CRP 3.5 GRAIN LEGUMES
Consortium Research Program
Leveraging Legumes to Reduce Poverty, Hunger, Malnutrition and Environmental Degradation in the Developing World

Vision

CRP 3.5 GRAIN LEGUMES is a major international research-for-development program convened by the CGIAR to help smallholder farmers increase yields of the eight major grain legume crops of the developing world by 20%, over 20% of the sown area, by 2020, benefiting 300 million poor. Benefits of US$ 3.0 billion over the decade will result from increasing food supplies by 7.1 million tons and fixing an additional 402,000 tons of atmospheric nitrogen. Additionally, human nutrition will be improved through the biofortification of essential dietary minerals and women’s participation in value chains will be enhanced, improving the well-being of their children.

CRP 3.5 addresses head-on the CGIAR priorities of food and nutritional security, poverty reduction and environmental sustainability.
Improving food and nutritional security

Grain legumes are “poor people’s meat”. The poorest of the poor are unable to afford enough meat and milk to supply their and their children’s needs for protein, micronutrients and oil. Numbering in the hundreds of millions, they depend on leguminous beans, peas and nuts to combat the nutritional deficiencies that harm the mental as well as the physical development of about one-third of children in sub-Saharan Africa, and nearly half of those in South Asia as well as for the poor in Latin America and the Caribbean and in Central/ West Asia and North Africa. Thus, a focus on grain legumes is a focus on the poorest people in the world.

A grain legume research-for-development focus particularly benefits women, because they are the primary cultivators of these crops in many areas — and through them, especially benefits the children that they care for.

Malnutrition stalks the bean-dependent poor in Latin America.

Chickpea-based famine relief paste ‘Wawa Mum’ nourishes children following floods in Pakistan. (Photo credit: Amjad Jamal, WFP Pakistan)

African mother weaning child on boiled beans.

Grain legumes were overlooked in policy decisions that boosted the production of Green Revolution cereals since the late 1960s, so farmers logically grew those policy-favored crops on their best lands, often with irrigation. But this relegated grain legumes to marginal rainfed environments and short-season, second-crop niches, causing yield and production increases to lag. The current shortfall of 7 million tons of supply compared to demand for chickpea, groundnut and pigeonpea in low-income food deficit countries is projected to increase by almost 50%, to 10 million tons by 2020, if business-as-usual continues.

Alarmed at the growing gap between demand and supply of grain legumes, and the high costs and uncertainties of filling this gap through imports, developing countries are reviewing and revising their policies to encourage greater production of grain legumes. This creates a window of opportunity for increased impacts from CRP 3.5 grain legume research-for-development.

Plant breeding allied with improved seed systems will give farmers essential genetic options for stabilizing and raising yields, by reducing disease and pest damage and losses from drought and heat, improving biological nitrogen fixation, and boosting yield potential. Improved crop management techniques will simultaneously be devised so that these genetic gains can be fully expressed in farmer’s fields.

Supply and Demand Projection to 2020 for chickpea, Pigeonpea, Groundnut and Soybean in Low Income Food Deficit Countries ('000 MT)

Source: IMPACT model projection, S. Nedumaran, ICRISAT.

Increasing demand-supply gap for grain legumes.

Better-adapted, less-diseased groundnut variety (upper right) produces more biomass and yield and fixes more atmospheric nitrogen than local variety (lower left).
Reducing rural poverty

Small-scale farmers cultivate grain legumes both for food and for cash. They typically inter-crop grain legumes so that they mature later than the cereal or root/tuber crop. Spreading risk over time in this way is crucially important for livelihood resilience. When the cereal/root/tuber crop is damaged by drought, the later-sown legume rescues the family food supply. In good years when a grain legume surplus is produced it is sold for much-needed cash.

The eight major grain legumes of low-income food-deficit countries in Africa, Asia, Latin America/Caribbean, and Central/West Asia-North Africa (groundnut, soybean, chickpea, cowpea, common bean, pigeonpea, lentil, and faba bean) are equal in total dollar value to maize or wheat. The US$24 billion annual value of the legume grain alone at the farm gate represents employment and income for hundreds of millions of rural poor. The per-capita consumption of grain legumes is growing more strongly than for other crop commodities in the developing world, yet local production is not able to keep up with this demand.

Filling this grain legume supply-demand gap also provides an exciting opportunity for South-South trade to help farmers escape from poverty. Incomes for poor farmers in parts of Ethiopia, Kenya, Malawi, Tanzania, and other African countries have sharply increased in recent years from the export of grain legumes to satisfy the huge demand of South Asia and beyond. Millions of South Asian farmers also benefit by selling their increased production into their home markets, as do farmers across the developing world. Research to further improve the competitiveness of these emergent value chains, particularly aspects that benefit poor women will receive high priority in CRP 3.5.
**Region and crop and focus of CRP 3.5**

To maximize impacts, CRP 3.5 will focus on the most important smallholder legume crops in low-income food deficit countries in these five regions:

- **South and Southeast Asia**
  - Chickpea, groundnut, pigeonpea, lentil
- **Western and Central Africa**
  - Cowpea, groundnut, common bean, soybean
- **Eastern and Southern Africa**
  - Common bean, groundnut, soybean, faba bean, cowpea, pigeonpea, chickpea
- **Latin America and the Caribbean**
  - Common bean
- **Central and Western Asia and North Africa**
  - Chickpea, lentil, faba bean

**Sustainable intensification**

Population growth trends indicate 50% more mouths to feed by 2050 than at the beginning of this millennium, but how can this food be produced? Nations do not want to expand agricultural cultivation into their remaining natural lands. They urgently need ways to raise food production on existing farmland that do not degrade and pollute the environment through the overuse of agrochemicals (sustainable intensification). CRP 3.5 will make an especially important contribution. Grain legume growth patterns uniquely complement those of cereals, roots and tubers so that farmers can intercrop them, producing two crops where there would otherwise be only one. Grain legumes boost food production and farming system efficiency by making fuller use of the water and nutrients in the soil.

Utilizing grain legumes to extend crop production past the end of the rainy season confronts drought and heat challenges, so CRP 3.5 will increase genetic tolerance to these stresses. Drought and heat tolerance will become ever more valuable to the world as climate change tightens its grip.

A stellar contribution of grain legumes to sustainable intensification is their ability to make their own nitrogen fertilizer out of thin air, through the remarkable process of biological nitrogen fixation (BNF). Nitrogen deficiency is a widespread limiting factor to increasing smallholder food production. Not only do grain legumes fix enough atmospheric nitrogen to satisfy much of their own need; they also leave extra nitrogen in the soil for the following crop. Their nitrogen-rich stems and leaves are important as well; they are blended into cereal fodder to enrich its protein content to improve the growth of livestock. Currently, though, BNF on poor smallholder farms is severely limited by concurrent stresses such as low soil phosphorus and drought. CRP 3.5 will work closely with partners such as the N2Africa program to raise BNF closer to its potential on small-scale farms through both plant breeding and improved crop management.
Strategic Objectives of CRP 3.5

CRP 3.5 pursues its vision through six Strategic Objectives:

- **SO 1 – Genetic resources:** Conserving and characterizing genetic resources and developing novel breeding methods/tools for improving efficiency of crop improvement

- **SO 2 – Crop improvement:** Accelerating the development of more productive and nutritious cultivars for resilient cropping systems of smallholder farmers

- **SO 3 – Crop and pest management:** Identifying and promoting crop and pest management practices for sustainable legume production

- **SO 4 – Seed systems:** Developing and facilitating efficient legume seed production and delivery systems for smallholder farmers

- **SO 5 – Value chains:** Enhancing grain legume value chain benefits captured by the poor, especially women

- **SO 6 – Partnerships:** Partnerships, capacities, and knowledge sharing to enhance grain legume R4D impacts
Program management

CRP 3.5 is a major institutional innovation uniting ten initial Principal Partners: four CGIAR centers (ICRISAT-lead center, CIAT, ICARDA and IITA), a CGIAR Challenge Program (Generation), four major national agricultural research systems (EIAR-Ethiopia, EMBRAPA-Brazil, GDAR-Turkey and ICAR-India) and the USA Dry Grain Pulses CRSP. All are leaders in complementary grain legume topics and regions. The unification will streamline these partner’s interactions with regional networks and national institutions. It will also enable cost-effective sharing of advanced research facilities and expertise. CRP 3.5 is proposed for the period 2012-2020 with an initial budget of approximately US$40 million and increasing over the period.

Climbing beans in mid-altitude Rwanda.

About ICRISAT

The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a non-profit, non-political organization that conducts agricultural research for development in Asia and sub-Saharan Africa with a wide array of partners throughout the world. Covering 6.5 million square kilometers of land in 55 countries, the semi-arid tropics have over 2 billion people, and 644 million of these are the poorest of the poor. ICRISAT and its partners help empower these poor people to overcome poverty, hunger, malnutrition and a degraded environment through better and more resilient agriculture. ICRISAT is headquartered in Hyderabad, Andhra Pradesh, India, with two regional hubs and four country offices in sub-Saharan Africa. It belongs to the Consortium of Centers supported by the Consultative Group on International Agricultural Research (CGIAR).