



Australian Government
Australian Centre for
International Agricultural Research

Sustainable and resilient farming systems intensification in the eastern Gangetic Plains

Project Highlights 1 (March 2015)



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Introduction

Millions of smallholder farm men and women in the eastern Gangetic Plain region of Nepal, Bangladesh and India are set to benefit from a four-year AU\$11 million integrated research and development initiative that is helping to make agriculture more productive, profitable and sustainable.

The region has the greatest remaining concentration of rural poverty in the world, and faces low productivity, weak institutions and intense threats from climate risk, including extreme events such as floods, drought and cold snaps. It is dominated by small farms, many of which are run by women owing to the number of men migrating for paid work. Most farmers have limited access to credit, quality seeds, fertilisers, irrigation or formal extension services and suffer water and labour shortages.

Currently rice and wheat productivity is low and diversification is limited, so new crop management and institutional innovations are critical. There is significant potential to boost agricultural and food production, so effective scaling out of the new innovations is also essential. At the moment markets are poorly developed and volatile, while agricultural knowledge and service networks are sparse. There is great potential to introduce and scale out more sustainable production practices which reduce rural poverty and boost water use efficiency.

The project

The *Sustainable and resilient farming systems intensification in the eastern Gangetic Plains* (SRFSI) project started with a field research component which aims to enable at least 130,000 farmers to adopt technologies to improve their crop yields with a complementary component on scaling out (under design) to boost agricultural production and reduce rural poverty within the next ten years. The project is initially targeting 7,000 farmers in eight districts: two in north-west Bangladesh, two in the eastern Terai of Nepal, and two each in the Indian states of Bihar and West Bengal – with five research hubs or communities in each district.

Innovations being tested in the field include conservation agriculture (CA) systems and ways to improve water use efficiency. Strengthening farmers' ability to adapt and link to markets and support services is also a high priority. The project is piloting inclusive approaches that benefit small and marginal households with a particular focus on women-headed households.

Progress report

The project was officially launched by Australian Ambassador to Nepal HE Glenn White in Dhulikhel, Nepal, at an event on 4 July 2014 attended by some 90 people from partner institutions in Australia, Bangladesh, India and Nepal. It was widely reported in the media following media releases being issued by the Australian Embassy in Nepal and the Australian High Commission in India.



Figure 1: Female farmer, Bhuluwa, Terai, Nepal

The project has more than 20 partners across Bangladesh, India, Nepal and Australia. Considerable effort has gone into consultation and building teams across institutions and creating a shared vision and understanding of participatory multi-stakeholder



Figure 1 Launch of the SRSFI project in Dhulikhel, Nepal

R&D approaches

The pre-project activities undertaken in 2013 (see below) involved high level consultations, training local stakeholders in innovation platforms, assessing farmer livelihood options and hydrological resources (by the International Water Management Institute), along with launching winter trials in Bangladesh and Bengal.

As at December 2014 the project had established 40 nodes of research across the targeted areas. A node consists of one or more villages in a district. The number of sites (farmer field experiments/trials) on new conservation agriculture technologies in a node range from 15 to 50 across the region. A comprehensive program of long-term, Kharif (summer) crops and Rabi (winter) crops research has been established, and skills have been built through a range of training and demonstration events (detailed below).

A significant challenge remains to reach large numbers of farmers, and particularly female farmers and small operators. Traditional linear approaches to technology transfer from researchers to extensionists to farmers have not been sufficient to reach these beneficiaries. Alternative approaches are being trialed including innovation platforms, which are multi-stakeholder forums for farmer-to-farmer learning and grounding public-private partnerships for research extension linkages at village level. The project is taking a gender-sensitive approach by involving women in all aspects of the research and scaling out, building an understanding their perspectives and gender roles, gathering disaggregated data and including women in technology development.



Figure 2 Smallholder farmers at a direct seeded rice field day, Rajshahi, Bangladesh

The project team has also established links with other regional projects including the Cereal Systems Initiative for South Asia, funded by the Bill & Melinda Gates Foundation and USAID, and the CGIAR Research Program on Climate Change, Agriculture and Food Security to enable the sharing of research outcomes and experiences in the region and globally – as well as sharing information other ACIAR and CSIRO projects.

Surveys

The SRSFI project includes a comprehensive program of surveys and discussions. These are building an understanding of the cropping systems, the natural and economic resources, people's livelihood strategies, their attitudes to risk and undertaking technical innovation, along with an understanding the status and requirements of the women farmers. Discussions have been held with male and female

farmers, service providers, input dealers, self-help groups and community leaders in each of the 40 nodes. A further round of group discussions with two groups of women, men, and mixed genders in each node are gathering further relevant information.

Socio-economic surveys are being conducted in two nodes in each district to gather household baseline data. For example, a rich data set on farming communities in two districts of West Bengal (Malda and Coochbehar) has been collected and analysed. This has provided a wide range of detailed information, such as the incidence of women-headed households in various socio-economic groups, scope to introduce crops to the cropping season, the potential for a 'mechanical hub' to overcome the lack of availability of machinery, the preferred means of receiving information and on women's role in decision-making. The project team is using this information to characterise the various areas in terms of their cropping systems, access to water and farming types to determine the types of technical options being tested in on-farm research trials, and to provide input into innovation platforms.



Figure 3 Discussions with farmers at trial sites, Coochbehar, West Bengal

Experiments with farmers

An important component of the project is the establishment of coordinated field trials in multiple locations. These are being conducted to explore a range of technological options for the different cropping systems in the nodes/villages including (1) opportunity cropping such as growing additional crops in the systems, for example intercropping with maize, vegetables of other short duration cultivars and relay planting; (2) diversifying crops and ways to intensify the cropping system e.g. through advanced planting or supplementary irrigation with energy efficient axial flow pumps and (3) long-term conservation agriculture with small-scale mechanisation.



Figure 4 A trial plot in a cauliflower plot, Nepal

The pre-project 2013/14 Rabi (winter) season trials completed in four of the eight project districts demonstrated the potential for increasing productivity and promoting prosperity in the region. In West Bengal and Bangladesh there were 55 and 99 on-farm participatory research trials respectively conducted to test various tillage practices and hybrids in different environments. Preliminary results of the Bangladeshi trials showed a 8-11% benefit of growing maize by reduced tillage, with labour savings of 30 days/ha, compared with farmers' conventional practices. The intercropping trials showed that farmers could almost

double their net income by intercropping maize with leafy vegetables compared with growing solely maize. Some of the data will validate the Maize Crop Manager which will be made available to farmers through smart phones and web-based tools. Preliminary results of wheat and chickpea trials indicated up to 17% improved



Figure 5 Diesel powered water pump near trial plot

productivity for wheat under minimum tillage, as well as savings in water and labour use – similar trends were also observed in the chickpea trials. In West Bengal, CA-based trials on wheat and lentil were more productive. However, for maize and mustard, while the yield was similar in CA and conventional tillage, there were savings on inputs and labour.

Opportunity trials are continuing on 120 farmer's fields across the sites testing different technological options depending on local needs; some 212 participatory farmer cropping systems trials have been targeted across sites

and nodes; and there are now 370 core trials (10 in each node) on conservation agriculture. Winter season trials are now underway in targeted areas – the third season in Bangladesh and West Bengal districts. Long-term trials with rice continue with more trials added in the winter season. Results available for the Bangladesh trials showed that direct seeded rice and unpuddled seeded rice provided a similar yield with less labour and lower fuel and input costs.

Private sector engagement

The SRFSI project has initiated engagements with the private sector at national and district levels to build their participation in research and the scaling out of the technologies. They will form a part of the innovation platforms. The project will explore innovative partnerships with business for fine tuning technologies to meet farmer and support service demand, e.g. nutrient blends, timing and quality of agricultural produce for different markets, for participating in machinery development and adaptation, and for evaluating other proto-technologies.

Agribusiness representatives participated in the May 2014 SRFSI strategic planning workshop in New Delhi, which offered some strategies for private sector investments. The experiences of a U.S. Agency for International Development (USAID) east India agri-business facilitation project and the globally recognized IDE model of commercialisation were also shared with the workshop participants. In addition, two other ACIAR projects have a decade or more of engagement with small-scale farm equipment commercialisation in India and Bangladesh respectively. Already some local West Bengal entrepreneurs are negotiating with Bangladesh equipment suppliers with a view to developing local manufacturing of two wheel tractor attachments for CA. The SRFSI project will focus particularly on local entrepreneurs/service providers of inputs, machinery and marketing. Training materials targeted to service providers are already being developed.



Figure 6 Zero till machine provided by the project

Gender

The increasing feminisation of agriculture in the eastern Gangetic Plain region was documented in a pre-project background study now available as an ACIAR publication. The survey of women-headed households showed that male out-migration affected more than 50% of households, creating new classes of de facto women-headed households in the region and diversifying household livelihoods to include remittances.

Gender will be the focus of continual analysis during the SRSFI project, in order to develop suitable technologies for these households. Moreover, the leaders of women's self-help groups will be targeted for on-farm research and dissemination of results. As described above some focus group discussions have been divided into separate



Figure 7 Female and male farmers at a field day in Rajshahi, Bangladesh

female, male and mixed groups in an effort to gather women's views. In each node 30% of the participating farmers are women. Some remarkable women have come forward to conduct on-farm trials in their fields. For example, in Baluwa node in Sunsari on the Terai in Nepal, Mrs Sanju Chaudhary has been selected as a project field technician. She is also the leader of a self-help group of 40-45 women. Similar interest has been shown by women in other areas of Nepal, in West Bengal and Bangladesh.

Knowledge sharing and capacity building

About 20 field days, exchange visits and exposure visits have been organised by project partners to date. In Bangladesh some 1000 people, including 400 women, attended various events during the rice season including farmer field days and exposure visits. The exposure visits involved stakeholders, including extension agents/officers, service providers, male and female farmers, researchers, local manufacturer, input dealers and local NGOs. In Nepal project staff, service providers and progressive farmers took part in an exposure visit to four districts to generate the awareness of farm mechanisation and agricultural marketing options. In West Bengal some 180 beneficiaries attended four events, including training on operation of machinery for tractor operators. While these numbers are impressive for this early stage of the project, further work is still required.

Project participants have also organised or attended some 30 events related to advanced courses, training and planned meetings. At the project inception in July 2014 scientists from a wide range of countries made scientific presentations to share their experiences and knowledge, along with their contribution to the project. Prior to the project inception meeting six scientists from partner institutes attended advanced training on conservation agriculture, farm machinery and on-farm research and data management.

Country planning meetings have since been held to design the on-farm participatory research (farmer field) and on-station research (in the research institute) to address the various issues of intensifying farming/cropping systems, soil health, surface and ground water access and management, nutrient management, conservation agriculture, crop modelling and various experimental protocols.

During November 2014, 50 staff were trained in innovation platform procedures during two workshops in Bagdogra and Patna. The formulation workshops not only

strengthened team building, but also augmented competencies for integrated agricultural research for development of a further 75 staff of the 20 partners.

In addition, five South Asian scientists from partner institutes attended an advanced conservation agriculture course at Ludhiana for three weeks to enable them to become CA experts for the project; eight researchers from partner institutes participated in a theory of change and impact pathways course in Brisbane; partner institutes conducted short courses and training on small-scale mechanisation, hands-on experience with conservation agriculture equipment, data collection and management for project staff and service providers; and recently Dr Peter Brown of CSIRO undertook training sessions on innovation platforms in Nepal and West Bengal in India for partner institutes.

Partners

The *Sustainable and resilient farming systems intensification in the eastern Gangetic Plains* project involves a large number of complementary research and development partners including national and state research institutions, extension services, non-government organisations and private sector partners across the three countries and in Australia.

The Australian Centre for International Agricultural Research (ACIAR) project is being led by the International Maize and Wheat Improvement Center (CIMMYT) with support of the Australian Department of Foreign Affairs (DFAT).

Australian project partners are CSIRO, Curtin University, University of Queensland and University of New England

Bangladeshi project partners include Bangladesh Agricultural Research Institute (BARI) and Rangpur-Dinajpur Rural Services, Department of Agricultural Extension and Bangladesh Agricultural Research Council (BARC)

Indian project partners are the Indian Council of Agricultural Research (ICAR), Bihar Agricultural University, Uttar Banga Krishi Vishwavidyalaya University, Department of Agriculture, West Bengal, JEEViKA (Bihar Rural Livelihoods Project) and Sakhi Bihar

Nepal's project partners are the Nepal Agricultural Research Council, Department of Agriculture, Ministry of Agricultural Development and Government of Nepal and International Development Enterprises (iDE)

International agricultural research centers include the International Maize and Wheat Improvement Center (CIMMYT), International Food Policy Research Institute (IFPRI), International Water Management Institute (IWMI) and International Rice Research Institute (IRRI)

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