TROPICAL LEGUMES III

Bulletin of Tropical Legumes

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About the bulletin

The *Bulletin of Tropical Legumes* is a quarterly publication of the Tropical Legumes III (TL III) project. The project is funded by the Bill & Melinda Gates Foundation (BMGF), and jointly implemented by the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), the International Center for Tropical Agriculture (CIAT), and the International Institute of Tropical Agriculture (IITA) in close collaboration with National Agricultural Research Systems (NARS) of target countries in sub-Saharan Africa and South Asia.

This quarter we will be focusing on the key highlights, achievements, lessons learnt during Year 1 of project implementation and a few success stories from the field.

Executive summary

TL III is a visionary project that seeks to improve the lives of smallholder farmers through enhanced grain legume productivity and production. To achieve this, TL III is anchored on three pillars: (i) Developing Improved Varieties of four key legumes (groundnut, cowpea, common bean and chickpea); (ii) Improving Breeding Program Capacity; and (iii) Seed Delivery and Gender as a cross cutting theme.

During Year 1 the project was able to release 12 improved seed varieties, establish 55 functioning stakeholder platforms, organize 14 capacity building trainings, and produce 356.6 tons of basic, and 15,637.1 t of certified/ quality declared seed. The project also adopted the 'small packs' approach to enhance wider and affordable access to the improved seed varieties. Six new labor saving technologies were accepted and are being used by smallholder farmers to increase production and quality of post-harvest products.

The key lesson learnt is the usefulness of small seed packs in the dissemination of new improved varieties to smallholder farmers. Small packs provide wider and more affordable access to seed of improved legumes varieties to smallholder farmers as their farming area is small. Across all the four legumes and countries, 20% of the seed produced were sold in small (1 kg, 2 kg, and 5 kg) packs.

Introduction

TLIII is a major international initiative supported by the Bill and Melinda Gates Foundation, teaming up ICRISAT, CIAT, IITA, eight NARS, and other partners, to develop improved cultivars of common bean, cowpea, chickpea and groundnut, and deliver the improved seeds to smallholder farmers in Ethiopia, Tanzania, Uganda, Nigeria, Mali, Burkina Faso, Ghana, and India.

These four grain legume crops are grown by most of the smallholder farmers and are a cornerstone of sustainable staple crop production systems. They provide 'free' nitrogen to soils through atmospheric nitrogen fixation, increase and diversify smallholder income streams (and hence buffer them from the effects of price, pest, and climate-related production fluctuations), and increase household diet quality because of their higher protein and nutritional content.

The TLIII project builds directly upon the outputs and momentum of the Bill and Melinda Gates Foundation-funded Tropical Legumes I and Tropical Legumes II (TL-I and TL-II) projects. Implementation began in April 2015. In this bulletin we are going to share with you the key highlights and achievements attained during Year 1 of the project and success stories from the field.

Key highlights and achievements

- Developing Improved Seed Varieties

This objective seeks to develop improved seed varieties that are resistant to biotic and abiotic stress as a strategy to mitigate key production constraints of common beans, chickpea, cowpea and groundnuts.

Development of improved seed varieties of groundnut and chickpea is led by ICRISAT, and NARS partners are supported by ICRISAT's global genetic gains program to develop a high throughput genotyping platform in groundnut and chickpea. INERA, SARI, IAR, IER and IITA are partnering in developing improved cowpea varieties; and the development of improved common

Project: Tropical Legumes III (TL III)

This work has been undertaken as part of the CGIAR RESEARCH PROGRAM ON Grain Legumes

Investor: Bill & Melinda Gates Foundation

Partners: CIAT 45, ICRISAT International Crops Research Institute for the Semi-Arid Tropics, IITA Research to Nourish Africa

beans varieties is spearheaded by CIAT for EIAR, DRD and NARO.

During the year the project released twelve improved seed varieties (6 groundnut, 2 cowpea, and 4 chickpea). Overall, 317 varieties were offered by the project for national testing, 18 national performance trials were conducted, 326 farmer preferred varieties were selected, 28 lines were submitted for distinctiveness, uniformity and stability (DUS) tests, and 100.06 t of breeder seed were made available for seed multiplication. See Table 1 below.

A TL III farmer admiring improved common bean variety in his farm (Iringa, Tanzania).

Table 1. Seed development summary.

	Country/State															
	Burkina Faso		Ghana		Mali		Nigeria		Ethiopia		Tanzania		Uganda		Uttar Pradesh	Total
Indicator	GN	CP	GN	CP	GN	CP	GN	CP	CB	CHP	GN	CB	GN	CB	CHP	Achievements
Number and type of improved Legume varieties developed	1	_	1	110	1	20	1	88	_	3	1	_	1	_	1	228
Number of improved varieties available for national performance testing	30	7	_	12	_	8	_	22	_	_	20	4	158	42	14	317
Number and type of national performance trials conducted	_	1	_	2	_	2	_	2	6	1	_	_	1	_	3	18
Number of FPVS conducted	1	80	_	5	86	0	_	5	3	81	10	3	0	40	12	326
Number of lines submitted for Distinctness, Uniformity and Stability (DUS)	0	7	0	_	0	_	0	_	4	3	0	4	0	8	2	28
Quantity of breeder seed available for seed multiplication of improved varieties (in tons)	6	6.35	_	0.404	_	2.245	_	15.36	_	_	0	_	0	37	31.84	100.06

Improving Breeding Program Capacity

A number of modern breeding tools and approaches were adopted and used by CGIAR legume breeding programs during TL-II project. As such TL III under the Improving Breeding Program Capacity objective seeks to institutionalize these breeding tools and approaches at the African hubs of these institutions and at the NARS partner institutions- so that African farmers are able to leverage the advances brought in by these technologies.

During the year ICRISAT installed the Breeding Management System (BMS) in all partner countries.

A BMS is a modern data management tool used by breeders to manage pedigree, genotyping and phenotyping datasets. ICRISAT also held five BMS trainings across countries to train national breeders on the same and they are now using the system in their breeding processes. Similar efforts were seen at CIAT headquarters where they installed a server and uploaded their first electronic field book.

Breeding pipelines for eight programs – groundnut in Mali, Malawi and Uganda; sorghum in Mali; pearl millet in Niger, and finger millet in Kenya; and common bean in

Uganda and Malawi – were assessed using the Breeding Program Assessment Tool (BPAT). The project held 14 capacity building trainings that equipped 271 breeders and technicians (across the region) with practical skills on how to capture, analyze and manage pedigree, genotyping and phenotyping datasets using Integrated Breeding Platform (IBP) and Breeding Management System.

Eight students (4 PhD, 4 MSc) were sponsored by TL III to undertake different breeding courses with the hope that after their completion they will be more effective and efficient in breeding, and thus achieve greater genetic gains.

Seed Delivery

This objective uses the seed delivery models used in TL-II but in a more expansive way to ensure that the improved seed varieties developed have been multiplied and have reached the smallholder farmer. It achieves this through partnerships with other projects that have similar objectives.

During the year a total of 15,993.7 tons (356.6 t of basic seed and 15,637.1 t of QDS) of improved seed were produced. (See Table 2 below.)

The small packs model was extensively used to enhance wider and affordable access to seed of improved legumes varieties, which means that 20% of the seed produced were sold in small (1 kg, 2 kg, and 5 kg) packs.

Fifty-five (55) innovative multi stakeholders' platforms were established/strengthened in various countries to link legumes value chain actors (seed producers, grain traders, researchers, extension staff and other input suppliers).

A total of 124 trainings and short courses on quality seed production, group dynamics and management, good agronomic practices, post-harvest handling and seed dressing were provided to 14,967 platform members (farmers, development technicians/experts, agro dealers and extension officers).

In an effort to create awareness about improved legumes varieties, improved agronomic practices, post-harvest handling, complementary technologies and business management, the project established 1,516 demonstration sites, 136 field days, organized one exchange visit,13 agri/seed fairs and shows, published 30,000 copies of assorted awareness materials (leaflets, flyers, manuals), and broadcast 70 TV/Radio programs.

Six labor saving technologies/mechanization tools were identified, demonstrated and are being used by smallholder farmers to reduce drudgery, and increase production/quality of post-harvest products.

Table 2. Quantity of various seed classes produced, and organizations engaged in TL III countries, by crop in 2015/16.

		Quantity of seed grade (tons)		Type of seed producers				
Country	Crop	Basic	Certified/Quality declared seed	Public seed enterprises	Seed companies	Individual seed producers	Farmer organizations	NGOs
Ethiopia	Beans	67.70	2,590.00	3	2	5	8	-
	Chickpea	72.50	2,040.70	4	1	10	18	-
Tanzania	Beans	82.58	542.70	3	2	58-	45	2
	Groundnut	13.00	156.00	2	2	10	15	-
Uganda	Beans	7.25	8,831.37		6	-	10	-
	Groundnut	7.00	52.00	1	3	11	6	1
Burkina Faso	Cowpea	31.10	239.60	1	5	5	5	2
	Groundnut	5.00	28.00	1	1	7	5	4
Ghana	Cowpea	19.20	95.70	1	3	11	1	-
	Groundnut	2.00	36.50	1	3		-	
Mali	Cowpea	9.20	184.00	-	1	1	1	-
	Groundnut	24.44	109.35	1	1	1	1	-
Nigeria	Cowpea	46.10	751.10	2	3	10	15	1
	Groundnut	4.80	120.00	3	3	5	10	-
India	Chickpea	NA	NA	-	-	-	3	-
Total		391.87	15,777.02	23	36	71	135	10

Figure 1. Seed delivery achievements.

- Project management coordinationThe project launch workshop was held on 18-23 August, 2015. This workshop provided TL III stakeholders a platform for: (i) better understanding of the project context and objectives; (ii) increased understanding of TL III's various country legume strategies; (iii) development of both project and country work plans; (iv) integrating TL III Project Monitoring, Learning and Evaluation (MLE) Plan into various country work plans. The workshop also created a sense of ownership of the project in partners.

The Global Monitoring, Learning and Evaluation plan was developed and submitted to BMGF for approval.

The project held two project oversight meetings. One, the Pan African Grain Legumes and World Cowpea Conference that focused on the importance of grain legumes for food security, child health, environmental sustainability, economic welfare and livelihood of smallholders' farmers in Africa. Two, the TL III Annual Review and Planning meeting, which provided a platform for all project implementers to review TL III Year 1 progress, present Year 2 annual work plan and seed road map, and forge the way forward in order to ensure that the project achieves its goal.

The project published a book, *Seven seasons of learning and engaging smallholder farmers in the drought prone areas of SSA and SA*, highlighting the achievements of the Tropical Legumes project over the past seven-year period.

Much has been achieved and yet more remains to be achieved. The project will intensify its activities during Year 2 for much of the activities undertaken during Year 1 were preparatory activities.

Real People, Real Stories from the Field

Legumes change fortunes of farmers and empower women in the Southern Highlands of Tanzania

While it is the number one cash crop for most farmers in Tanzania, maize is getting a serious run for its money from legumes such as beans, groundnut, and soybean which are becoming commercial crops in the cool and hilly terrain of the Southern Highlands. In addition, legumes are also good for tackling malnutrition and soil infertility as they are a cheap source of protein and are able to fix nitrogen from the air into the soil.

This turn of events has, firstly, been fueled by many years of collaboration between farmers, Uyole Agricultural Research Institute with technical backstopping from IITA, CIAT, ICRISAT and Wageningen University, development partners such as One Acre Fund and Farm Inputs Promotion Services (FIPS), the Tanzanian Government, the Bill & Melinda Gates Foundation, and the private sector, which has seen the development and dissemination of improved varieties and good agronomic practices enabling farmers to increase their legume yield by up to four times.

And secondly, a ready market within and in the neighboring countries of Zambia, DR Congo, Malawi, and as far down as South Africa.

On a recent visit to the region, we met a number of farmers whose fortunes have greatly changed and livelihoods improved as a result of growing legumes. One such example is given below.

Daudi Bukuku – from borrowing soap to a respectable bean expert

- Daudi Bukuku, a charming 38-year-old farmer has seen his life turn around from not being able to even afford soap for his family to being able to purchase and install a biogas plant at his home, thus reducing the drudgery and time spent by his wife looking for firewood. All thanks to beans.
- "Before starting this improved farming of beans, I used to harvest 200 kg of beans from an acre. Life was hard and I was struggling to even buy soap for my family. However, everything changed when I was invited for a training at ARI Uyole on improved farming methods for beans, and also received new, improved varieties to try out," Daudi says.

"I learned proper spacing, proper use of fertilizers, and how to harvest and store my crop. I applied everything I had learned and now my yield is up to 700 to 800 kg per acre. My life is so much better. I have managed to buy livestock and installed a biogas plant that converts the waste from my livestock into gas for cooking. I am no longer destroying the environment for firewood. And my wife now respects me as I have made her life easy. She

David Daudi and his wife preparing beans after harvesting.

is not struggling with cooking. In twenty minutes all the food is ready," he said.

Daudi's farm acts as a demonstration site for transferring the technologies and knowledge he has gained from the researchers to the neighboring farmers who are inspired with what they see and the positive changes in his life. He has also been trained in the production of Quality Declared Seeds (QDS) and therefore sells seeds of various local and improved varieties to nearby farmers.

"They (neighboring farmers) now consider me a bean expert and come to me when they need any advice on beans or good varieties to plant. This has also made me more respected in the village," he said proudly.

Empowering women and improving marriages

Upendo women's group in Mchewe village in Mbeya rural district has also seen beans change their lives and their marriages for the better.

According to the chairperson of the group, Witness Sikayange, the women came together in 2010 to find ways to work together to improve their lives and those of their families through farming.

"We realized we can earn more money from beans compared to maize as we can harvest up to three times a year compared to once a year for maize. We then approached researchers and government extension workers for training on improved farming methods and for improved varieties and after that we started commercial farming of beans.

"We are now living a very comfortable life. We all have improved houses and are taking our children to school. And our marriages are even better. Before we used to have a lot of quarrels with our husbands but since we started making our own money, they now respect us as we are not just sitting begging for everything," Witness said.

The group is also growing QDS for the various varieties of bean released by Uyole Agricultural Research Institute to sell to surrounding farmers and processing pre-cooked beans for sale.

Spreading the success

There are a number of ongoing initiatives to build further on these successes and to spread the benefits of legumes to more farmers. Some of them are given below. Adding soybean to the mix: The 'Putting nitrogen fixation to work for smallholder farmers in Africa,' project, in short N2Africa, led by Wageningen University of the Netherlands, is promoting the production of soybean in the area and introducing the use of seed innoculants and improved farming methods, such as higher density planting and use of appropriate fertilizers, organic, inorganic and bio.

According to Fred Baijukya, an agronomist at IITA's Eastern Africa hub and N2Africa Country Coordinator for Tanzania, the project in collaboration with ARI-Uyole and lead farmers is currently conducting trials of new improved soybean varieties to identify the best performing varieties with farmers preferred traits to recommend for release.

The project is also conducting agronomic trials and looking into the best agronomic practices that will ensure that farmers get the highest returns. These include time of planting, spacing, and use of fertilizers.

Dissemination of technologies: One challenge that most research organizations face is wide-scale dissemination and scaling out of new technologies to reach many farmers. Two NGOs – One Acre Fund and Farm Inputs Promotion (FIPs) – are assisting in these efforts. FIPs is


Upendo women's group harvesting beans (Photo: Courtesy by CIAT).

providing farmers with small packs of different inputs including improved seed varieties and fertilizers, for testing and adoption of those that they like; they also provide advice on good agronomic practices. FIPs also links farmers to agro-dealers and private sector companies to ensure supply of the inputs.

One Acre Fund, on the other hand, is providing loans to farmers to purchase seeds and other inputs such as fertilizers for their farms, and training them on better farming practices.

These two development partners are now keen to work with the research teams to help in the dissemination of new legume varieties released from research institutes as well as for inputs such as rhizobium and legume fertilizers.

These successful cases show the clear link between research and development, says Jean Claude Rubyogo, a seed system specialist and researcher from CIAT. Jean has been one of the researchers who has been conducting research on bean technology transfer approaches in the country for many years.

If the successes achieved by Daudi and Upendo women's group can be replicated throughout the region, then clearly the region will transform itself and make a big impact on the efforts to support the country in industrializing, and thus reduce poverty and malnutrition.

Building capacity of research institutes to develop new legume varieties: Efforts to provide farmers with better varieties is the hallmark of this project across the three CGIAR partner centers and NARS. According to Emmanuel Monyo, the TL III coordinator, the overarching goal for the capacity development component of the project is to increase the speed, efficiency and quality of output of the partner breeding programs, leading to programs that generate substantially higher rates of genetic gain than at present. Ultimately the project will truly meet its aim of improving the livelihoods and nutritional status of smallholder farmers, especially under-served women, through increased legume production.

Events

TL III will conduct two important workshops. (1) The Regional Monitoring Learning and Evaluation workshop during the third quarter of 2016. The workshop will discuss MLE strategy for the project and it is expected that by the end of the workshop the participants/ stakeholders will have a better understanding of how to track project indicators, data collection tools, and the role of MLE in project implementation

(2) The second is Genetic Gains Program Improvement Plans workshop under the theme **Increasing the Genetic Gains of Partner Breeding Programs.** The workshop will use the Breeding Program Assessment Tool (BPAT) results as a resource to help guide breeding programs in improving targeting, speed, scale, efficiency, and quality (control, precision, and accuracy) according to its unique characteristics and resources.

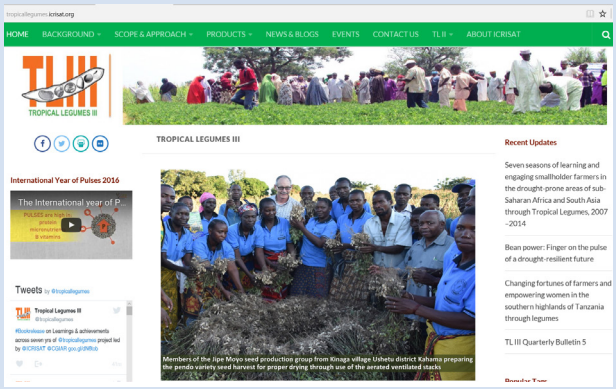
TL III website launch

Tropical Legumes III (TLIII)

Website Launched

The new website allows virtual visitors to learn and share about the Tropical Legumes project led by ICRISAT. Get the latest news updates, blogs, tweets and photostreams.

http://tropicallegumes.icrisat.org



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