



Food security through ricebean research in India and Nepal (FOSRIN)

Introduction

FOSRIN is a major initiative funded by DG research of the European Commission under the 6th Framework programme. It involves cooperation between 8 partners (universities, NARS and NGOs) in Europe and Asia. The three-year project has the overall objective of making the under-utilised crop ricebean (*Vigna umbellata*) more than locally popular by identifying and measuring the diversity in the germplasm available in India and Nepal and characterising it for suitability to local cropping systems, matching farmer-preferred varieties to diverse seasons, environments and markets, using genetic, agronomic, and socio-economic approaches based on client-orientated principles to identify genotypes and parents for breeding programmes suitable for integrating ricebean into rice- and maize-based cropping systems and into the diets of consumers in WNE India and Nepal.



Project staff at the kick-off meeting in Kathmandu, November 2006

Why?

Cereal production in S Asia has far outstripped that of legumes, with serious consequences for the food security and nutritional well-being of poor farmers in marginal areas. Ricebean (*Vigna umbellata*) is a legume grown in Western, Northern and Eastern (WNE) India and Nepal. It is grown as an intercrop, particularly of maize, and has been grown on residual water after rice. There is little or no choice of improved varieties as there has been almost no modern plant breeding in the crop: landraces predominate, and seed supply is limited or non-existent. Consequently, it is not grown widely despite being suitable for marginal areas where many poor people live. Established marketing channels do not exist. Ricebean grows well on many soils. It has rapid establishment, pest resistance, and potential for good yields of nutritious fodder and high quality grain, and this neglected crop has great scope for genetic improvement.



Ricebean evaluation trial in Gulmi, Nepal

What

Our specific scientific objectives are as follows:

- To analyze the supply-chain for stages and linkages where product value of improved ricebean is potentially lost or where information on product quality may be compromised or lost.

- To assess genetic diversity and indigenous knowledge on ricebean in Nepal and India
- To assess genetic diversity and uses of ricebean using indigenous knowledge of the crop
- To characterise the germplasm diversity using molecular marker techniques
- To characterise the germplasm for phenological traits and suitability for a range of diverse environments and cropping systems using participatory approaches.
- To assess the potential impact of enhanced pulse availability on local human nutrition.
- To develop a Market-based Legumes Traits Value-Index (MLTVI) that allows breeders to assess *ex-ante* the value of new legumes in terms of their monetary value to consumers.
- To develop innovative and efficient marketing methods for high quality, protein-rich products from the crops to increase market accessibility, product value and promote export value.
- To develop policies to support and promote equitable access to such protein-rich foods, building sustainable medium and long term food security

In order to meet these objectives, we are working through a number of complementary areas of scientific and research activity (Workpackages).

Supply-chain, consumer demand and marketing

This work, led by CAU, will produce a quantifiable Market-price based Legumes Traits Value Index (MLTVI), and the characterisation of the regional ricebean supply-chain in terms of agents, product flows and information flows. The work will include literature reviews of hedonic price analysis in order to improve earlier methodologies, pre-testing the methodology and field work (interviews with agents at all stages of the supply chain, collection and analysis of legumes samples and price data, assessment of grey literature), statistical analysis of the information and derivation of the MLTVI, followed by characterisation of the supply chain and designing a strategy to introduce ricebean into the legume supply chain.

Assessment of genetic diversity and indigenous knowledge

Led by LI-BIRD, this will describe the extent of ricebean diversity and its geographical distribution, collect representative samples of ricebean together with associated socio-economic data, evaluate the collection in the field for phenotypic diversity, and seek to understand the socio-economic and biophysical factors that control ricebean diversity and utilisation. The work will involve searching grey literature, field surveys (crops, PRAs, household surveys and

diversity fairs), germplasm collection, assessment of indigenous knowledge, and evaluation of germplasm in replicated field sites.

Molecular markers

This work will evaluate the collection of ricebean germplasm for molecular marker diversity, and is led by NARC in Nepal, with assistance from CAZS-NR. It will involve extraction and assay of DNA from bulk and individual plant samples, assay of a stratified random sample for identified polymorphic markers, analysis of the molecular marker data for diversity, comparison of the molecular data with agromorphological data and relating the diversity to biophysical and socio-economic variables.

Germplasm characterisation and adaptation

The aim of this workpackage, led by GVT, is to characterise germplasm for its suitability to a range of diverse environments and cropping systems. Activities will involve the identification of a set of accessions that best meet farmers' needs in terms of morphology, flowering time and grain quality, germplasm exchange between India and Nepal (if possible) to enable across-country testing, field testing in Mother and Baby trials, with analysis across years, locations and, if possible, countries.

Nutrition and health

The health and nutrition work is led by Bergen, and has the objective of assessing the potential impact of enhanced pulse availability on local human nutrition. It will involve 24-hour recall studies of diet composition, household surveys of food processing, assessment of the nutrient content of crops and ways to improve this, calculations of the range of daily requirements and cost:benefit analyses.

Who

The partners include Universities, National Agricultural Research Centres (NARS) and NGOs in the UK, Germany, Norway, India and Nepal. The project is led from CAZS Natural Resources (CAZS-NR), a semi-autonomous self-funding Centre within the University of Wales, Bangor. CAZS-NR expertise spans many countries in Africa, Asia and Europe, and we have wide experience of developing and promoting participatory approaches with farming communities in Asia. We are using our regional office for S Asia in Kathmandu to assist coordination of the project in the region. CAZS-NR will also produce the project website, as well as being responsible for other aspects of dissemination such as workshops and the production of the monograph. CAZS-NR will use their experience in the development of participatory approaches to germplasm characterisation to assist in the work on genetic diversity and indigenous knowledge and

germplasm characterisation, and will also assist with the molecular analysis of ricebean diversity.

Christian Albrechts University, Kiel (CAU) will, in co-operation with the Asian partners, carry out market surveys, assess constraints and opportunities, cost:benefit analysis in comparison to other legumes, and assess customer requirements and farmer-preferred traits for ricebean, while the University of Bergen (UB) will lead the health and nutrition studies, working closely with local partners in Asia.

The NGO Gramin Vikas Trust (GVT) will act as a within-country coordinator in India. With their long experience of participatory trials, they will lead the work on germplasm characterisation, and co-operate with Kiel to lead the Indian work on the supply chain and marketing, providing substantial back-up to the survey work. They will also be involved in the assessment of genetic diversity and indigenous knowledge. The two Indian SAUs, CSKHPKV in Palampur, Himachal Pradesh, and AAU in Jorhat, Assam, will also assist in the survey work, and will provide field sites, in particular in hill areas, for the germplasm characterisation, as will GVT for the hilly areas of western Madhya Pradesh, as well as assisting in the surveys of genetic diversity and indigenous knowledge in these regions. All the Indian partners will also assist Bergen in WP5, providing facilities in all the areas in which the project is working.

Of the Nepalese partners, the Nepal Agriculture Research Council (NARC) will lead the work on molecular assessment of genetic diversity, using the laboratory facilities set up during previous work with CAZS-NR. In this, they will be assisted by CAZS-NR. They will also contribute to the health and nutrition studies. The NGO Local Initiatives for Biodiversity, Research and Development (LI-BIRD) will provide the back up for Kiel for the survey work in Nepal, and lead the work package on indigenous knowledge and germplasm characterisation, drawing on a long experience in this type of work and working closely with CAZS-NR. They will also provide access to farm sites in Nepal for germplasm characterisation.

Output and dissemination

This project involves the participation of a large number of stakeholders, most of whom are small resource-poor farmers. The major outputs of the project, improved technologies (which includes germplasm), are public goods and will be placed in the public domain, although great care will be taken when disseminating germplasm to protect the IPR of the project partners, and all organisations wishing to use germplasm or DNA will be required to sign a materials transfer agreement.

Promising ricebean landraces and better understanding of the crop's nutritional value will form the basis for future research. For example, most promising landraces can be utilized as parents for ricebean improvement. Similarly new knowledge generated from nutrient analysis will be widely disseminated, which will create new market demand for the crop, ultimately contributing to greater use and conservation of ricebean. This material will be developed by the partners working with farmers. Wider adoption of farmer preferred and high yielding ricebean landraces will lead to substantial increase in the yield of ricebean, contributing to increase in income, food and nutritional security of the farmers.

The other intended results of the project include the MLTVI, and the knowledge of the supply chain for ricebean and other legumes in Nepal and India, which should be of benefit to a number of groups such as plant breeders and market intermediaries. The core of the nutrition WP is to establish better knowledge of a variety of South Asian diets, and the role of pulses and in particular ricebean in that. These data are presently largely unknown and will fall into a basic research category but could be crucial for further research on nutrition intervention and impact analysis of agrarian change.

There have not yet been any major project activities aimed at dissemination. However, the on-farm germplasm evaluation trials were visited by project staff at the tour held prior to the kick-off meeting, and a number of farmers and their families participated in the event, discussing ricebean with the project staff. In 2007 project staff are scheduled to attend two conferences, one in the UK in September, and one in India. We intend to try to develop a mechanism of mentoring with the participating communities after the completion of the project, and if possible to conduct a separate impact assessment five years post-project. We are also strongly of the opinion that outcomes should be subject to intensive upscaling efforts both during and after the project.

For more information about FOSRIN, please contact the Coordinator, Dr Philip Hollington by e-mail (p.a.hollington@bangor.ac.uk) or by telephone (+44 (0)1248 382285).

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