being grown in and around large cities in the region, since there is a great demand for fresh foodstuffs from the urban population. In SSA, where although some 70% of the population still live and work in rural areas, the average annual urban growth rate is 3.5% per year—the highest in the world.

Traditionally, rice farmers in the region produce, apart from rice, a range of different crops, including vegetables. "Vegetables are now an integral part of the rice-based production systems in West Africa," said Dr Virginie Levasseur, Vegetable Agronomist, who is leading the World Vegetable Center (AVRDC)-Africa Rice Center collaborative project on the *Promotion of Superior Vegetable Cultivars in West Africa*.

Citing the example of the Office du Niger in Mali—one of the largest irrigation schemes in SSA—where rice production has diversified and farmers have started supplementing their income by growing vegetables in the rice fields in the dry season, she said, "Up to one third of the rice farmers' income comes from vegetable farming."

The collaborative project, which began operating from 2003, lays emphasis on integrating vegetables into rice-based farming systems. This fits in well with the Center's new production-system based strategy for the sustainable intensification and diversification of the lowland ecology, in particular the inland valleys and peri-urban rice-based systems in the region.

The inland valley lowlands have great potential for agriculture because of their fertile soils and the relative abundance of water. The valley bottoms are generally used for rice in the wet season and for vegetable crops in the dry season with residual moisture or supplementary irrigation.

Vegetable farming is generally a women's activity, which helps them earn money and increase the food security of their families. Women cultivate traditional vegetables such as local spinach, local eggplant, okra, and exotic vegetables such as hot peppers, tomatoes and onions. However, vegetable production and availability in West Africa are amongst the lowest in the world.

According to the initial surveys conducted by the joint project to identify constraints to vegetable production and marketing in integrated rice-vegetable systems in West Africa, it was found that farmers use low-yielding vegetable varieties that are susceptible to insect pests, diseases and to extreme agroecological conditions.

Among the other important constraints are the poor quality of seeds used, low availability of inputs for vegetable production and inadequate infrastructure for conservation, processing and transport, which leads to severe post-harvest losses. Lack of qualified researchers and extension agents in the vegetable sector is another bottleneck.

The project's priorities include:

- A better understanding of the interactions between rice and vegetable production and the opportunities for improvement
- Development of improved varieties and promotion of indigenous vegetables
- Improvement of small-scale vegetable seed production systems
- Training and information dissemination

Vegetables are increasingly grown in and around cities in sub-Saharan Africa

One of the initial activities of the project was a joint workshop on *Planning for Vegetable Research and Development in West Africa* in Bamako, in March 2004, which was attended by representatives from nine West African countries.

Joint missions have been carried out in target countries to make contacts with concerned people in this area and explore possibilities of collaboration. "This has enabled us to have an interdisciplinary understanding of the integrated rice-vegetable systems," said Dr Levasseur.

Partners of the project include the national research and extension systems of target countries in West Africa, the African Network for Horticulture Development (RADHORT), vegetable producers and processors. The Africa Rice Center-convened Inland Valley Consortium (IVC) serves as an entry point for the project in the region.

Exploring the Potential of Rice-fish Farming for West Africa

Water and cultivable land are getting more and more scarce around the world, particularly in drought-prone West Africa. One way to use these resources more efficiently is to integrate agriculture and aquaculture.

For instance rice-fish farming, which has been quite successfully practiced for centuries in Asia, offers farmers more than just fish as an extra farm crop. By promoting species diversification and nutrient recycling, it increases the productivity of land and water resources. It also contributes to the sustainability of inland capture fisheries, which are globally threatened.

Integrated rice-fish farming: efficient use of land and water resources

In this system, rice and fish are grown together either on the same plot or on adjacent plots and the by-products of one are used as inputs by the other. The fish provide a high-protein *bonus* crop to the rice farmer as well as additional fertilizer to the field.

Overall rice yields increase, fish enrich family diets, farmers' incomes rise and soils become more fertile. It has been found that efficient rice-fish farming systems can result in net incomes that are 7–65% higher than for rice monoculture.

The Africa Rice Center believes that there is enormous scope for the integrated rice-fish farming system in SSA, where it could lead to improved income, nutrition and food security for poor farmers and consumers. The system could help break the downward spiral of falling food production and declining soil fertility that plagues the region.

The Africa Rice Center-convened IVC, which serves as a platform for regional cooperation to develop technologies and operational support systems for intensified but sustainable use of inland valleys in SSA, is well positioned to take up the R&D activities in this area, in close collaboration with national and international partners. IVC is a system-wide initiative of the CGIAR.

IVC started exploring the potential of rice-fish farming for West Africa when it organized, in partnership with the Food and Agriculture Organization of the United Nations (FAO), a workshop on integrated irrigation and aquaculture (IIA) for West Africa, in November 2003 in Bamako, Mali. Thirty representatives from 10 West African countries participated in the workshop, which had Resource Persons from several international and national institutes.

The workshop was timely as the Consortium is participating in the project on *Community-based Fish Culture in Irrigation Systems and Seasonal Floodplains* within the Challenge Program on Water and Food. The project aims to enhance the productivity of seasonal floodwaters of large rivers by integrating community-based fish production into existing floodplain and irrigation systems.

Apart from developing technical options for integrating fish and other living aquatic resources into seasonal floodplains and irrigation systems, the project will explore institutional arrangements so that all stakeholders can equitably share the profits of this system. A major component of the project is to improve the capacity of national research and extension systems in this field.

The target areas of the project are the floodplains and deltaic lowlands of the Indus-Ganges, Mekong and Niger rivers. During the rainy season, floods prevent the use of land in the river floodplains and deltaic lowlands for crop production for several months every year.

The WorldFish Center has found that parts of these floodwater areas can be enclosed to produce a profitable crop of specifically stocked aquatic organisms, in addition to the naturally occurring 'wild' species that are traditionally fished.

This new approach was successfully introduced in Bangladesh and Vietnam, where fenced areas were stocked with fish during the flood season, while the same land was cultivated with rice during the dry season. Fish production from the fenced floodplain areas increased at least two- to ten-fold over the natural catch. Harvests from fish were sold on the market producing cash returns that was shared among group members.

The underlying assumption of this approach is that all stakeholders can communally manage seasonal water bodies under equitable and sustainable-sharing arrangements. However, the success of this approach depends on many variables, including prevailing social and economic conditions and is, therefore, highly site-specific.

Through the Niger River basin component of the project, this approach will be introduced to SSA for the first time. If it proves successful in Mali, it can be extrapolated to deepwater rice areas in Senegal, Nigeria, Guinea, Sierra Leone and Côte d'Ivoire.

IVC is responsible for the project component relating to the floodplains of the Niger River in Mali. It will coordinate the R&D activities of this component in association with Dr Ousmane Diallo, Head of Research on Aquatic Resources, Institut d'économie rurale (IER).

Fish enrich family diets and increase rural income

"We have already decided that the research site will be around Mopti, in Mali, where the largest floating rice ecology in this area is found," said Dr Paul Kiepe, IVC Scientific Coordinator.

In addition to IVC and IER, the project partners for the Mali component include the WorldFish Center (lead center for the overall project) and the International Food Policy Research Institute (IFPRI). The launching workshop is planned to be held in early 2005.