



**RESEARCH
PROGRAM ON**
Grain Legumes and
Dryland Cereals

Estimating the Potential Area Adoption of GLDC Crop Cultivars Released in 2018

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1. Introduction

The CGIAR Research Program on Grain Legumes and Dryland Cereals (CRP-GLDC) has set aspirational targets to contribute to System-Level Outcomes (SLOs) on reducing poverty, improving food and nutritional security for health and improving natural resources systems and ecosystem services. Under SLO 1.1 (reduce poverty), the GLDC target is to reach 8.9 million and 21.7 million farm households that have adopted improved GLDC crop varieties released in the target countries, by 2022 and 2030, respectively. A robust impact assessment study is needed to track the adoption of new GLDC crop cultivars in order to provide evidence on targets achieved. Prior to the *ex-post* impact study, greater clarity is needed on the potential area that the GLDC cultivars released in 2018 will be adopted on or reach in the target countries. This brief presents the methods used to estimate the potential area adoption in 2022 by GLDC crops cultivars released in 2018 in the target environment and countries.

2. Data and Methods

Firstly, data on the number of cultivars released in 2018 as part of CRP-GLDC was collated from breeders in all the centres participating in the program. The data contains information on crop variety or hybrid name, country released, target mega-environments, primary or secondary traits of the cultivars, institutes responsible for the release in the target countries, etc. Secondly, we collated information on: (1) the area of GLDC crops in the GLDC mega-environments, by country; (2) expert assessment on adoption ceiling defined as the maximum adoption rate as a proportion of the total cropped area (Nedumaran et al, 2015; Kumaracharyulu et al. 2016; Mausch et al. 2013); and (3) adoption lag defined as the number of years until maximum adoption is reached.

The logistic adoption curve (Alston et al. 1995) was used to estimate the potential area adoption of the new cultivars. The estimate used parameters like release year of technology, maximum adoption rate, end year of technology adoption and median of adoption year. Adoption is assumed to follow the logistic or S-shaped diffusion curve starting with less than 1% of the area placed under improved technologies in the first year of adoption.

3. Results

The summary results are presented in Tables 1-4. A total of 59 GLDC crop cultivars (including hybrids and varieties) were released in 2018. About 26 groundnut cultivars were released in 2018, of which 10 were released in Mali and 6 in Burkina Faso (Table 1). Among countries, Mali released about 12 GLDC cultivars in 2018 (10 of groundnut and 2 of sorghum).

The potential area that GLDC crops might be adopted on in the target countries in 2022 will be 0.97 million ha and in 2023 it may reach 2.2 million ha (Table 2). The details of potential area adopted by target counties and crops are given in Appendix 1. Among crops, pearl millet may potentially reach 0.47 million ha and groundnut about 0.19 million ha. The higher potential area adopted is driven by the number of cultivars released and the maximum adoption rate. For example, in India, 4 pearl millet hybrids were released targeting specific states. Due to better seed systems and private companies involved in promoting pearl millet cultivars, the potential area of adoption of these technologies will be higher compared to countries in Africa which have a poor public and private seed system.

Among the mega-environments, the GLDC cultivars will reach about 0.75 million ha in semi-arid South Asia and about 0.13 million ha in semi-arid Western and Central Africa (Table 3).

In India, about 11 GLDC crop cultivars were released in 2018, and it may be potentially adopted on about 0.71 million ha by 2022 (Table 4).

This projection can serve as an indicator to track the adoption of GLDC cultivars by 2022 and beyond. This analysis provides only the potential adoption area. Further analysis is required to assess the number of farm household these technologies will be adopted by and the economic gains that would accrue in order to assess the number households moved out of poverty.

References

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Table 1: Number of GLDC crop cultivars released in 2018 by target countries.

Country	Chickpea	Finger millet	Groundnut	Lentil	Pearl millet	Pigeonpea	Sorghum	Soybean	Grand total
Bangladesh				1					1
Burkina Faso			6						6
Ethiopia	2								2
Ghana			1					1	2
India			2	3	4	1	1		11
Iran	2			1					3
Malawi			1				3		4
Mali			10				2		12
Myanmar	1								1
Nepal				1					1
Niger					6				6
Nigeria			3						3
Tanzania, United Republic of			2						2
Uganda		2							2
Zambia			1			2			3
Grand total	5	2	26	6	10	3	6	1	59

Table 2: Potential area (ha) adopted by GLDC crops from 2021 to 2023.

GLDC crops	Potential area adopted		
	2021	2022	2023
Chickpea	15170.49	39393.27	89925.91
Finger millet	2902.04	7535.74	17202.39
Groundnut	72667.20	191921.13	456066.68
Lentil	4589.18	12168.06	29175.67
Pearl millet	182597.84	474152.60	1082382.84
Pigeonpea	21069.72	57252.93	144838.36
Sorghum	69009.76	179197.95	409068.27
Soybean	1117.41	2901.59	6623.66
Grand total	369123.63	964523.26	2235283.78

Table 3: Potential area (ha) adopted by GLDC crops in 2022 by mega-environment.

GLDC crops	Dry sub-humid East Africa	Dry sub-humid South Asia	Dry sub-humid Southern Africa	Dry sub-humid WCA	Semi-arid East Africa	Semi-arid South Asia	Semi-arid Southern Africa	Semi-arid WCA	Grand total
Chickpea		5074.68			3549.64	30768.96			39393.27
Finger millet	7535.74								7535.74
Groundnut	12252.91		14206.96	33797.63		65443.59	1424.09	64795.95	191921.13
Lentil		1811.07				10356.98			12168.06
Pearl millet						429965.78		44186.81	474152.60
Pigeonpea			2925.54			54327.39			57252.93
Sorghum						154418.49	940.83	23838.63	179197.95
Soybean				2901.59					2901.59
Grand total	19788.65	6885.75	17132.50	36699.21	3549.64	745281.20	2364.92	132821.39	964523.26

Table 4: Potential area (ha) adopted by GLDC crops by country in 2022.

GLDC countries	Chickpea	Finger millet	Groundnut	Lentil	Pearl millet	Pigeonpea	Sorghum	Soybean	Grand total
Bangladesh				4983.93					4983.93
Burkina Faso			3524.39						3524.39
Ethiopia	3549.64								3549.64
Ghana			4119.22					2901.59	7020.80
India			65443.59	5373.06	429965.78	54327.39	154418.49		709528.31
Iran	5074.68			1643.12					6717.80
Malawi			14206.96				940.83		15147.79
Mali			7813.09				23838.63		31651.71
Myanmar	30768.96								30768.96
Nepal				167.95					167.95
Niger					44186.81				44186.81
Nigeria			83136.87						83136.87
Tanzania, United Republic of			12252.91						12252.91
Uganda		7535.74							7535.74
Zambia			1424.09			2925.54			4349.63
Grand total	39393.27	7535.74	191921.13	12168.06	474152.60	57252.93	179197.95	2901.59	964523.26

Appendix: 1

Potential area of adoption by crop, country and mega-environment.

S.N O	Crop	Country Released	Release Name	GLDC Mega environments	Area (ha) of crop in ME by country	Max adoptio n rate (%)	Potential Area adoption in 2021 (ha)	Potential Area adoption in 2022 (ha)	Potential Area adoption in 2023 (ha)
1	Chickpea	Ethiopia	names will soon be assigned	Semi-arid East Africa	75833	40	683.5	1774.8	4051.5
2	Chickpea	Ethiopia	names will soon be assigned	Semi-arid East Africa	75833	40	683.5	1774.8	4051.5
3	Chickpea	Iran	Ata	Dry sub-humid South Asia	65705	60	977.1	2537.3	5792.2
4	Chickpea	Iran	Nosrat	Dry sub-humid South Asia	65705	60	977.1	2537.3	5792.2
5	Chickpea	Myanmar	Yezin 13	Semi-arid South Asia	375620	70	11849.2	30769.0	70238.6
6	Finger millet	Uganda	NAROMIL 5	Dry sub-humid East Africa	80297	40	1451.0	3767.9	8601.2
7	Finger millet	Uganda	NAROMIL 4	Dry sub-humid East Africa	80297	40	1451.0	3767.9	8601.2
8	Groundnut	Burkina Faso	Â Soukeba	Semi-arid West and Central Africa	324561	20	221.9	604.5	1537.2
9	Groundnut	Burkina Faso	Beeda	Semi-arid West and Central Africa	324561	20	221.9	604.5	1537.2
10	Groundnut	Burkina Faso	Touinware	Semi-arid West and Central Africa	324561	20	221.9	604.5	1537.2
11	Groundnut	Burkina Faso	Nafa 1	Dry sub-humid West and Central Africa	53923	20	184.3	502.1	1277.0
12	Groundnut	Burkina Faso	Â Lokre	Semi-arid West and Central Africa	324561	20	221.9	604.5	1537.2
13	Groundnut	Burkina Faso	Â Miou Paale	Semi-arid West and Central Africa	324561	20	221.9	604.5	1537.2
14	Groundnut	Ghana	SARINUT 2	Semi-arid West and Central Africa	117335	30	1586.3	4119.2	9403.2
15	Groundnut	India	GJG 33	Semi-arid South Asia	4958007	70	6821.6	18582.7	47257.8
16	Groundnut	India	GJG32	Semi-arid South Asia	4958007	70	17202.2	46860.8	119171.8
17	Groundnut	Malawi	Naliendele2016	Dry Sub-humid Southern Africa	202341	60	5471.2	14207.0	32431.3
18	Groundnut	Mali	Nyanda	Semi-arid West and Central Africa	222006	30	300.9	781.3	1783.6
19	Groundnut	Mali	Mwenje	Semi-arid West and Central Africa	222006	30	300.9	781.3	1783.6
20	Groundnut	Mali	Keniana Tiga	Semi-arid West and Central Africa	222006	30	300.9	781.3	1783.6
21	Groundnut	Mali	Kounadiya Tiga	Semi-arid West and Central Africa	222006	30	300.9	781.3	1783.6

22	Groundnut	Mali	Wasso Tiga	Semi-arid West and Central Africa	222006	30	300.9	781.3	1783.6
23	Groundnut	Mali	Sago Tiga	Semi-arid West and Central Africa	222006	30	300.9	781.3	1783.6
24	Groundnut	Mali	Benkadi Tiga	Semi-arid West and Central Africa	222006	30	300.9	781.3	1783.6
25	Groundnut	Mali	Wassaba Tiga	Semi-arid West and Central Africa	222006	30	300.9	781.3	1783.6
26	Groundnut	Mali	Djigui Tiga	Semi-arid West and Central Africa	222006	30	300.9	781.3	1783.6
27	Groundnut	Mali	Baana Tiga	Semi-arid West and Central Africa	222006	30	300.9	781.3	1783.6
28	Groundnut	Nigeria	Samnut 29	Dry sub-humid West and Central Africa	711311	40	6411.1	16647.8	38003.0
29	Groundnut	Nigeria	Samnut 28	Dry sub-humid West and Central Africa	711311	40	6411.1	16647.8	38003.0
30	Groundnut	Nigeria	Samnut 27	Semi-arid West and Central Africa	1064790	40	19194.1	49841.4	113776.6
31	Groundnut	Tanzania, United Republic of	MTWARANUT-2016	Dry sub-humid East Africa	261766	40	2359.3	6126.5	13985.3
32	Groundnut	Tanzania, United Republic of	TANZANUT 2016	Dry sub-humid East Africa	261766	40	2359.3	6126.5	13985.3
33	Groundnut	Zambia	MGV8	Semi-Arid Southern Africa	34770	35	548.4	1424.1	3250.9
34	Lentil	Bangladesh	BARI Massor 9	Semi-arid South Asia	70983	60	1919.3	4983.9	11377.2
35	Lentil	India	LL4727	Semi-arid South Asia	194280	70	657.5	1791.0	4554.7
36	Lentil	India	Sekhar	Semi-arid South Asia	194280	70	657.5	1791.0	4554.7
37	Lentil	India	IPL220	Semi-arid South Asia	194280	70	657.5	1791.0	4554.7
38	Lentil	Iran	Sepehar	Dry sub-humid South Asia	23402	60	632.8	1643.1	3750.9
39	Lentil	Nepal	Khajuro Masuro 4	Dry sub-humid South Asia	2392	60	64.7	167.9	383.4
40	Pearl millet	India	AHB 1269	Semi-arid South Asia	7048455	70	50948.1	132297.2	302004.4
41	Pearl millet	India	RHB 233	Semi-arid South Asia	7048455	70	44579.6	115760.0	264253.9
42	Pearl millet	India	RHB 234	Semi-arid South Asia	7048455	70	44579.6	115760.0	264253.9
43	Pearl millet	India	HHB 311	Semi-arid South Asia	7048455	70	25474.1	66148.6	151002.2
44	Pearl millet	Niger	Mil De Siaka	Semi-arid West and Central Africa	1307867	30	2836.1	7364.5	16811.4
45	Pearl millet	Niger	ICRI-Tabi	Semi-arid West and Central Africa	1307867	30	2836.1	7364.5	16811.4
46	Pearl millet	Niger	CHAKTI	Semi-arid West and Central Africa	1307867	30	2836.1	7364.5	16811.4

47	Pearl millet	Niger	PPBVtera	Semi-arid West and Central Africa	1307867	30	2836.1	7364.5	16811.4
48	Pearl millet	Niger	PPBV Falwel	Semi-arid West and Central Africa	1307867	30	2836.1	7364.5	16811.4
49	Pearl millet	Niger	PPBVSERKINHHA OUSSA	Semi-arid West and Central Africa	1307867	30	2836.1	7364.5	16811.4
50	Pigeonpea	India	Pusa Arhar 16	Semi-arid South Asia	1944736	60	19943.1	54327.4	138160.0
51	Pigeonpea	Zambia	MPPV 4	Dry Sub-humid Southern Africa	50000	50	563.3	1462.8	3339.2
52	Pigeonpea	Zambia	MPPV 3	Dry Sub-humid Southern Africa	50000	50	563.3	1462.8	3339.2
53	Sorghum	India	Parbhani Shakti	Semi-arid South Asia	7345556	80	59467.1	154418.5	352502.4
54	Sorghum	Malawi	PILIRA 5	Semi-Arid Southern Africa	13535	60	120.8	313.6	715.9
55	Sorghum	Malawi	PILIRA 3	Semi-Arid Southern Africa	13535	60	120.8	313.6	715.9
56	Sorghum	Malawi	PILIRA 4	Semi-Arid Southern Africa	13535	60	120.8	313.6	715.9
57	Sorghum	Mali	SAMBONI	Semi-arid West and Central Africa	677366	30	4590.2	11919.3	27209.1
58	Sorghum	Mali	Nando	Semi-arid West and Central Africa	677366	30	4590.2	11919.3	27209.1
59	Soybean	Ghana	Favour	Dry sub-humid West and Central Africa	82651	30	1117.4	2901.6	6623.7

Source: Crop area by mega environments – ICRISAT GIS unit; Max adoption rate (Nedumaran et al., 2015; Kumaracharyulu et al., 2016; Mausch et al., 2013)



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