

Integrated seed systems delivering on the promise: Experiences from Tropical Legumes II

Jean-Claude Rubyogo, Mula G Myer, Hakeem Ajeigbe, Alpha Kamara, Steven Boahen, Robin Buruchara, Hari D Upadhyaya, Janila Pasupuleti, Patrick Okori, Haile Desmae, Ousmane Boukar, Christian Fatokun, Ousmane Coulibaly, Clare Mukhankusi, Steve Beebe, Pooran M Gaur, Ganga Rao NVPR, Chris Ojiewo, Sameer Kumar CV, Hesham Agrama, Robin Buruchara, Steve Beebe, Omari Mponda, Juma Mfaume, Phillip Mashamba, Stephen Lyimo, Rose Ubwe, David K Okello, Yuventino Obong, Robert Kileo, Paul M Kimurto, Asnake Fikre, Million Eshete, Justus Chintu, Geoffrey Kananji, Francis Maiden, Albert Chamango, Virginia Chisale, Manuel Amane, Amade Muitia, Candidus Echekwu, Amos Miningou, Nicholas Denwar, Ondie Kodio, Mamadou Touré, Haruna Mohammed, Issa Drabo, Bruce Mutari, Goodwill Makunde, David Karanja, Sostene Kweka, Michael Kilango, Magdalena Williams, Michael Ugen, Stanley Nkabulo, Kidane Tumsa, Jandeka Mahasi, Frederick Baijukya and Emmanuel S Monyo

Summary

Due to limited commercialization of legume varieties by the private sector, the legume seed system has remained rather underdeveloped and weak in many countries of sub-Saharan Africa. The TL II project developed and successfully implemented innovative seed delivery models that significantly impacted the seed systems in 13 countries of SSA and two in SA. First, the pluralistic and integrated seed system was developed, which strengthened linkages amongst various legume seed value chain actors. Second, the participation of several seed producers in a decentralized system increased production of certified and quality declared seed of legumes, which ensured seed access to farmers in remote areas. Third, there was a rapid adoption and use of newly released varieties by farmers as a result of increased awareness on improved varieties through multi-media and user-friendly communication strategies and tools. In addition, the increase in the number of channels and outlets that conveniently made available seeds to farmers, combined with affordable small seed packs, enhanced access to quality seed of improved legume varieties, especially by previously disadvantaged women farmers. Fourth, as a result of enhanced skills and knowledge of seed value chain actors, seed production significantly increased by 221% (from 139,048 tons to 446,232 tons) while seed access increased by 70% (from 5,033,913 to 8,512,050 beneficiaries) between phases I (2007-2010) and II (2011-2014).

The problem

Grain legumes play a paramount role in human nutrition and market economies of SSA and SA. Smallholder farming households with limited access to inputs, including quality seed of improved legume varieties, dominate legume production in these regions. New varieties with attainable yield of more than two tons ha⁻¹ have been developed and released. However, most farmers still continue to get yields below 500 kg ha⁻¹ due to the use of landraces or obsolete varieties combined with poor agronomic practices. Therefore, the continued deployment of obsolete varieties has dampened the prospects for increased legume productivity for food and income security. Thus, there is a requirement for revamping legume seed systems to meet smallholder farmers' production and agroecological intensification needs, which was a major activity under TL II.

on seed business management, especially marketing of seed in small packs. This resulted in improved collaboration and enhanced effectiveness of the private sector. The net impact was a drastic growth in production and market opportunities of legumes, attracting an increasing number of players in establishing strong and durable linkages in the legume innovation system across TL II countries.

Results

Seed delivery systems models

The need for synergy informed engagement of a wide range of partners in seed production and dissemination. Between 2007 and 2010 (phase I), nearly 500 seed producers were involved in TL II seed systems across several legumes. By the end of phase II, the number of seed producers across TL II countries had increased by 72% to more than 1,700.

Various successes were obtained with different models in specific regions. The use of small affordable seed packs was extensively used across several TL II member countries (see Box 1). In some countries, the approach was an opportunity for private companies to expand seed business to remote areas and

Farmers want access to new varieties and some are willing to pay for certified seed at affordable prices. To meet this demand, seed simply has to be marketed in affordable sizes and in places where farmers can easily access, and from vendors that farmers trust (or who may be held accountable to buyers). Small seed packs (sizes 0.05, 0.1, 0.25, 0.5, 1, 2, 5, 10, and 25 kg) were extensively used in seed dissemination across all crops in all the target countries (see Table 86). More than two million farmers were reached with seed through this approach, 72.5% of them women.

Table 86. Amount of small seed packs distributed, by crop, per country, from 2007- 2014.

Country	Number of small seed packs per crop						Total
	Chickpea	Groundnut	Common bean	Soybean	Pigeonpea	Cowpea	
India	16,622	11,460	NT	NT	8,140	NT	36,222
Bangladesh	90	290	NT	NT	NT	NT	380
Ethiopia	424	NT	176,858	NT	NT	NT	177,282
Uganda	NT	NT	-	NT	40	NT	40
Tanzania	45	NT	3,045	NT	4,825	NT	7,915
Kenya	3,568	NT	108,500	35,566	NT	NT	147,634
Mozambique	NT	NT	NT	457,099	NT	9,345	466,444
Nigeria	NT	11,500	NT	308,000	NT	75,885	395,385
Niger	NT	NT	NT	NT	NT	64,399	64,399
Malawi	NT	839,500	NT	NT	500	NT	840,000
Mali	NT	6,740	NT	NT	NT	17,300	24,040
Total	20,749	869,490	288,403	800,665	13505	166,929	2,159,741

NT: Country not targeted

The small packs approach is increasingly gaining popularity as the most efficient and cost effective means of reaching more farmers with affordable quantities of seed and a wide range of preferred varieties. In Kenya, Dry-land Seed Company Ltd and Kenya Agricultural Research Institute (KARI Seed Unit) packed and sold 89 tons of seed of drought tolerant bean varieties in 0.1 kg, 0.5 kg, 1 kg and 2 kg packs. In India, a total of 115,232 tons of assorted legume crops were distributed in different pack sizes, ranging from 2 kg to 20 kg.

Box 1. Effectiveness of innovative seed delivery strategies: evidence from small seed pack approach in TL II countries.

reach the poor, hard-to-reach women farmers. For instance, seed companies in Uganda and Kenya reached more smallscale farmers through the use of small bean seed packs at various outlets, and at times with the support of NARS staff. Another successful seed system model was the 'one village-one variety' concept with pigeonpea open pollinated varieties and hybrids in Andhra Pradesh and Odisha in India. In this model, smallscale farmers with limited access to land consolidated small units of land to produce seed collectively and avoid contamination of the varieties; all members of the village had to adopt one variety. In India (Karnataka and Tamil Nadu), ICRISAT and partners developed and promoted an integrated groundnut seed system (see Box 2). Due to policy support from state government in Karnataka, 48 small private seed companies ventured into seed production of popular chickpea varieties grown by local farmers. This led to the production of more than 91,000 tons of certified seed in 2013–14.

In Malawi, seed loans were successful in disseminating new groundnut varieties. Under the scheme, smallscale farmers produced new varieties and passed it on to members of the community as loan. Moreover, with groundnut, successful dissemination of varieties at community level was achieved in women's groups in Mali. Similarly, commercially oriented mixed gender farmers groups and farmer cooperative unions have become the backbone of common bean and chickpea seed production in

Two alternate groundnut seed system models were developed and promoted in partner states of India (Karnataka and Tamil Nadu) during Phase I.

The first model is the Panjabrao Deshmuch Krishi Vidyapeeth (PDKV) model that engages farmers in informal seed multiplication. Improved varieties in 2 kg packs are distributed to farmers who then multiply the seed over two seasons, producing 20 kg in the first season and subsequently 200 kg in the second season, which is enough for planting in 1 ha by the third season. In the third season, farmers save 2 kg from selected plants and repeat the cycle. This model enables farmers to attain seed self-sufficiency, sustaining high adoption rates among farmers.

The second seed system model is semi-formal and was implemented successfully in Karnataka state. In this model, the University supplies basic seeds to farmers, who either offered land, for certified seed production under the formal seed chain or Truthfully Labeled Seed (TLS), which was produced without certification but monitored by the University, NGOs and farmer associations. A similar model was also used in Tamil Nadu. Semi-formal seed systems were found to be successful in meeting local groundnut seed demand. In Tamil Nadu, the transport cost of 100 kg of pods alone is about 700 Indian rupees (INR), which is 20% of the cost of seed. Thus, the alternate seed systems reduced the costs of seed transportation by more than 10%.

Through the semi-formal model, which was implemented in the five districts of Erode and Thiiruvannamalai in Tamil Nadu and Bagalkot, Hiriur and Raichur in Karnataka, linkages were established between formal and informal seed sectors through supply of basic seed by the University. In Karnataka state, additional linkages were also facilitated through certification of seed production plots by the state seed certifying agencies leading to certified seed production. This seed was procured by the state seed corporations or the State Department of Agriculture. About 100 kg of basic seed of the variety ICGV 87846 was supplied to ICRISAT's Agri-Business Incubation (ABI) Program, Krishi Vignan Kendra-Sandhiyur, and Regional Research Station-Vridhachalam for further multiplication and distribution to farmers through this system. Similarly, 100 kg seed of ICGV 00351 was also supplied to ICRISAT's ABI program during 2010 rainy season.

Source: Tropical Legumes II project (2012). – Four Seasons of Learning and Engaging Smallholder Farmers: Progress of Phase I

Box 2. Efficiency of integrating formal and informal seed system models: Case of Karnataka and Tamil Nadu states of India.

In Central Rift Valley of Ethiopia, beans are important cash crop and are predominantly a man's enterprise. Inadequate presence of women farmers and gender inequitable access to bean seed as well as the use of poor quality seed of older and degenerated varieties had stalled bean productivity and marketing prospects in Ethiopia. An impact driven seed systems approach was designed to accelerate the supply of quality seed of market-demanded varieties to both women and men farmers. In addition to accessing seed of improved bean varieties, farmers also accessed good crop management techniques, a combination which increased production and unlocked market opportunities. Between 2008 and 2012, with support from TL II, the Catholic Relief Service (CRS), Diocese received 13.7 tons of basic seed of two canning bean varieties (Awash 1 and Awash Melka) from the Ethiopian Institute of Agricultural Research (EIAR), Melkassa and the seed was availed to 186 (102 male and 84 female) seed entrepreneur farmers, who produced 133.5 tons of quality declared seed. In addition, TL II and EIAR, Melkassa provided complementary support such as training of trainers on improved bean, pre and post-harvest management practices as well as business management skills. Furthermore, TL II facilitated the engagement of various stakeholders through public-private partnerships in which EIAR and other bean value chain actors in Ethiopia, including seed producers, bean exporters and local traders, development partners like CRS, Meki Diocese came together with a common goal of improving the bean value chain to improve livelihoods of Ethiopians.

Mrs Milko Bati, a 38 year old widow of Tuka Kabele (Lungano village), is an example of smallholder farmers whose livelihood improved by engaging in seed production. The mother of six, received 150 kg of seed of the variety Awash Melka and used this to produce seed that she sold to meet her farm family livelihood. The bean seed enterprise and additional income from production and marketing of bean seed radically improved Milko's livelihood - economically, nutritionally, and socially. Having been economically empowered through the sale of beans, Milko constructed a new house for her family, moving from her initial grass-thatched-mud-walled house (see Photo 1) to a spacious permanent house, worth Birr 16,500 (\$ 921.8) (Photo 2). Moreover, feeding her family has become more affordable than before. With the high yields achieved from improved bean varieties, her household income has drastically increased and most expenses greatly offset by the proceeds from sale of beans. Apart from meeting her family's cash needs, additional income is invested in other diversified enterprises to support bean production and the family welfare. For instance, she increased her herd from one cow in 2008 to four in 2012 (see photo 3); the family is more nutritionally secure through inclusion of milk in their food basket. The family has also bought three pairs of oxen, three donkeys, four sheep, ten goats, and ten chickens from bean sales. The income from bean seed sales and associated investments in livestock has also reduced pressure on the family for tuition of her six children. The significant impact on the turn-around in her household livelihood has prompted Milko to increase her bean crop progressively from 5.25 ha in 2008 to 8.25 ha in 2012. Her ambition does not stop there. Using the proceeds from bean sales in 2012, she bought a plot to build a commercial building at Meki trading center.

Milko's social status has also risen in the neighborhood, especially among fellow women to whom she sells or donates bean seed as a kind gesture. About 58 female farmers and 5 male farmers have benefited from her generosity.

To thousands of bean farmers in Ethiopia including Milko and her neighbors, white pea beans are *white gold*.



Photo 2



Photo 1



Photo 3

Box 3. Women thriving in men's world as a result of enhanced access to quality seed: Evidence from Central Rift Valley, Ethiopia.

Ethiopia. In West Africa, the project promoted and strengthened community seed production for cowpea and soybean seed production. This ensured availability of cowpea seeds in target communities in Mali, Nigeria and Niger Republic and soybean seeds in Nigeria. Community based seed production involving NGOs, CBOs and farmers associations, improved access to cowpea and soybean seeds in target communities in Mozambique.

Equity and gender was the cornerstone of TL II seed systems. For instance, among Ethiopia women, seed entrepreneurs are increasingly playing a major role in male dominated seed production (see Box 3). This effort has contributed to improved livelihoods and role of women farmers in household and rural economies of beneficiary communities.

Due to the concerted efforts invested in developing and implementing the seed delivery models, impressive results were achieved in terms of access to high quality legumes seed of user-preferred varieties. In phase I, more than 5 million farmers received high quality seed of one or more improved legume varieties. In phase II, collaborative efforts were stepped up enabling more than 8.5 million beneficiaries to access seed (see Figure 15), indicating a 70% increase in the number of beneficiaries from phase I. In total, more than 13.5 million smallholder farmers (including 61.2% women) accessed seed of improved legume varieties in TL II countries between 2007 and 2014.

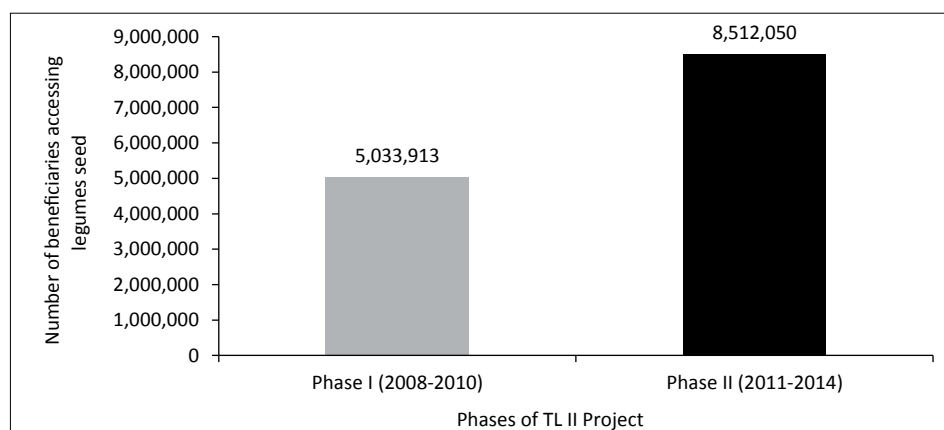


Figure 15. Seed access across TL II countries in phases I and II, for all crops (2008-2014).

Enhanced capacities

To expand and sustain the project outcomes/outputs, TL II engaged in building the skills and knowledge of partners/actors along the seed value chain of various grain legumes. More than 130,000 legume seed system actors were trained between 2007 and 2014 across target countries (pigeonpea: 87,160; chickpea: 47,075; soybean: 26,677; common bean: 23,633; groundnut: 18,384 and cowpea: 8,548). Ninety percent of the trainees were legume seed farmers while public extension staff, private sector extension staff, representatives of NGOs/FBOs and legume traders constituted 10%. Notably, 54% of the individuals trained were females.

Enhanced awareness on improved legumes varieties

Multi-media communication strategies and user-friendly tools for variety promotion were adopted/ developed and shared with partners across crops, countries, and regions. These included training modules, manuals, leaflets/flyers, and information bulletins. During Phase I and Phase II of TL II (2007–2014), a total of 8,000 leaflets with information on groundnut seed production (6,000 in Uganda, 2,000

in Malawi) were distributed. Additional 15,000 flyers describing groundnut varieties were printed in Chichewa and Swahili and distributed to farmers in project sites. More than 2,000 bean seed production/business manuals were produced in four languages (Amharic, Oromifa, Swahili and Luganda) and shared with partners in Ethiopia, Kenya, Tanzania and Uganda, respectively. A total of 2,200 cowpea production guides were distributed to stakeholders in Nigeria. The guide was translated into French and 2,500 copies were distributed in Niger and Mali. Two thousand production guides of soybean were produced and distributed in Nigeria. Mass communication was also used to disseminate knowledge about the new varieties and their seed source through several radio programs (12 in Ethiopia, 30 in Tanzania, 6 in Malawi, 16 in Mozambique, 42 in Nigeria for cowpea and soybean and 14 each in Mali and Niger Republic for cowpea), and TV programs (7 in Ethiopia, 15 in Tanzania, 2 in Malawi, 1 in Uganda, 8 in Mozambique, 21 in Nigeria for cowpea and soybean, 7 each in Mali and Niger Republic for cowpea). In India, more than 28,000 booklets and pamphlets with information on pigeonpea were distributed to 22,250 farmers and extension personnel.

Certified and quality declared seed production

The strong partnership supported by appropriate capacity building and availability of improved and user-preferred varieties resulted in increased seed production and supply. Between 2007 and 2014, more than 580,000 tons of assorted seed classes of the six legumes were produced as indicated in Table 87; of which, more than 430,000 tons were certified and quality declared seed. The total seeds produced per crop per seed grade in each implementing region/country are indicated in Tables 87 to 98.

In phase II, impressive seed production/supply levels were recorded. Most of the crops surpassed the targeted milestones (based on already executed two year period of the project). For instance, quantities of chickpea seed produced (294,308 tons) surpassed the milestone (11,645 tons) by more than 2,000% (see Table 88).

Table 87. Quantity of seed produced (tons) across target countries, by crop and project phase (2008-2014).

Crop	Phase I (2008-2010)	Phase II (2011-2014)	Total
Chickpea	99,877	294,308	394,185
Common bean	11,355	49,401	60,756
Cowpea	2,495	9,665	12,160
Groundnut	21,927	70,235	92,162
Pigeonpea	1,086	6,612	7,698
Soybean	2,308	16,011	18,319
Total	139,048	446,232	585,280

* The data do not include Groundnut seed from one West African country; pigeonpea and chickpea from South Asia; cowpea from one ESA country

Table 88. Milestones and actual seed production across target countries by crop (2011-2014).

Crop	Phase II milestones	Phase II actual achieved	% achievement
Chickpea	11,645	294,308	2,427
Common bean	6,920	49,401	7,076
Cowpea	120	9,665	8,054
Groundnut	24,085	70,235	292
Pigeonpea	770	6,612	859
Soybean	210	16,011	7,624

Groundnut seed systems in Western and Central Africa

Tables 89 to 98 indicate the quantities of seed produced across TL II project countries during phases I and II.

Table 89. Quantity of groundnut seed produced (tons) in WCA, by country, by seed class (2008-2014).

Country	Seed classes and amount (tons) produced														
	2008		2009		2010		2011		2012		2013		2014		Total
	EG	CS/QDS	EG	CS/QDS	EG	CS/QDS	EG	CS/QDS	EG	CS/QDS	EG	CS/QDS	EG	CS/QDS	
Mali	13.67	48.00	15.88	60	19.30	68.00	22.50	272.00	29.40	313.00	34.15	520.0	9.8	98.8	1,524.50
Niger	7.72	11.78	10.63	27	14.69	75.68	13.28	152.55	26.34	367.55	25.00	540.0	0	245.0	1,517.20
Nigeria	1.27	20.25	10.76	41	2.78	88.50	0.75	111.63	6.11	945.90	6.55	1,061.8	21.6	292.8	2,611.70
Burkina Faso	6.70	80.00	8.80	78	7.70	71.00	8.20	75.00	8.80	77.00	11.00	85.0	28.4	147.0	692.60
Ghana	1.20	9.50	1.10	12	0.90	14.50	1.80	11.80	1.60	12.70	1.40	10.3	2.7	346.1	427.60
Senegal	0	0	0	0	0.3	0.85	0.42	0.64	0.35	0.83	0.23	1.0	0	0	4.62
Total	30.56	169.53	47.17	218	45.67	318.53	46.95	623.62	72.6	1,716.98	78.33	2,218.1	62.5	1,129.7	6,778.22

EG=Early generation seed (Breeder/Basic seed)

CS=Certified seed

Chickpea, groundnut and pigeonpea in eastern and southern Africa

Table 90. Quantity of chickpea seed produced (tons) in ESA, by country, by seed class (2008-2014).

Country	Class and quantity (tons) of seed produced			
	Breeder	Basic	Certified/QDS	Total
Ethiopia	41.9	715.8	12,454.7	13,212.4
Tanzania	42.00	303.80	1,412.9	1,758.70
Kenya	27.59	16.90	1,460.9	1,505.39
Total	111.49	1,036.5	15,328.5	16,476.49

Table 91. Quantity of groundnut seed produced (tons) in ESA, by country (2008-2014).

Country	Certified/QDS produced (tons)
Tanzania	25,575.0
Uganda	577.7
Malawi	18,502.9
Mozambique	132.7
Total	44,788.3

Table 92. Quantity of pigeonpea seed produced (tons) in ESA, by country, by seed class (2008-2014).

Country	Breeder	Basic	Certified/QDS	Total
Tanzania	23.38	84.00	1,488.40	1,595.78
Malawi	23.90	170.39	1,787.20	1,981.49
Uganda	7.70	42.81	39.30	89.81
Total	54.98	297.20	3,314.90	3,667.08

Common bean seed systems in ESA

The lessons learned and functional partnership established in the first phase (2007–10) resulted in an increased quantity of bean seeds produced in the second phase (40,980.19 tons), as indicated in Table 93.

Table 93. Quantity of bean seed produced (tons) in ESA, by country (2008-2014).

Country	Assorted seed produced (tons)							
	2008	2009	2010	2011	2012	2013	2014	Total
Ethiopia	386.20	2,128.00	7,557.00	2,820.3	5,133.2	5,591.7	7,090.98	30,707.38
Kenya	377.40	452.80	453.60	587.8	721.9	2,088.3	1,636.30	6,318.1
Malawi	NA	NA	NA	1,064.8	887.2	1,200.3	1,074	4,226.3
Tanzania	NA	NA	NA	544.6	687.7	745.3	493.54	2,471.14
Uganda	NA	NA	NA	1,069.7	3,559.0	4,229.0	6,459.14	15,316.84
Zimbabwe	NA	NA	NA	426.5	439.6	570.0	280.20	1,716.3
Total	763.6	2,580.80	8,010.60	6,513.70	11,428.60	14,424.60	17,034.16	60,756.06

NA: Not applicable : Uganda and Tanzania joined TL II seed systems activities started in 2010/11 as anchoring countries while Zimbabwe and Malawi only received limited technical support (training and TL II experiences sharing by PABRA resources people from anchoring country particularly from Kenya (KARI) and CIAT.

Cowpea seed systems in SSA

Table 94. Quantity of cowpea seed produced (tons) in SSA, by country, by seed class (2008-2014).

Country	Class and quantity (tons) of seed produced				Total
	2008-2010		2011-2014		
	FS	CS	FS	CS	
Nigeria	108.55	991.60	205.15	2,719.91	4,025.21
Mali	22.87	133.8	64.61	716.08	937.36
Niger Republic	15.02	963.01	31.11	5,182.58	6,191.72
Mozambique	21.15	228.30	78.75	666.45	994.65
Tanzania	8.40	2.30	0	0	10.7
Total	175.99	2,319.01	379.62	9,285.02	12,159.64

FS=Foundation Seed, CS= Certified Seed

Soybean seed systems in SSA

Table 95. Tons of soybean seed produced in SSA, by country, by seed class (2008-2014).

Country	Class and quantity (tons) of seed produced				Total
	2008-2010		2011-2014		
	EG	CS/QDS	EG	CS/QDS	
Nigeria	33.8	1,248.30	3,661.83	7,612.08	12,556.01
Mozambique	32.9	762.00	314.60	4,060.87	5,170.37
Kenya	38.3	80.24	64.00	260.31	442.85
Malawi	27.6	122.00	0	0	149.60
Total	132.6	2,212.54	4,040.43	11,933.26	18,318.83

EG=Early Generation seed, CS/QDS= Certified Seed/Quality Declared Seed

Chickpea, groundnut and pigeonpea seed systems in SA

Seed production and supply

Table 96. Tons of chickpea seed produced in SA across target countries (2008-2014).

Country	Seed classes and amount (tons) produced												
	2008		2009		2010		2011		2012		2013/14		
	EG	CS/QDS	EG	CS/QDS	EG	CS/QDS	EG	CS/QDS	EG	CS/QDS	EG	CS/QDS	Total
India	903.4	13,413	1,407.1	17,857	1,683.3	17,428.9	2,637.8	22,793.5	31,840.0	3,234	18,702.43	136,685	268,585.43
Bangladesh	0	0	0	0	0	0	0	0	21.2	65	28.90	72	187.10
Total	903.4	13,413	1,407.1	17,857	1,683.3	17,428.9	2,637.8	22,793.5	31,861.2	3,299	18,731.33	136,757	268,772.53

EG=Early generation seed (Breeder seed/ Basic seed); CS/QDS=Certified seed/ Quality declared seed
NT: Not yet

Table 97. Tons of groundnut seed produced in SA across target countries (2008-2014).

Country	Seed classes and amount (tons) produced												
	2008		2009		2010		2011		2012		2013/14		
	EG	CS/ DS	EG	CS/QDS	EG	CS/QDS	EG	CS/QDS	EG	CS/QDS	EG	CS/ QDS	Total
India	158.65	618.7	497.87	1,251.68	381.09	2,710.48	1,874.18	4,237.50	2,503.1	3,613.5	2,733.32	7,659.69	28,239.76
Bangladesh	0	0	0	0	0	0	0.63	1.62	6.0	6.0	59.95	158.4	232.6
Total	158.65	618.7	497.87	1,251.68	381.09	2,710.48	1,874.81	4,239.12	2,509.1	3,619.5	2,793.27	7,818.09	28,472.36

EG=Early generation seed (Nucleus/Breeder/Foundation seed); CS/QDS=Certified seed/ Quality declared seed

Table 98. Tons of pigeonpea seed produced in SA across target countries (2008-2013).

Country	Seed classes and amount (tons) produced												
	2008		2009		2010		2011		2012		2013/14		
	EG	CS/ QDS	EG	CS/QDS	EG	CS/QDS	EG	CS/QDS	EG	CS/QDS	EG	CS/QDS	Total
India	0	0	13.45	6.5	29.88	68.76	300.34	161.52	186.92	1,014.15	620.19	1,120.43	3,522.14
Bangladesh	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	0	0	13.45	6.5	29.88	68.76	300.34	161.52	186.92	1,014.15	620.19	1,120.43	3,522.14

EG=Early generation seed (Breeder /Foundation seed); CS/QDS=Certified seed/ Quality declared seed

Adoption and use of newly released varieties

Impressive results were also achieved in improved varieties release process, adoption and retention. During phases I and II, a total of 163 varieties were released through farmer participatory variety selection; of which, 106 varieties are still in production (Figure 16), representing 65% retention. This resulted from rigorous and well-coordinated research for development that clearly focused on end-user preference. The process was also enhanced by sound collaboration between the TL II Project, NARS, civil society, farmer organizations, seed companies as well as local seed and grain dealers.

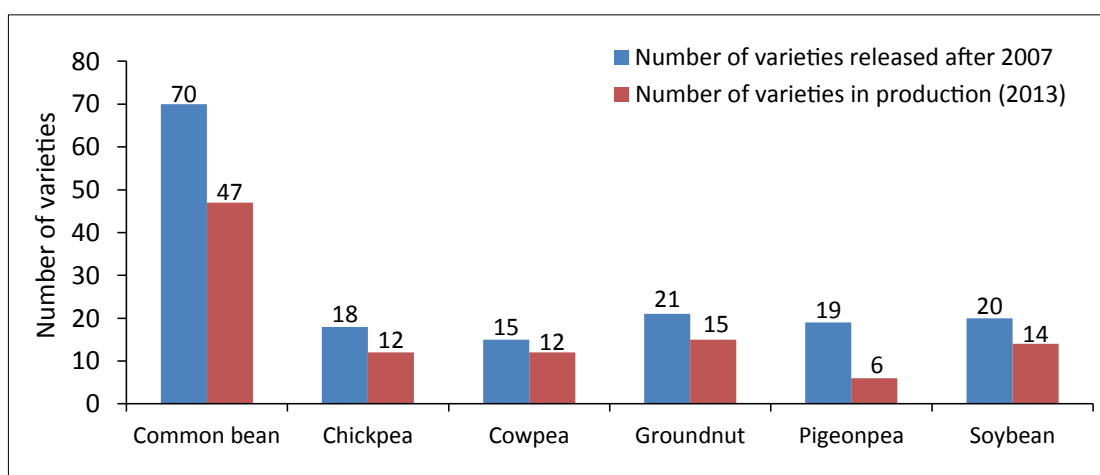


Figure 16. Number of varieties released in TL II countries after 2007 and those in production, by crop.

Conclusion

While resource-poor farmers are ready to adopt new improved varieties of legumes, it is also worth noting that the variety, complementary technologies and seed delivery can together achieve the desired impact. Moreover, an efficient seed system for delivering varieties has to be linked to the commodity value chain; developed grain markets are an obvious driver of seed demand through which the need for productivity is justified. The seed delivery systems may intrinsically be region-and-crop-specific; therefore, a pluralistic approach offers an opportunity to identify the best bets, especially when enabled by policies that recognize seed outside the certification scheme. The recognition of quality declared seeds, contributed significantly to the access of improved legume varieties and shortening the lag time in variety release and adoption by farmers. It is also critical that investment should be made towards creating awareness of new varieties.