

## Sustainable Management of Crop-based Production Systems for Raising Agricultural Productivity in Rainfed Asia

### GRANT RESULTS SHEET



Groundnut farmers in Lao PDR

The programme enhanced productivity and profitability of rainfed agriculture through climate-resilient, diversified crop-based production systems and farmer-preferred, locally adapted varieties

### Introduction

Food production needs increase by 70 per cent to meet the demand of the world's growing population, which is expected to reach 9.1 billion by 2050. In developing countries, 80 per cent of production increases are expected to come from yield increases, and only 20 per cent from the expansion of arable lands (with very limited scope for such expansion in Asia). Rainfed agriculture will have to play a greater role in ensuring future food security. However, the low and variable productivity of these lands remains a major concern. The programme helped enhance the production and productivity of rainfed smallholder agriculture through: farmer-participatory research; pro-poor agricultural technologies; climate-resilient crop-based production systems; and intercropping and integrated pest management (IPM) practices.

### Goals and objectives

The programme aimed to intensify the cropping systems with grain legumes to improve the productivity and sustainability of rainfed agriculture while diversifying smallholder farmers' income-generating opportunities. The main objectives included: (i) transforming low-productivity rainfed cropping systems into resilient and productive ones; (ii) providing technical innovation services to enhance capacities and expertise to support agricultural development; (iii) demonstrating inclusive market-oriented development in rainfed agriculture; (iv) building the capacity of smallholder farmers and their families to sustain resilient productive rainfed cropping systems and harness diverse income-generating opportunities; and (v) scaling up technological innovations through partnerships.



## Facts at a glance

### Grant implementing agency

International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

### Theme

Climate-smart agriculture and value chains

### Benefiting countries

India, Lao People's Democratic Republic, Nepal and Viet Nam

### Total programme cost

IFAD: US\$ 1.5 million  
ICRISAT: US\$ 700,000 (in-kind)  
NARES: US\$ 300,000 (in-kind)

### Partner

National Agricultural Research and Extension Systems (NARES)

### Effectiveness and duration

2012-2017

### Linkages to IFAD investment projects

Various projects in all target countries

## Beneficiaries

The grant reached out to over 30,000 direct beneficiaries and an estimated 150,000 indirect beneficiaries, particularly targeted under IFAD-funded projects in: Jharkhand, Madhya Pradesh and Rajasthan States of India; northern and southern parts of the Lao People's Democratic Republic; western mid-hills of Nepal; and Ha Tinh and Cao Bang Provinces of Viet Nam. Almost half of the beneficiaries were from indigenous and tribal communities, and 36 per cent and 22 per cent of them were women and youth, respectively. In Rajasthan, all project participants were women, and in Jharkhand female beneficiaries constituted almost 57 per cent, and young people almost 42 per cent. Moreover, almost all the Lao beneficiaries (95 per cent) and all project participants in Jharkhand were from indigenous and tribal communities.

## Main activities

Activities were implemented under four integrated components:

**Designing resilient productive cropping systems.** Various resilient productive cropping systems were introduced, such as intercropping of cereals with grain legumes. Crops were selected based on productivity, gender sensitivity, and market/consumer preferences. Farmer-participatory varietal selection trials were conducted on farmers' fields. A wide range of pro-poor improved crop management practices were also developed and tested.

**Technical support to scale up innovations.** Innovations were scaled up through integration with other development programmes and extension services as well as through linkages with IFAD-supported projects. Farmers were sensitized on the advantages of multiple cropping through training programmes and field days. Those who received seeds of improved varieties were encouraged to sell the produce as seed to other farmers and not as grain to the market. This promoted farmer-to-farmer spread of varieties.

**Inclusive market-oriented development.** Seed business models, including community-based seed production systems, were developed through the involvement of lead farmers and farmer groups, including self-help groups. Support was also provided to develop rural microenterprises and link farmers to markets through value addition at the local level, while enhancing women's decision making at both farm and household level.

**Building capacity of smallholder farmers.** Farmers benefited from a variety of formal and informal training sessions, exposure visits, field days, farmers' fairs, workshops and awareness programmes, with the help of print and electronic media.

## Main results

**Productivity increases.** Various models of intercropping were introduced, such as: (i) soybean-pigeon pea intercropping in Madhya Pradesh in India;

## Community-based seed production systems enhanced farmers' access to seeds, and provided a meaningful business proposition for seed producers

(ii) pearl millet-moth bean-green gram, pearl millet-green gram or moth bean, and sesame-guar in Rajasthan in India; (iii) wheat-bean, rice-lentil, maize-chickpea, maize-soybean-chickpea systems in Nepal; (iv) rice and groundnut sequencing in Lao People's Democratic Republic; and (v) groundnut (spring) – mung bean (summer-autumn) – maize (winter) etc. sequencing in Viet Nam. Additionally, ecofriendly integrated pest management techniques (e.g. pheromone traps) were promoted for managing insect-pests. Seed treatments with biofungicides were promoted to minimize incidence of soil-borne diseases. These systems and practices significantly increased productivity. For example, cultivation of groundnut in the dry season led to yield increase of wet-season rice by 25 per cent in the Lao People's Democratic Republic. Seed treatment with molybdenum enhanced chickpea yield by 22-25 per cent in Madhya Pradesh and lentil yield by 25-30 per cent in Nepal. Planting of pigeon pea on ridges with a spacing of 75 cm between ridges and 30 cm between plants helped the crop from waterlogging and resulted in 27 per cent higher yield compared with flat sowing in control plots. The IPM for pod borer increased chickpea yield by 50 per cent in Nepal.

**Enhanced seed production and access.** Community-based seed production systems proved effective in enhancing the availability of, and farmers' access to, seeds, while providing a meaningful business proposition for seed producers. In Viet Nam, small farmers were linked with a local seed company in Cao Bang Province, so procuring 400 tonnes of groundnuts. In Madhya Pradesh, the RAK College of Agriculture produced quality seed at a research station farm for improved varieties of pigeon pea, chickpea and lentils. In total, 47.8 tonnes of quality seed were produced during the project period. Farmers taking up seed production produced 12.8 tonnes of seed for varieties of pigeon pea, lentils and chickpea. Some of these seeds were distributed to farmers in neighbouring areas. In Nepal, 12 community-based groups produced seed of improved varieties of bean, pigeon pea, groundnut, soybean, chickpea and lentils, which were distributed among farmers.

**Greater incomes and market access.** As a result of yield increases, seed production business activity, and greater control of pests and diseases, farmers benefited from higher production levels and incomes. For example, in the Lao People's Democratic Republic, farmers cultivating groundnut earned additional income compared with those cultivating rice in the dry season. The subsequent rice crop in the same field yielded 5 tonnes/ha compared with the usual 2.4 tonnes/ha, earning an additional US\$ 614/household. This success prompted farmers in neighbouring areas to start commercial production with support from the project. They achieved groundnut yields of 1,200 kg/ha, earning 2.5 times more income (US\$ 300) compared with rice. Small farmers in Cao Bang Province (Viet Nam) selling seeds to companies obtained additional income of US\$ 120,000 and US\$ 75,000, respectively, compared with previous individual selling.

## Partner

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In Jharkhand, women farmers received 12 dal mills / huller machines to make dal (splits) and flour from their legume crops. The products were used for their own consumption, boosting nutritional security, with the surplus sold at the local market to earn additional income. In addition, linkages were developed with 71 existing microenterprise centres for value addition of farm and forest produce. The project also signed a public-private-community partnership agreement to promote marketing of groundnuts produced by farmers from Lao Ngyam District (Salavanh Province) in Thailand. Farmers learned how to maintain quality to meet market standards and to obtain the best price on international markets.

## Lessons learned

Farmer-participatory demonstrations and trials, as well as farmers' visits to research stations and other project locations, proved successful in enhancing farmers' knowledge and adoption of improved varieties and technologies, as well as in spreading them to other farmers.

Inadequate availability of quality seed is a major constraint to farmers' adopting improved varieties. In most countries, private seed companies have limited involvement in seed production of certain crops. Project-supported farmers were keen to produce improved seed varieties, provided an arrangement existed to procure seed through national/state seed corporations or other agencies. Community-based seed production systems through farmers groups or associations proved a valid option for seed delivery at village level. Where possible, public-private partnerships should also be established to strengthen the seed system.

Knowledge management products in local languages are of great help in spreading technologies beyond the programme timeframe.

Some investment projects did not have staff with adequate knowledge of crop production aspects, which posed challenges in testing and promoting the related technologies.

## Knowledge generated/disseminated

Packages of good practices and production technologies were developed for the new crops and improved varieties introduced by the grant. Thirty-three booklets were published in local languages, and more than 29,000 copies were distributed to farmers. In all, 68 training programmes, 58 field days, 12 exposure visits, and 7 workshops were conducted. A video was produced to share project experience and achievements, and some of the knowledge management products were posted on the IFADAsia Portal.