Gross Economic Benefits from Tropical Legumes II modern varieties in Project Countries

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The Tropical Legumes II (TL II) project aims to increase the productivity (yield per unit area) and production (total availability) of six major grain legumes – chickpea, common bean, cowpea, groundnut, pigeonpea and soybean in rural areas of SA an SSA. The project worked in a total of fourteen countries: twelve in SSA (Burkina Faso, Ghana, Mali, Niger, Nigeria, Ethiopia, Kenya, Malawi, Mozambique, Senegal, Tanzania, Uganda and Zimbabwe) and two in SA (India and Bangladesh) during the Phase II. Burkina Faso, Ghana, Uganda are new anchor countries during phase II.

The project focused on developing improved legume varieties and ensuring that smallholder farmers have access to seed of these varieties, in the context of ongoing environmental constraints such as drought, pests and diseases. In particular, efforts were targeted on the informal and formal seed sector and the supply of quality seed, which is a major constraint in the adoption of legumes. The expected increase in added value of productivity gains in the rural areas of these regions will amount to about $1.3 billion over the ten year period 2007 to 2017. It is expected that at least 50 new varieties, with yield advantages of at least 20% over the adapted checks, across the six crops will be released to farmers, with the seed sector (public and private) producing more than 96,000 tons of quality seed, enough to plant 1.6 million ha through the formal seed sector and considerably more when informal distribution systems are added.

During the first two phases (2007 to 2014), more than 100 varieties have been released, yielding more than 20% over the local checks. More than 112,000 tons of seed of modern legume varieties were produced directly with project funds and more than 354,000 tons with project and partners' investment. In addition, the total amount of seed produced during the 2 phases covered almost 2 million ha with the funds provided under TL and almost 6 million ha with project and partners' investment. The average adoption rate of modern legume varieties in TL countries is estimated to 23.82% of area cropped with legumes. So far, the project has attained some of its major targets only after 7 years of implementation. The total gross benefits from project intervention was computed using two approaches: (1) the total seed produced during the years of project implementation and (2) the adoption rate data from adoption surveys and/or expert opinions conducted between 2010 and 2012.

It is estimated that, since 2007, modern legume varieties (MVs) developed/disseminated under the TL project implemented by ICRISAT, CIAT, and IITA with NARS partners have been adopted on at least **2 million ha** and have generated more than $448 million from project funding and $976 million from project and partners' investment. Even when using the adoption rates data from adoption and expert opinion surveys, the aggregate gross benefits from TL related modern legume varieties is estimated at about $978 million, which is still far above the total TL investment grossly compounded at $48 million[1] (phases 1 and 2). The returns on investment are high. In effect, for each TL dollar invested, the project generates $9 with direct project investment, $20 with partnership's investment and again $20 when using adoption rate based estimation.

1. Uncompounded investment is $42 million. Compound rate is about 5% as in many projects in SSA with annual investment roughly estimated to $7 per year

Methods and data

In order to compute the gross benefits resulting from TL intervention, two approaches were used. One approach was based on the quantity of seed produced during the 7 years of project implementation, and the second approach was based on adoption rates estimated from adoption surveys or expert opinions.

a. Seed based estimation of total gross benefits

The concept of cumulative adoption implied by the logistic function was applied. The area planted to MVs (or the number of adopters) in a given year includes the new area planted to MVs (or the new adopters) in that year as well as the areas planted to MVs in all previous years. The area planted was estimated based on the quantity of seed produced each year. It was assumed that the seed produced is recycled every 5-6 years and improved seed generates a stream of benefits with the yield gains accruing beyond the year of planting of fresh seed. Thus, the annual benefits were aggregated across the years to derive the total benefits for the whole 2008-2013 period. The gross benefit calculation per year was based on the cumulative quantity of seed produced over the years, the seeding rate, the yield with the local varieties, the yield gains over the local check, and the producer price of the crop from FAO. The yield gains were obtained from survey data using econometric methods where available or adjusted on-farm trials where not available. The parameters used in the calculation of gross benefits from TL investment since 2007 include:

1. The quantity of seed produced in year *t* (QS*t*)(tons)
2. The seeding rate [SR] (kg ha^{-1})
3. The percent yield gain over the local check [PYGOL] (%)
4. The yields with local varieties [YLO] (tons/ha)
5. The FAO producer price of the crop [PPCROP] ($/ton)

The gross economic benefits using the seed based approach (*GEBSEED*) were estimated as the value of additional crop production per year (*t*) and country as follows:

$$GEBSEED_{2013} = \frac{(1000 \times \sum_{t=2008}^{2013} QSt)}{SR} \times YLO \times PYGOL \times PPCROP$$

The total value of additional production was aggregated over crop, country and year.

b. Adoption rates based estimation

Adoption is an outcome resulting from increased productivity. Farmers convinced with increased productivity from modern varieties are likely to use more and more of the varieties. Adoption rate expressed in terms of percentage of area adopted along with productivity gains provide gross measures of additional gross benefits from using modern varieties. The gross benefit calculation was based on the adoption rates obtained from formal adoption surveys that are nationally representative or expert opinion surveys. The following parameters were used to compute the total gross economic benefits from TL intervention. These include the adoption rate (% area), the area under the crop (ha), the yield of the local varieties/local check (tons/ha), the yield gains over the local check (%), and FAO producer price of the crop from FAO statistics.

The parameters are measured as follows:

6. The adoption rate (% area) [ADOPAREA]
7. The area cultivated under the crop (ha) [AREACROP]
8. The yields of the local varieties/local check (tons/ha) [YLO]
9. The yield gains over the local check [YLDGAINS] (%)
10. The FAO producer price of the crop [PPCROP] ($/ton)

The total gross economic benefits using the adoption rate approach (*GEBADOPT*) were calculated as follows:

$$GEBADOPT_{2013} = \frac{ADOPAREA \times AREACROP}{100} \times \frac{YLO \times YLDGAINS}{100} \times PPCROP$$

The adoption rate used was derived from adoption surveys that are representative of the major growing areas of the respective legumes. However, because adoption studies were not conducted for all crops and countries, expert opinions collected in other Bill & Melinda Gates Foundation projects such as DIVA and TRIPSA were used. These rates were adjusted depending on actual information one has about the period.

Results

Appendix 6 through 26 provide the individual calculations of gross benefits by crop, country and scenarios. Tables 99-101 presents a summary of gross economic benefits derived from TL related modern legume varieties from 2007 to 2013 under 2 scenarios on (1) seed production and on (2) adoption rate by crop and region scenario. Using seed production, the total gross benefits were calculated with seed produced using project funds and seed produced using both project and partners' investment. The latter provided measures on the effect of partnering in seed production. Using the total seed produced with project funds, the total gross benefits were estimated at $448.884.845 compared with $1.566.362.854 using both project and partners' funds, indicating the significant impact of partnering in seed production. In effect, the total gross benefits have more than tripled. Using the adoption rates, the gross benefits from project intervention were estimated at about $976.730.258.

Most of the direct gross benefits were derived from chickpea in South Asia accounting for about 59% of the total gross benefits of the project followed by common beans in ESA (20%) and pigeonpea in ESA (5%). Without accounting for chickpea in South Asia, most of the gross benefits are accounted for by the adoption of common beans in ESA (48%), pigeonpea in ESA (11%), cowpea in WCA (10%), etc (Table 100). Though West and Central Africa has the largest area cultivated to groundnut and cowpea, it is noted that the quantity of seed produced is still very low. The search for alternative institutional arrangements to increase seed production in countries and crops remain essential in increasing the gross benefits from TL II investments and thus impacts of TL II investments in WCA.

When including partners' investments, it is noted that more than 65% of the gross benefits is realized through chickpea in SA, followed by groundnut in ESA (9%), common bean in ESA (6%), and soybean WCA (4%). Total gross benefits are 3.5 times higher due to strong partnership.

The significant drop in the share of common beans in ESA in total gross benefits may be explained by the weak partnership in seed production when compared to groundnut or chickpea in ESA.

When using the adoption rate estimates, the share of the gross benefits significantly changes. In fact, chickpea accounts for about 25% of total gross benefits followed by groundnut in ESA (23%), cowpea in

Table 99. Total gross benefits derived from TL II related modern legume varieties from 2007-2013 from direct funding from TL II; including partners' funding and with adoption data.

		Additional production					
		Direct TL II funding (Seed)		Including partners' funding (Seed)		With adoption data	
Crop	Region	Value ($)	Percent of total	Value ($)	Percent of total	Value ($)	Percent of total
Common bean	ESA	87,729,042	19.54%	93,218,739	5.95%	97,118,775	9.94%
Cowpea	WCA	18,106,550	4.03%	52,530,800	3.35%	171,848,588	17.59%
	ESA	2,013,900	0.45%	3,208,275	0.20%	8,775	0.00%
Groundnut	ESA	249,624	0.06%	140,938,849	9.00%	220,393,530	22.56%
	WCA	11,780,249	2.62%	15,667,599	1.00%	59,911,053	6.13%
	SA	2,826,623	0.63%	32,531,282	2.08%	10,871	0.00%
Pigeon pea	ESA	20,894,784	4.65%	49,634,696	3.17%	37,467,104	3.84%
	SA	6,210,978	1.38%	30,085,440	1.92%	65,097,080	6.66%
Chickpea	ESA	7,875,685	1.75%	44,479,455	2.84%	43,516,886	4.46%
	SA	266,330,610	59.33%	1,019,913,136	65.11%	248,146,829	25.41%
Soybean	WCA	10,605,000	2.36%	59,841,250	3.82%	33,173,095	3.40%
	ESA	14,261,800	3.18%	24,313,333	1.55%	37,672	0.00%
Total gross-benefits ($)		**448,884,845**	**100.00%**	**1,566,362,854**	**100.00%**	**976,730,258**	**100.00%**

Table 100. Total gross benefits derived from TL II related modern varieties from 2007-2013 from direct funding from TL II; including partners' funding and with adoption data (excluding chickpea in SA).

		Additional production					
		Direct TL II funding (Seed)		Including partners' funding (Seed)		With adoption data	
Crop	Region	Value ($)	Percent of total	Value ($)	Percent of total	Value ($)	Percent of total
Common bean	ESA	87,729,042	48.06%	93,218,739	17.06%	97,118,775	13.33%
Cowpea	WCA	18,106,550	9.92%	52,530,800	9.61%	171,848,588	23.59%
	ESA	2,013,900	1.10%	3,208,275	0.59%	8,775	0.00%
Groundnut	ESA	249,624	0.14%	140,938,849	25.79%	220,393,530	30.25%
	WCA	11,780,249	6.45%	15,667,599	2.87%	59,911,053	8.22%
	SA	2,826,623	1.55%	32,531,282	5.95%	10,871	0.00%
Pigeon pea	ESA	20,894,784	11.45%	49,634,696	9.08%	37,467,104	5.14%
	SA	6,210,978	3.40%	30,085,440	5.51%	65,097,080	8.93%
Chickpea	ESA	7,875,685	4.31%	44,479,455	8.14%	43,516,886	5.97%
Soybean	WCA	10,605,000	5.81%	59,841,250	10.95%	33,173,095	4.55%
	ESA	14,261,800	7.81%	24,313,333	4.45%	37,672	0.01%
Total gross-benefits ($)		**182,554,235**	**100.00%**	**546,449,718**	**100.00%**	**728,583,429**	**100.00%**

Table 101. Total gross benefits derived from TL II related modern varieties from 2007-2013 from direct funding from TL II and direct and indirect funding from TL II by region and country.

		Additional production			
		Direct funding (seed)		Including partners' funding (seed)	
Region	Country	Value ($)	Percent of total	Value ($)	Percent of total
ESA	Kenya	8,844,033	2.01%	22,272,886	1.42%
	Tanzania	12,890,619	2.94%	103,122,340	6.59%
	Malawi	18,265,442	4.16%	98,439,364	6.29%
	Uganda	32,874,159	7.49%	33,811,252	2.16%
	Zimbabwe	257,775	0.06%	3,858,316	0.25%
	Ethiopia	36,337,778	8.28%	72,537,956	4.63%
	Mozambique	13,592,324	3.10%	21,751,232	1.39%
WCA	Mali	4,830,688	1.10%	10,201,088	0.65%
	Niger	4,038,504	0.92%	9,349,404	0.60%
	Nigeria	31,098,426	7.09%	107,963,705	6.89%
	Burkina Faso	267,294	0.06%	267,294	0.02%
	Ghana	254,768	0.06%	254,768	0.02%
	Senegal	2,119	0.00%	3,391	0.00%
SA	India	275,210,205	62.70%	1,081,977,988	69.10%
	Bangladesh	158,007	0.04%	55,187	0.00%
Total gross-benefits ($)		438,922,141	100.00%	1,565,866,171	100.00%

WCA (18%), and 10% for common beans. If one excludes chickpea in SA, groundnut accounts for 30% of the total gross benefits followed by cowpea in WCA (24%), common bean in ESA (13%), pigeonpea in SA (9%), groundnut in WCA (8%), etc.

Country-wise, with direct project funding, the total gross benefits from TL II related modern varieties is dominated by India accounting for 62%, followed by Ethiopia (8%), Uganda (7%), Nigeria (7%), etc. Similar trends are observed with project and partners' investments with India accounting for 69% now followed by Tanzania and Nigeria (7% each). The lowest shares are recorded in West Africa countries except for Nigeria. With direct project investments, when examining the gross benefits per hectare of legume cropped area, it is noted that Ethiopia has the largest benefit $211.74 /ha of legume cropped area, followed Mozambique ($27 /ha), Uganda ($23 /ha), Malawi ($19 /ha), Kenya (15%), India (14%). As for the case of total gross benefits, the lowest values of gross benefits per cropped area are recorded in West African countries. Region-wise, SA accounts for 54%, followed by ESA (38%) and lastly WCA with 8% of the total gross economic benefits.

Conclusions and caveats

The results showed that the gross benefits from TL II intervention are very high under different scenarios. Using direct project funding, the total gross benefits are estimated at a little more than $513 million. With partnership investment, the gross benefits increase by more than threefold. These results

follow the same trend when using adoption data. The returns on investment are high. In effect, for each TL II dollar invested, the project generates $9 with direct project investment, $20 with partnership's investment and again $20 when using adoption rate based estimation.

There are however severe disparities between regions where SA and ESA accounts for about 90% of the total gross benefits. This calls for more research investments in appropriate institutional arrangements to enhance seed production and uptake in WCA. Investments in irrigation facilities for off-season cropping and breeder seed production may be highly necessary.

This analysis relies heavily on the total quantity of seed produced and does not account for farmers' recycling of seed and improved seed generates a stream of benefits with the yield gains accruing beyond the year of planting of fresh seed. Thus, the annual benefits were aggregated across the years to derive the total benefits for the whole 2008-2013 period. This analysis may suffer from attribution issues when using both the total quantity of seed production or adoption rates. This is likely to be refined as more adoption studies with nationally representative samples are undertaken.

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Appendix 6. Total direct gross economic benefits derived from modern common bean varieties disseminated/developed under the TL II project in ESA (2007-2013).

Country	Certified/QDS seed 2009-2013 (tons)	Seeding rate (kg ha^{-1})	Yield gains over local checks (%)	Yield with local varieties (tons/ha)	Yield gain over local check* (tons/ha)	Area under bean in 2011 (ha)	Area under TL II varieties (ha)	Adoption rate of TL II varieties (%)	Additional production (tons)	Producer Price of bean at farm gate ($/ton)	Value of additional bean production 2009-2013 ($)
Kenya	4,573.90	70	42	0.79	0.3318	1,078,685	65,341	6.06	21,680	760	16,477,017
Tanzania	1,279.84	70	49.5	0.883	0.437085	817,303	18,283	2.24	7,991	320.5	2,561,248
Malawi	227.00	70	42	0.527	0.22134	306,509	3,243	12.71	8,573	550	4,715,543
Uganda*	8,817.70	70	56.4	0.964	0.543696	1,005,091	125,967	12.53	68,488	480	32,874,159
Zimbabwe	62.00	70	41.2	0.883	0.363796	37,000	886	2.39	322	800	257,775
Ethiopia	20,908.56	70	35.5	0.895	0.317725	331,708	298,694	90.05	94,902	325	30,843,300
											87,729,042

Appendix 7. Total gross economic benefits from modern common bean varieties from direct TL II Project and partnership seed production interventions from 2007 – 2013.

Country	Certified/ QDS seed 2009-2013 (tons)	Seeding rate (kg ha^{-1})	Yield gains over local checks (%)	Yield with local varieties (tons/ha)	Yield gain over local check* (tons/ha)	Area under bean in 2011 (ha)	Area under TL II varieties (ha)	Adoption rate of TL II varieties (%)	Additional production (tons)	Producer Price of bean at farm gate ($/ton)	Value of additional bean production 2009-2013 ($)
Kenya	4,573.90	70	42	0.79	0.3318	1,078,685	65,341	6.06	21,680	760	16,477,017
Tanzania*	2,223.84	70	49.5	0.883	0.437085	817,303	31,769	2.24	13,886	320.5	4,450,404
Malawi	2,728.00	70	42	0.527	0.22134	306,509	38,971	12.71	8,574	550	4,715,543
Uganda	8,817.70	70	56.4	0.964	0.543696	1,005,091	125,967	12.53	68,488	480	32,874,159
Zimbabwe	928.00	70	41.2	0.883	0.363796	37,000	13,257	2.39	4,823	800	3,858,316
Ethiopia	20,908.56	70	35.5	0.895	0.317725	331,708	298,694	90.05	94,903	325	30,843,300
											93,218,740

Appendix 8. Total gross economic benefits derived from modern common beans varieties and from TL II intervention from 2007 to 2013 using adoption rate data from several sources.

Country/ Variety	Year released	Adoption under variety 2013 (% area)	Average Yield of local varieties (tons)	Yield gain of new varieties over local checks (%)	Average yield gains over local (t/ha)	Area under beans 2012** (ha)	Area under variety 2012/2013 (ha)	Additional production (tons)	Bean price/ton* ($/ton)	Value of additional output in 2012 ($)	Total gross benefits ($)
ETHIOPIA											
Meher season	2003-2011	38.7	0.905	35.5	0.321	331,708	128,370	41,207	325	13,378,641	
Belg season	2003-2011	25.5	0.895	66.1	0.591	112,461	28,678	16,948	325	5,508,241	
	Total										**18,886,883**
UGANDA	1998-2011	13.2	0.964	56.4	0.544	1,060,000	139,920	76,116	480		**36,535,910**
KENYA											
Western region	1998-2011	24	0.85	10	0.085	110,026	26,406	2,245	837.5	1,879,792	
Eastern province	1998-2011	30	0.675	9	0.061	275,065	82,519	5,013	837.5	4,198,433	
Rift valley	1998-2011	16	0.9	10	0.090	275,065	44,010	3,961	837.5	3,317,280	
Central province	1998-2011	21	0.75	10	0.075	137,640	28,904	2,168	837.5	1,815,560	
	Total										**11,211,065**
ZIMBABWE											
Highveld	2007 – 2013	34.2	0.92	29.4	0.8	15,000	5,130	4,104	800	3,283,200	
Midleveld	2007 – 2013	24.4	0.75	36.7	0.6	10,000	2,440	1,464	800	1,171,200	
Lowveld	2007 – 2013	16.1	0.98	58.9	0.8	12,000	1,932	1,546	800	1,236,480	
	Total										**5,690,880**
MALAWI											
High altitude	(2002-2011)	30	0.5	50	0.25	124,971	37,491	9,373	550	5,155,054	
Mid-altitude	(2002-2011)	25	0.5	42	0.21	114,198	28,550	5,995	550	3,297,467	
Low altitude	(2002-2011)	0									
	Total										**8,452,521**

Continued.

Appendix 8. *Continued*

Country/ Variety	Year released	Adoption under variety 2013 (% area)	Average Yield of local varieties (tons)	Yield gain of new varieties over local checks (%)	Average yield gains over local (t/ha)	Area under beans 2012** (ha)	Area under variety 2012/2013 (ha)	Additional production (tons)	Bean price/ton* ($/ton)	Value of additional output in 2012 ($)	Total gross benefits ($)
TANZANIA											
Southern Tanzania	(2002-2011)	18.3	0.883	49.5	0.437	365,661	66,916	29,242	320	9,357,528	
Northern Tanzania	jesca 1997, Selian 98, selian 94	18.6	0.883	35.9	0.317	370,153	68,849	21,825	320	6,983,988	
	Total						690,116	221,207			16,341,516
TOTAL											**97,118,775**

Appendix 9. Total direct gross economic benefits derived from modern cowpea and soybean varieties disseminated/developed under the TL II project in WCA and ESA (2007 to 2013).

Country	Certified/ QDS seed 2008-2013 (tons)	Seeding rate (kg ha^{-1})	Yield gains over local check (%)	Yield with local varieties (tons/ha)	Yield gain over local check (tons/ha)	Area under cowpea in 2011 (ha)	Area under TL II varieties (ha)	Adoption rate of TL II varieties (%)	Additional production (tons)	Producer Price of cowpea ($/ ton)	Value of additional cowpea production 2013 ($)	Value of additional cowpea production 2008-2013 ($)
Cowpea												
Mali	174	25	80	0.5	0.40	250,000	6,960	2.8	2,784	350	974,400	3,410,400
Mozambique	548	25	100	0.3	0.30	300,000	5,480	5.5	1,644	350	575,400	2,013,900
Niger	339	25	100	0.3	0.30	4,700,000	3,390	0.07	1,017	150	152,550	533,925
Nigeria	1051	25	60	0.7	0.42	3,200,000	17,517	0.5	7,357	550	4,046,350	14,162,225
											5,748,700	**20,120,450**
Soybean												
Malawi	150	60	38	0.8	0.30	75,000	2,500	3.3	760	600	456,000	1,596,000
Mozambique	1734	60	28	0.8	0.22	13,000	28,900	222.3	6,474	500	3,236,800	11,328,800
Nigeria	1212	50	25	1.0	0.25	600,000	24,240	4.0	6,060	500	3,030,000	10,605,000
Kenya	382	60	10	1.0	0.10	2,000	6,367	318.3	637	600	382,000	1,337,000
											7,104,800	**24,866,800**

Appendix 10. Total gross economic benefits from modern cowpea and soybean varieties from direct TL II Project and partnership seed production interventions from 2007 – 2013

Country	Certified/ QDS seed 2008-2013 (tons)	Seeding rate (kg ha^{-1})	Yield gains over local check (%)	Yield with local varieties (tons/ha)	Yield gain over local check (tons/ha)	Area under cowpea in 2011 (ha)	Area under TL II varieties (ha)	Adoption rate of TL II varieties (%)	Additional production (tons)	Producer Price of cowpea ($/ton)	Value of additional cowpea production 2013 ($)	Value of additional cowpea production 2008-2013 ($)
Cowpea												
Mali	448	25	80	0.5	0.40	250,000	17,920	7.2	7,168	350	2,508,800	8,780,800
Mozambique	873	25	100	0.3	0.30	300,000	8,730	8.7	2,619	350	916,650	3,208,275
Niger	3711	25	100	0.3	0.30	4,700,000	37,110	0.79	11,133	150	1,669,950	5,844,825
Nigeria	2813	25	60	0.7	0.42	3,200,000	46,883	1.5	19,691	550	10,830,050	37,905,175
											15,925,450	**55,739,075**
Soybean												
Malawi	150	60	38	0.8	0.30	75,000	2,500	3.3	760	600	456,000	1,596,000
Mozambique	2800	60	28	0.8	0.22	13,000	46,667	359.0	10,453	500	5,226,667	18,293,333
Nigeria	6839	50	25	1.0	0.25	600,000	136,780	22.8	34,195	500	17,097,500	59,841,250
Kenya	1264	60	10	1.0	0.10	2,000	21,067	1053.3	2,107	600	1,264,000	4,424,000
											24,044,167	**84,154,583**

Appendix 11. Total direct gross economic benefits derived from modern cowpea and soybean varieties from 2007 to 2013 using the adoption rate from several sources.

Country	Adoption of MVs* (% area)	Yield gains over local check (%)	Yield with local varieties (tons/ha)	Yield gain over local check (tons/ha)	Area under cowpea in 2009 (ha)	Area under TL II varieties (ha)	Adoption rate of TL II varieties (%)	Additional production (tons)	Producer Price of cowpea ($/ton)	Value of additional cowpea production per year ($)
Cowpea										
Mali	30	80	0.5	0.40	283,665	85,100	30.0	34,040	325	11,062,935
Mozambique	3	100	0.3	0.30	300,000	9,000	3.0	2,700	325	877,500
Niger	9	100	0.3	0.30	4,156,263	374,064	9.0	112,219	130	14,588,483
Nigeria	30	60	0.7	0.42	2,320,590	696,177	30.0	292,394	500	146,197,170
										172,726,088
Soybean										
Malawi	25	38	0.8	0.30	86,796	21,699	25.0	6,596	575	3,792,985
Mozambique	35	28	0.8	0.22	10,000	3,500	35.0	784	480	376,320
Nigeria	36	25	1.0	0.25	592,000	213,120	36.0	53,280	550	29,304,000
Kenya	43	10	1.0	0.10	2,950	1,269	43.0	127	600	76,110
										33,549,415

Appendix 12. Total direct gross economic benefits derived from modern groundnut varieties disseminated/developed under the TL II project in WCA (2007-2013).

Country	Certified/ QDS seed (tons)	Seeding rate (kg ha^{-1})	Yield gains over local check (%)	Yield with local varieties (tons/ha)	Yield gain over local check (tons/ha)	Area under groundnut in 2011 (ha)	Area under TL II varieties (ha)	Adoption rate of TL II varieties (%)	Additional production (tons)	Producer Price of groundnut ($/ton)	Value of additional groundnut production ($)
Burkina Faso	466	80	15	0.683	0.10	388704	5,825	1.5	597	447.9	267,294
Ghana	71	80	15	1.304	0.20	356780	888	0.2	174	1467.6	254,768
Mali	1412	80	21	0.765	0.16	340,000	17,650	5.2	2,835	501	1,420,288
Niger	1175	80	35	0.334	0.12	690,853	33,571	4.86	3,925	893	3,504,579
Nigeria	1406	80	20	0.749	0.15	2,342,810	70,300	3.0	10,531	601	6,331,201
Senegal	5	80	15	0.609	0.09	865,770	63	0.0	6	371	2,119
											11,780,249

Appendix 13. Total gross economic benefits from modern groundnut varieties from direct TL II Project and partnership seed production interventions from 2007 – 2013 in WCA.

Country	Certified/ QDS seed (tons)	Seeding rate (kg ha^{-1})	Yield gains over local check (%)	Yield with local varieties (tons/ha)	Yield gain over local check (tons/ha)	Area under groundnut in 2011 (ha)	Area under TL II varieties (ha)	Adoption rate of TL II varieties (%)	Additional production (tons)	Producer Price of groundnut ($/ton)	Value of additional groundnut production ($)
Burkina Faso	466	80	15	0.683	0.10	388704	5,825	1.5	597	447.9	267,294
Ghana	71	80	15	1.304	0.20	356780	888	0.2	174	1467.6	254,768
Mali	1412	80	21	0.765	0.16	340,000	17,650	5.2	2,835	501	1,420,288
Niger	1175	80	35	0.334	0.12	690,853	33,571	4.86	3,925	893	3,504,579
Nigeria	2269	80	20	0.749	0.15	2,342,810	113,450	4.8	16,995	601	10,217,280
Senegal	8	80	15	0.609	0.09	865,770	100	0.0	9	371	3,391
											15,667,599

Appendix 14. Total gross economic benefits derived from modern groundnut varieties from 2007 to 2013 using the adoption rate from several sources.

Variety	Groundnut adoption (2007-2013) (% area)	Average Yield of local varieties (tons)	Yield gain of new varieties over local checks (%)	Average yield gains over local (ton/ha)	Area under groundnut 2012** (ha)	Area under variety 2012/2013 (ha)	Additional production (ton)	Groundnut price/ton* ($/ton)	Total gross benefits (2007-2013) ($)
Burkina Faso	0.5	0.683	15	0.10245	388704	1943.52	199	447.9	89,183
Ghana	0.5	1.303	15	0.19545	356780	1783.9	349	1467.6	511,698
Mali	17.64	0.765	21	0.16065	340000	59976	9,635	501	4,826,244
Niger	10.98	0.334	35	0.1169	690853	75855.66	8,868	893	7,918,701
Nigeria	22	0.749	20	0.1498	2342810	515418.2	77,210	601	46,418,439
Senegal	0.5	0.609	15	0.09135	865770	4328.85	395	371	146,787
						659306.1			**59,911,053.14**

Appendix 15. Total direct gross economic benefits derived from modern groundnut varieties disseminated/developed under the TL II project in ESA (2007-2013).

Country	Varieties released / supported	Certified/ QDS seed* (tons)	Seeding rate (kg ha^{-1})	Yield gains over local check (%)	Yield with local varieties (tons/ha)	Yield gain over local check (tons/ha)	Area under Groundnut in 2011 (ha)	Area under TL II varieties (ha)	Additional production (tons)	Producer Price of Groundnut ($/ton)	Value of additional Groundnut production per year ($)
Malawi	ALL / average	0			0.50	0.00	353,138	0	0	422	0
	CG 7	0	80	150	0.50	0.75	353,138	0	0	422	0
	Nsinjiro	0	80	150	0.50	0.75	353,138	0	0	422	0
	Baka	0	60	120	0.50	0.60	353,138	0	0	422	0
	Chitala	0	80	100	0.50	0.50	353,138	0	0	422	0
	JL24	0	80	100	0.50	0.50	353,138	0	0	422	0
	Chalimbana 2005	0	80	100	0.50	0.50	353,138	0	0	422	0
	SC Mwenje	0	80	100	0.50	0.50	353,138	0	0	422	0
Tanzania	ALL / average				0.55	0.00	839,631	0	0	422	0
	Mnanje	0	80	150	0.55	0.83	839,631	0	0	422	0
	Pendo	0	80	150	0.55	0.83	839,631	0	0	422	0
	Nachingwea	0	80	130	0.55	0.72	839,631	0	0	422	0
	Mangaka	0	80	150	0.55	0.83	839,631	0	0	422	0
Uganda	ALL / average	0			0.90	0.00	421,000	0	0	422	0
	Serenut 1-14	0	80	70	0.90	0.63	421,000	0	0	422	0
	Serenut 2	0	80	57	0.90	0.51	421,000	0	0	422	0
Yield	Serenut 3R	0	80	57	0.90	0.51	421,000	0	0	422	0
advantage	Serenut 4T	0	80	57	0.90	0.51	421,000	0	0	422	0
averages	Serenut 5R	0	80	57	0.90	0.51	421,000	0	0	422	0
	Serenut 6T	0	80	57	0.90	0.51	421,000	0	0	422	0
	Acholi White	0	80	60	0.90	0.54	421,000	0	0	422	0
	Igola	0	80	40	0.90	0.36	421,000	0	0	422	0
	Red beauty	0	80	0	0.90	0.00	421,000	0	0	422	0
Mozambique	ALL/ average	66.5			0.50	0.00		831	0	429	249,624
	Mamane	30	80	140	0.50	0.70	389,266	375	263	429	112,613
	Nametil	36.5	80	140	0.50	0.70	389,266	456	319	429	137,012
								831			**249,624**

Appendix 16. Total gross economic benefits from modern groundnut varieties from direct TL II Project and partnership seed production interventions from 2007 – 2013 in ESA.

Country	Varieties released / supported	Certified/ QDS seed* (tons)	Seeding rate (kg ha^{-1})	Yield gains over local check (%)	Yield with local varieties (tons/ha)	Yield gain over local check (tons/ha)	Area under Groundnut in 2011 (ha)	Area under TL II varieties (ha)	Additional production (tons)	Producer Price of Groundnut ($/ton)	Value of additional Groundnut production per year ($)
Malawi	ALL / average	16253.25						203,192		422	63,520,917
	CG 7	13243.4	80	150	0.50	0.75	353,138	165,543	124,157	422	52,394,201
	Nsinjiro	2410.12	80	150	0.50	0.75	353,138	30,127	22,595	422	9,535,037
	Baka	6.25	60	120	0.50	0.60	353,138	104	63	422	26,375
	Chitala	473.44	80	100	0.50	0.50	353,138	5,918	2,959	422	1,248,698
	JL24	46.12	80	100	0.50	0.50	353,138	577	288	422	121,642
	Chalimbana 2005	49.92	80	100	0.50	0.50	353,138	624	312	422	131,664
	SC Mwenje	24	80	100	0.50	0.50	353,138	300	150	422	63,300
Tanzania	ALL / average	17542.2						219,278		422	76,231,214
	Mnanje	4850	80	150	0.55	0.83	839,631	60,625	50,016	422	21,106,594
	Pendo	11562.2	80	150	0.55	0.83	839,631	144,528	119,235	422	50,317,249
	Nachingwea	190	80	130	0.55	0.72	839,631	2,375	1,698	422	716,609
	Mangaka	940	80	150	0.55	0.83	839,631	11,750	9,694	422	4,090,763
Uganda	ALL / average	330.9						4,136		422	937,093
	Serenut 1-14	183.2	80	70	0.90	0.63	421,000	2,290	1,443	422	608,819
Yield	Serenut 2	40.33	80	57	0.90	0.51	421,000	504	257	422	108,498
advantage	Serenut 3R	29.344	80	57	0.90	0.51	421,000	367	187	422	78,943
averages	Serenut 4T	37.326	80	57	0.90	0.51	421,000	467	238	422	100,416
	Serenut 5R	3.11	80	57	0.90	0.51	421,000	39	20	422	8,367
	Serenut 6T	3.09	80	57	0.90	0.51	421,000	39	20	422	8,313
	Acholi White	5	80	60	0.90	0.54	421,000	63	34	422	14,243
	Igola	5	80	40	0.90	0.36	421,000	63	23	422	9,495
	Red beauty	24.5	80	0	0.90	0.00	421,000	306	0	422	0
Mozambique	ALL / average	66.5						831		429	249,624
	Mamane	30	80	140	0.50	0.70	389,266	375	263	429	112,613
	Nametil	36.5	80	140	0.50	0.70	389,266	456	319	429	137,012
								427,437			**140,938,849**

Appendix 17. Total gross economic benefits derived from groundnut varieties disseminated/developed under the TL II project in ESA (2007-2013) using adoption rates from several sources (2007-2013).

Country	Varieties released/ supported	Adoption rate	Seeding rate (kg ha^{-1})	Yield gains over local check (%)	Yield with local varieties (tons/ha)	Yield gain over local check (tons/ha)	Area under in 2012 (ha)	Area under TL II varieties (ha)	Additional production (tons)	Producer Price ($/ton)	Value of additional production per year ($)
Malawi	ALL / average	0.81		117.1429	0.50	0.59	353,138	286,042	167,539	422	79,295,796
	CG 7	0.367	80	150	0.50	0.75	353,138	129,602	97,201	422	41,018,921
	Nsinjiro	0.141	80	150	0.50	0.75	353,138	49,792	37,344	422	15,759,313
	Baka	0.001	60	120	0.50	0.60	353,138	353	212	422	89,415
	Chitala	0.013	80	100	0.50	0.50	353,138	4,591	2,295	422	968,658
	JL24	0.025	80	100	0.50	0.50	353,138	8,828	4,414	422	1,862,803
	Chalimbana 2005	0.263	80	100	0.50	0.50	353,138	92,875	46,438	422	19,596,687
	SC Mwenje	0	80	100	0.50	0.50	353,138	0	0	422	0
Tanzania	ALL / average	0.32		145	0.55	0.80	839,631	268,682	214,274	422	90,423,557
	Mnanje	0.001	80	150	0.55	0.83	839,631	840	693	422	292,318
	Pendo	0.184	80	150	0.55	0.83	839,631	154,492	127,456	422	53,786,426
	Nachingwea	0.001	80	130	0.55	0.72	839,631	840	600	422	253,342
	Mangaka	n/a	80	150	0.55	0.83	839,631	n/a	n/a	422	n/a
Uganda	ALL / average	0.556		57	0.90	0.51	421,000	234,076	120,081	422	50,674,177
	Serenut 1-14	n/a	80	70	0.90	0.63	421,000	n/a	n/a	422	n/a
	Serenut 2	n/a	80	57	0.90	0.51	421,000	n/a	n/a	422	n/a
	Serenut 3R	0.142	80	57	0.90	0.51	421,000	59,782	30,668	422	n/a
	Serenut 4T	0.119	80	57	0.90	0.51	421,000	50,099	25,701	422	n/a
	Serenut 5R	n/a	80	57	0.90	0.51	421,000	n/a	n/a	422	n/a
	Serenut 6T	n/a	80	57	0.90	0.51	421,000	n/a	n/a	422	n/a
	Acholi White	n/a	80	60	0.90	0.54	421,000	n/a	n/a	422	n/a
	Igola	n/a	80	40	0.90	0.36	421,000	n/a	n/a	422	n/a
	Red beauty	n/a	80	0	0.90	0.00	421,000	n/a	n/a	422	n/a
Mozambique	ALL / average	n/a			0.50	0.00		n/a	n/a	429	n/a
	Mamane	n/a	80	140	0.50	0.70	389,266	n/a	n/a	429	n/a
	Nametil	n/a	80	140	0.50	0.70	389,266	n/a	n/a	429	n/a
								788,800			**$220,393,530**

Appendix 18. Total direct gross economic benefits derived from modern pigeonpea varieties disseminated/developed under the TL II project in ESA (2007-2013).

Country	Varieties released / supported	Certified/ QDS seed* (tons)	Seeding rate (kg ha^{-1})	Yield gains over local check (%)	Yield with local varieties (tons/ha)	Yield gain over local check (tons/ha)	Area under Pigeonpea in 2012 (ha)	Area under TL II varieties (ha)	Additional production (tons)	Producer Price ($/ton)	Value of additional production per year ($)
Malawi	ALL / average	770.6						77,060			11,953,899
	Sauma (ICP 9145)	266.2	10	23	0.99	0.23	203,400	26,620	6,061	526	3,188,283
	Kachangu (ICEAP 00040)	164.2	10	30	0.99	0.30	203,400	16,420	4,877	526	2,565,165
	Mwaiwathu Alimi (ICEAP 00557)	241.7	10	35	0.99	0.35	203,400	24,170	8,375	526	4,405,200
	Chitedze Pigeonpea 1 (ICEAP 01514/15)	98.5	10	35	0.99	0.35	203,400	9,850	3,413	526	1,795,251
Tanzania	ALL / average	504.2						50,420			8,940,885
	Mali (ICEAP 00040)	354	10	40	0.945	0.38	290,000	35,400	13,381	486	6,503,263
	Tumia (ICEAP 00068)	28	10	35	0.945	0.33	290,000	2,800	926	486	450,085
	Komboa (ICPL 87091)	25	10	30	0.945	0.28	290,000	2,500	709	486	344,453
	ICEAP 00053	34.7	10	38	0.945	0.36	290,000	3,470	1,246	486	605,593
	ICEAP 00554	28.4	10	35	0.945	0.33	290,000	2,840	939	486	456,514
	ICEAP 00557	19.8	10	35	0.945	0.33	290,000	1,980	655	486	318,274
	ICEAP 00932	14.3	10	40	0.945	0.38	290,000	1,430	541	486	262,702
								127,480			**$20,894,784**

Appendix 19. Total gross economic benefits from modern pigeonpea varieties disseminated/developed from direct TL II project and partnership seed production interventions in ESA (2007-2013).

Country / variety	Certified/ QDS seed *	Seeding rate (tons)	Yield gains over local check (kg ha^{-1})	Yield with local varieties (%)	Yield gain over local check (tons/ha)	Area under Pigeonpea in 2011 (tons/ha)	Area under TL II varieties (ha)	Additional production (ha)	Producer Price (tons)	Value of additional production per year ($/ton)
Malawi [ALL / average]	**1824.6**						**182,460**			**28,606,904**
Sauma(ICP 9145)	527.2	10	23	0.99	0.23	203,400	52,720	12,004	526	6,314,285
Kachangu(ICEAP 00040)	519.9	10	30	0.99	0.30	203,400	51,990	15,441	526	8,121,982
Mwaiwathu Alimi(ICEAP 00557)	650.7	10	35	0.99	0.35	203,400	65,070	22,547	526	11,859,593
Chitedze Pigeonpea 1(ICEAP 01514/15)	126.8	10	35	0.99	0.35	203,400	12,680	4,394	526	2,311,044
Tanzania [ALL / average]	**498.5**						**117,468**			**21,027,792**
Mali(ICEAP 00040)	896.5	10	40	0.945	0.38	290,000	89,650	33,888	486	16,469,422
Tumia(ICEAP 00068)	58.1	10	35	0.945	0.33	290,000	5,810	1,922	486	933,926
Komboa(ICPL 87091)	27.3	10	30	0.945	0.28	290,000	2,730	774	486	376,142
ICEAP 00053	65.6	10	38	0.945	0.36	290,000	6,560	2,356	486	1,144,868
ICEAP 00554	42.4	10	35	0.945	0.33	290,000	4,240	1,402	486	681,557
ICEAP 00557	59.05	10	35	0.945	0.33	290,000	5,905	1,953	486	949,196
ICEAP 00932	25.73	10	40	0.945	0.38	290,000	2,573	973	486	472,681
							299,928			**$49,634,696**

Appendix 20. Total gross economic benefits derived from modern pigeonpea varieties disseminated/developed under the TL II project in ESA using adoption rates from several sources (2007-2013).

Country	Varieties released / supported	Adoption rate	Yield gains over local check (%)	Yield with local varieties (tons/ha)	Yield gain over local check (tons/ha)	Area under Pigeonpea in 2011 (ha)	Area under TL II varieties (ha)	Additional production (tons)	Producer Price ($/ton)	Value of additional production per year ($)
Malawi	ALL / average	0.5	29.3	0.99	0.29	203,400	101,700	29,534	526	**14,299,000**
	Sauma (ICP 9145)	0.25	23	0.99	0.23	203,400	50,850	11,579	526	6,090,315
	Kachangu (ICEAP 00040)	0.2	30	0.99	0.30	203,400	40,680	12,082	526	6,355,111
	Mwaiwathu Alimi (ICEAP 00557)	0.05	35	0.99	0.35	203,400	10,170	3,524	526	1,853,574
Tanzania	ALL / average	0.497	35	0.945	0.33	290,000	144,130	47,671	486	**23,168,105**
	Mali (ICEAP 00040)	0.306	40	0.945	0.38	290,000	88,740	33,544	486	16,302,248
	Tumia (ICEAP 00068)	0.003	35	0.945	0.33	290,000	870	288	486	139,848
	Komboa (ICPL 87091)	0.016	30	0.945	0.28	290,000	4,640	1,315	486	639,304
Uganda	ALL / average	n/a		0.8	0.00	101,000	n/a 245,830	n/a	422	n/a **$37,467,104**

Appendix 21. Total direct gross economic benefits derived from modern chickpea varieties disseminated/developed under the TL II project in ESA (2007-2013).

Country	Varieties released / supported	Certified/ QDS seed (tons)	Seeding rate (kg ha^{-1})	Yield gains over local check (%)	Yield with local varieties (tons/ha)	Yield gain over local check (tons/ha)	Area under Chickpea in 2012 (ha)	Area under TL II varieties (ha)	Adoption rate of TL II varieties (%)	Additional production (tons)	Producer Price ($/ton)	Value of additional production per year ($)
Ethiopia	ALL / average	1605.4					239,512					5,630,772
	Arerti	1328.4	140	110	1.19	1.31	239,512	9,489	4.0	12,421	407	5,055,160
	Shasho	151.1	140	68	1.19	0.81	239,512	1,079	0.5	873	407	355,457
	Marye	0.9	120	51	1.19	0.61	239,512	8	0.0	5	407	1,853
	Habru	69.9	140	51	1.19	0.61	239,512	499	0.2	303	407	123,328
	Ejere	16.4	140	26	1.19	0.31	239,512	117	0.0	36	407	14,751
	Natoli	1.2	120	68	1.19	0.81	239,512	10	0.0	8	407	3,293
	Kutaye	3.8	120	68	1.19	0.81	239,512	32	0.0	26	407	10,429
	Teji	16.4	140	51	1.19	0.61	239,512	117	0.0	71	407	28,935
	Bifru	0	132	54,5	1.19	0.65	239,512	0	0.0	0	407	0
	Chefe	12	140	68	1.19	0.81	239,512	86	0.0	69	407	28,230
	Acos Dube	4.8	140	51	1.19	0.61	239,512	34	0.0	21	407	8,469
	Minjar	0.5	120	43	1.19	0.51	239,512	4	0.0	2	407	868
	Arerti, Natoli, Teji, Habru, Sasho*	0	132	54,5	1.19	0.65	239,512	0	0.0	0	407	0
Tanzania	ALL / average	315.2					120,000					1,413,076
	Ukiriguru 1 (ICCV 97105)	150.4	90	46	1.12	0.52	120,000	1,671	1.4	861	822	707,706
	Mwanza 1 (ICCV 00108)	108.8	90	43	1.12	0.48	120,000	1,209	1.0	582	822	478,569
	Mwangaza (ICCV 92318)	28.9	120	54	1.12	0.60	120,000	241	0.2	146	823	119,875

Continued

Appendix 21. *Continued*

Country	Varieties released / supported	Certified/ QDS seed (tons)	Seeding rate (kg ha^{-1})	Yield gains over local check (%)	Yield with local varieties (tons/ha)	Yield gain over local check (tons/ha)	Area under Chickpea in 2012 (ha)	Area under TL II varieties (ha)	Adoption rate of TL II varieties (%)	Additional production (tons)	Producer Price ($/ton)	Value of additional production per year ($)
	Mwanza 2 (ICCV 00305)	27.1	105	45	1.12	0.50	120,000	258	0.2	130	822	106,926
Kenya	ALL / average	293..4										831,837
	Chania Desi1 (ICCV 97105)	75.97	90	50	1.00	0.50	190	844	444.3	422	615	259,564
	Saina K1 (ICCV 95423)	82.8	105	35	1.00	0.35	190	789	415.0	276	615	169,740
	ICCV 92944	43.45	90	50	1.00	0.50	190	483	254.1	241	615	148,454
	LTD068 (ICCV 00305)	44.38	105	38	1.00	0.38	190	423	222.5	161	615	98,777
	ICCV 97126	14.9	90	50	1.00	0.50	190	166	87.1	83	615	50,908
	ICCV 97306	3.15	110	35	1.00	0.35	190	29	15.1	10	615	6,164
	LTD065 (ICCV 00108)	28.75	90	50	1.00	0.50	190	319	168.1	160	615	98,229
												$7,875,685

Appendix 22. Total gross economic benefits from modern chickpea varieties disseminated/developed from direct TL II project and partnership seed production interventions in ESA (2007-2013).

Country	Varieties released / supported	Certified/ QDS seed (tons)	Seeding rate (kg ha^{-1})	Yield gains over local check (%)	Yield with local varieties (tons/ha)	Yield gain over local check (tons/ha)	Area under Chickpea in 2012 (ha)	Area under TL II varieties (ha)	Adoption rate of TL II varieties (%)	Additional production (tons)	Producer Price ($/ton)	Value of additional production per year ($)
Ethiopia	ALL / average	12062.04					239,512					42,234,542
	Arerti	9768.4	140	110	1.19	1.31	239,512	69,774	29.1	91,335	407	37,173,158
	Shasho	1329.5	140	68	1.19	0.81	239,512	9,496	4.0	7,685	407	3,127,596
	Marye	761.4	120	51	1.19	0.61	239,512	6,345	2.6	3,851	407	1,567,268
	Habru	84.56	140	51	1.19	0.61	239,512	604	0.3	367	407	149,193
	Ejere	26.73	140	26	1.19	0.31	239,512	191	0.1	59	407	24,043
	Natoli	4.2	120	68	1.19	0.81	239,512	35	0.0	28	407	11,527
	Kutaye	15.73	120	68	1.19	0.81	239,512	131	0.1	106	407	43,172
	Teji	31.96	140	51	1.19	0.61	239,512	228	0.1	139	407	56,388
	Bifru	0	132	54.5	1.19	0.65	239,512	0	0.0	0	407	0
	Chefe	21.53	140	68	1.19	0.81	239,512	154	0.1	124	407	50,648
	Acos Dube	8.95	140	51	1.19	0.61	239,512	64	0.0	39	407	15,791
	Minjar	9.08	120	43	1.19	0.51	239,512	76	0.0	39	407	15,758
	Arerti, Natoli, Teji, Habru, Sasho*		132	54.5	1.19	0.65	239,512	0	0.0	0	407	0
Tanzania	ALL / average	315.2					120,000					1,413,076
	Ukiriguru 1 (ICCV 97105)	150.4	90	46	1.12	0.52	120,000	1,671	1.4	861	822	707,706
	Mwanza 1 (ICCV 00108)	108.8	90	43	1.12	0.48	120,000	1,209	1.0	582	822	478,569
	Mwangaza (ICCV 92318)	28.9	120	54	1.12	0.60	120,000	241	0.2	146	823	119,875

Continued

Appendix 22. *Continued*

Country	Varieties released / supported	Certified/ QDS seed (tons)	Seeding rate (kg ha^{-1})	Yield gains over local check (%)	Yield with local varieties (tons/ha)	Yield gain over local check (tons/ha)	Area under Chickpea in 2012 (ha)	Area under TL II varieties (ha)	Adoption rate of TL II varieties (%)	Additional production (tons)	Producer Price ($/ton)	Value of additional production per year ($)
	Mwanza 2 (ICCV 00305)	27.1	105	45	1.12	0.50	120,000	258	0.2	130	822	106,926
Kenya	ALL / average	293.4										831,837
	Chania Desi1 (ICCV 97105)	75.97	90	50	1.00	0.50	190	844	444.3	422	615	259,564
	Saina K1 (ICCV 95423)	82.8	105	35	1.00	0.35	190	789	415.0	276	615	169,740
	ICCV 92944	43.45	90	50	1.00	0.50	190	483	254.1	241	615	148,454
	LTD068 (ICCV 00305)	44.38	105	38	1.00	0.38	190	423	222.5	161	615	98,777
	ICCV 97126	14.9	90	50	1.00	0.50	190	166	87.1	83	615	50,908
	ICCV 97306	3.15	110	35	1.00	0.35	190	29	15.1	10	615	6,164
	LTD065 (ICCV 00108)	28.75	90	50	1.00	0.50	190	319	168.1	160	615	98,229
												$4,479,455

Appendix 23. Total gross economic benefits derived from modern chickpea varieties disseminated/developed under the TL II project in ESA using adoption rates from several sources (2007-2013).

Country	Varieties released / supported	Adoption rate (% area)	Yield gains over local check (%)	Yield with local varieties (tons/ha)	Yield gain over local check (tons/ha)	Area under Chickpea in 2012 (ha)	Area under TL II varieties (ha)	Additional production (tons)	Producer Price ($/ton)	Value of additional production per year ($)
Ethiopia	ALL / average	0.63	59.55	1.19	0.71	239,512	150,893	106,921	407	43,516,886
	Arerti	n/a	110	1.19	1.31	239,512	n/a	n/a	407	n/a
	Shasho	n/a	68	1.19	0.81	239,512	n/a	n/a	407	n/a
	Marye	n/a	51	1.19	0.61	239,512	n/a	n/a	407	n/a
	Habru	n/a	51	1.19	0.61	239,512	n/a	n/a	407	n/a
	Ejere	n/a	26	1.19	0.31	239,512	n/a	n/a	407	n/a
	Natoli	n/a	68	1.19	0.81	239,512	n/a	n/a	407	n/a
	Kutaye	n/a	68	1.19	0.81	239,512	n/a	n/a	407	n/a
	Teji	n/a	51	1.19	0.61	239,512	n/a	n/a	407	n/a
	Chefe	n/a	68	1.19	0.81	239,512	n/a	n/a	407	n/a
	Acos Dube	n/a	51	1.19	0.61	239,512	n/a	n/a	407	n/a
	Minjar	n/a	43	1.19	0.51	239,512	n/a	n/a	407	n/a
Tanzania	ALL / average	n/a	47	1.12	0.53	120,000	n/a	n/a	822	n/a
	Ukiriguru 1(ICCV 97105)	n/a	46	1.12	0.52	120,000	n/a	n/a	822	n/a
	Mwanza 1(ICCV 00108)	n/a	43	1.12	0.48	120,000	n/a	n/a	822	n/a
	Mwangaza(ICCV 92318)	n/a	54	1.12	0.60	120,000	n/a	n/a	823	n/a
	Mwanza 2(ICCV 00305)	n/a	45	1.12	0.50	120,000	n/a	n/a	822	n/a
Kenya	ALL / average	n/a	44	1.00	0.44	190	n/a	n/a	615	n/a
	Chania Desi1 (ICCV 97105)	n/a	50	1.00	0.50	190	n/a	n/a	615	n/a
	Saina K1(ICCV 95423)	n/a	35	1.00	0.35	190	n/a	n/a	615	n/a
	ICCV 92944	n/a	50	1.00	0.50	190	n/a	n/a	615	n/a
	LTD068(ICCV 00305)	n/a	38	1.00	0.38	190	n/a	n/a	615	n/a
	ICCV 97126	n/a	50	1.00	0.50	190	n/a	n/a	615	n/a
	ICCV 97306	n/a	35	1.00	0.35	190	n/a	n/a	615	n/a
	LTD065(ICCV 00108)	n/a	50	1.00	0.50	190	n/a	n/a	615	n/a
							150,893			**$43,516,886**

Appendix 24. Total direct gross economic benefits from TL II related modern groundnut, chickpea and pigeonpea varieties disseminated/ developed under the TL II project in South Asia (SA) (2007-2013).

Country	Certified/ QDS seed* (tons)	Seeding rate (kg ha^{-1})	Yield gains over local check (%)	Yield with local varieties (tons/ha)	Yield gain over local check (tons/ha)	Area in 2011 (ha)	Area under TL II varieties (ha)	Adoption rate of TL II varieties (%)	Additional production (tons)	Producer Price ($/ton)	Value of additional production ($)
Groundnut											
India (2008-2013)	1821	125	40	1	0.40	5,856,145	14,568	0.2	5,827	483	2,814,538
Bangladesh (2011-13)	9	125	30	0.8	0.24	31,755	72	0.2	17	699	12,086
											2,826,623
Chickpea											
India (2008-2013)	56833	62	45	1.35	0.61	9,190,000	916,661	10.0	556,872	478	266,184,689
Bangladesh (2012-2013)	53	62	30	1	0.30	8,229	855	10.4	256	569	145,921
											266,330,610
Pigeonpea											
India (2008-2012)	307	5	22	0.95	0.21	4,420,000	61,400	1.4	12,833	484	**6,210,978**

Appendix 25. Total gross economic benefits from modern groundnut, chickpea and pigeonpea varieties disseminated/developed from direct TL II project and partnership seed production interventions in SA (2007-2013).

Country	Certified/ QDS seed* (tons)	Seeding rate (kg ha^{-1})	Yield gains over local check (%)	Yield with local varieties (tons/ha)	Yield gain over local check (tons/ha)	Area in 2011 (ha)	Area under TL II varieties (ha)	Adoption rate of TL II varieties (%)	Additional production (tons)	Producer Price ($/ton)	Value of additional production ($)
Groundnut											
India (2008-2013)	20,940	125	40	1	0.40	5,856,145	167,520	2.9	67,008	483	32,364,864
Bangladesh (2011-13)	124	125	30	0.8	0.24	31,755	992	3.1	238	699	166,418
											32,531,282
Chickpea											
India (2008-2013)	217,679	62	45	1.35	0.61	9,190,000	3510,952	38.2	2,132,903	478	1,019,527,684
Bangladesh (2012-2013)	140	62	30	1	0.30	8,229	2,258	27.4	677	569	385,452
											1,019,913,136
Pigeonpea											
India (2008-2012)	1480	5.0	22	1.0	0.20	4,420,000	296,000	6.7	62,160	484	**30,085,440**

Appendix 26. Total gross economic benefits derived from modern pigeonpea, chickpea and groundnut varieties disseminated/developed under the TL II project in SA using adoption rates from several sources (2007-2013).

	Year	Adoption rate (% area)	Avg. yield of local varieties (tons/ha)	Yield gain of new cultivars than check (%)	Average yield gain over local (tons/ha)	Area under crop in 2012 (ha)	Area under TL II varieties (ha)	Additional Production (tons)	Price/ton ($/ton)	Value of additional production ($)	Total benefits ($)
Groundnut											
Tamil Nadu	2013	8	1.8	35	0.63	386,000	309	195	483	93,965	
Karnataka	2011	1	1.2	30	0.36	848,000	85	31	483	14,745	
											108,710
Chickpea											
Andhra Pradesh	2013	85	1.35	45	0.6075	615,000	522,750	317,571	478	151,798,759	
Karnataka	2013	65	1	35	0.35	886,000	575,900	201,565	478	96,348,070	
											248,146,829
Pigeonpea											
Andhra Pradesh	2011	31	1.1	25	0.275	498,000	154,380	42,455	484	20,547,978	
Maharashtra	2011	40	0.95	22	0.209	1,101,000	440,400	92,044	484	44,549,102	
											65,097,080

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