Forging new research partnerships

Private sector involvement is helping to deliver the products of research to rice farmers. In Bangladesh, the commercial development of a pheromone to control the major rice stemborer has been facilitated through a partnership between a private company and UK and national research institutions. This research has had a direct effect in changing government policy. There is no formal registration process for insect pheromones in Bangladesh but plans are now well advanced to introduce such a system.

Alan Cork

Pheromones enable children to fish in rice fields safely

Challenges and opportunities

During the 1990s increases in rice production worldwide were just sufficient to keep up with the rate of population growth. By the end of the decade global rice production totalled 400 million tonnes in milled equivalent, 95 per cent of which was grown in developing countries. However, projections of future demand for rice mean that production will have to increase substantially over the next few decades in order to meet this growing need. This arises at a time when rice production is becoming less profitable for farmers and when less water and labour will be available. Furthermore, trade liberalization presents particular challenges to the many developing countries in view of the importance of the rice crop for food security. Improvement in sustainable productivity is the key requirement for future rice production. Scientific research will continue to play a major role in helping to bring this about.

DFID Department for International Development

The United Kingdom's Department for International Development (DFID) commissions research directed towards the achievement of the Millenium Development Goals. The goals include halving the proportion of people in extreme poverty worldwide by 2015, improving the health of the poorest communities, and reversing the loss of environmental resources. Benefits from research conducted by one of DFID's bilateral programmes, the Crop Protection Programme (CPP), contribute directly and indirectly to the attainment of these goals. CPP research combines natural and social science in projects that alleviate the key crop production constraints faced by the poor in order to improve their livelihoods. The CPP also works to develop research capacity in the target countries. This helps to provide an enabling environment for the research to be translated into practice and to have a continuing impact on poverty once research activities have concluded.

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CPP Crop Protection Programme

Rice Research in the DFID Crop Protection Programme

Improving the productivity and sustainability of rice-based cropping systems can make a major contribution to alleviating poverty and improving the quality of people's lives. Rice is the staple food for more than half of the world's population and rice production provides employment for more than 1 billion people. The designation of 2004 by the United Nations as the *International Year of Rice* underscores the crucial importance of rice to people's livelihoods. Crop Protection Programme (CPP) rice research is helping to increase rice production and productivity, reduce drudgery, develop safer and more sustainable practices and ensure a stable supply of cheap food.

The CPP aims to generate benefits for poor people by producing and applying new knowledge on crop protection. In support of this objective, the CPP funds projects that address key constraints to rice production, including major weed, disease, insect and rodent pests. These constraints are identified through extensive consultation with local stakeholders to ensure that the research is in line with national priorities. Although the

Charlie Riches

In Tanzania, adoption of green manure reduces witchweed infestation and increases soil fertility and rice yield

research has a disciplinary focus, projects are designed to address broader issues such as gender and in some cases are cross-sectoral in nature. The projects involve partnerships between developing and developed country organizations.Two major collaborators are the international Rice Research Institute (IRRI) and the Africa Rice Center (WARDA). In order to ensure that the outputs of the research meet the needs of end users, these partnerships increasingly include private sector and non-government organizations. The research in rice-based systems is conducted in South Asia and in Africa where the greatest impact can be achieved.

Labour, water and weeds

Research in Bangladesh and India has addressed the emerging problems of shortages of water and, in some locations, of a scarcity of labour during the planting period. The research has shown that direct-seeding technologies have considerable potential to ameliorate these problems, provided suitable weed management regimes can be developed. Field trials have demonstrated that farmers can reduce input costs, maintain yields and increase incomes by substituting herbicides for manual weeding. However, the new practices are knowledge intensive and in certain areas there may be negative effects from reduced employment opportunities. These issues are being examined in current research projects where the technologies are being promoted.

Charlie Riches

Improved weed management practices removes the need for laborious hand weeding in Bangladesh

Rice pest management and human health

The control of rodents traditionally relies on the use of poisons, but these are often ineffective and cause health problems for people and the environment. Research in Mozambique, conducted in partnership with DFID's Crop Post-Harvest Programme, and in Bangladesh has identified improved rodent management practices including habitat modification and trapping. In addition to raising rice yields, villagers have benefited from reduced contamination of grain in stores and a lower risk of contracting diseases carried by rodents.

Steve Belmain

Improved rodent management protects rice yields and reduces human health problems

Preserving agro-biodiversity

In most situations, populations of rice insect pests are kept below damaging levels through the action of a wide range of natural enemies. However, the intensification of rice production often disturbs this balance and pest problems increase. Ecological research has shown that the key to effective natural control lies in ensuring that natural enemies with complementary functions are preserved. From this work a clearer understanding is emerging of what combination of natural enemies is most effective and how rice production systems can best be managed to ensure optimal pest control.

Farmer training and participatory research

Annual and perennial wild rice (*Oryza*) species are difficult to control in many parts of the tropics, including the flood plains of Tanzania and the Niger valley in West Africa, where they are a major constraint to the sustainable intensification of lowland and irrigated rice production. They are similar in appearance to cultivated rice in the early stages of growth so may be overlooked during weeding. They then compete vigorously with the crop and cause substantial yield losses. Through collaborative work in wild rice infested areas, the CPP project is developing and promoting improved control practices. Farmer participatory demonstrations of different improved control methods are being undertaken and extension information needed to support wild rice management has been developed.

Reducing risk for the rural poor

Major outbreaks of pests such as rice hispa in Bangladesh do not arise frequently. However, when they do occur the effect on the livelihoods of subsistence rice farmers can be catastrophic. Research has identified conditions that favour the build-up of the hispa beetle. This has led to the development of improved surveillance and forecasting systems and the promotion of more targeted control measures. Vulnerable farmers are benefiting from reduced risk and safer pest management practices.

Striga species, the so-called witchweeds, are noxious parasitic weeds which principally attack and reduce the yield of staple cereals and legumes including upland rice. They impose an additional stress with which people, who have little capacity for investment in crop production, have to cope in an environment characterized by marginal rainfall for cropping and declining soil fertility. CPP research in Tanzania has, however, demonstrated that rotation of rice on *Striga*-infested fields with either the green manure, *Crotalaria ochroleuca*, or the legume crop, pigeonpea, leads to a reduction in the *Striga* problem, increases soil fertility and increases crop yield. Farmers have found this to be a low input, economic and sustainable practice and in at least one district, farmers have adopted the practice.

Developing institutional capacity

Research on rice blast disease in West Africa and on rice sheath blight in Bangladesh has helped national research organizations and international agricultural research centres to develop their capacity in molecular diagnostics. UK expertise has been used to transfer molecular tools that have allowed the distribution and prevalence of pathogen isolates to be mapped. This information is being used to guide the deployment of resistant rice varieties in order to ensure that they remain effective for as long as possible. However, institutional capacity remains weak and there is a clear need to maintain and strengthen collaborative links.