

An analysis of off-takers facilitating bean grain trade to pull seed demand and supply response in Eastern and Southern Africa

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1. INTRODUCTION

Conventional model for creating demand for seed of leguminous crops has been through promotional events such as agricultural show, field days, seed fairs, demonstrations, use of print media and mass media campaigns etc. Other emerging approaches to create demand and increase adoption of improved legume crop variety seeds include use of Multi Stakeholder Platforms (MSPs). These have proven efficient in delivering and fostering demand for seeds of leguminous crops (Lorlamen et al., 2021; Ojiewo et al., 2020; Rubyogo et al., 2019). The MSPs bring together various actors to boost their networks, and resources. As such, combining promotional activities of varieties, seed, integrated management with seed and grain trade. However, conventional methods and less targeted MSP interventions may fail to create sustained seed demand hence less seed business could limit quality seed supply to farmers and contribute to slow adoption of new varieties. Bringing local traders particularly large traders, also known as bean off-takers, into MSPs and assigning them management and operations could create sustained demand for bean seed. Furthermore, Multi-stakeholder partnerships work better if implemented through public private partnerships (Aseete et al., 2022, Rubyogo et al., 2010).

In bean seed trade and improvement of varietal turnover, traders are important in two ways. First, they are movers of large volumes of what seed (Sperling et al., 2020) called potential seed. Sperling et al., 2020 showed that traders are the backbone of smallholder seed security and need to be engaged. Secondly, through targeting specific market varieties, they can create demand for seed thus supporting bean seed businesses. Undoubtedly, off-takers have the potential of facilitating adoption of improved varieties. Using traders to create demand for seed helps to integrate the formal and informal seed system. This has the potential of scaling up impact from new bean varieties (McGuire and Sperling, 2016 & Sperling et al., 2021). Sustaining grain business through informal traders helps move seed varieties at scale (Sperling et al., 2021).

2. RATIONAL FOR THE STUDY AND RESEARCH QUESTIONS

From the foregoing discussion, the role of off-takers in the development of bean seed businesses is invaluable. Therefore, characterizing them to understand the nature of their business and how to support bean seed trade is critical. In this study, the following research questions were outlined.

1. What is the nature of off-takers and off taker businesses that support bean trade?
2. What is the off-taking potential and volumes of bean handled by variety and how can grain demand be used to infer seed demand for new varieties?
3. What linkages exist between off takers and other bean seed actors?

4. METHODOLOGY

4.1 Study area.

The study was carried out in four countries. Two countries in east Africa (Burundi and Democratic Republic of Congo) and two countries in southern Africa (Zambia and Zimbabwe). The study was exploratory and thus there were no specific locales within each country. Off takers were tracked based on where they conduct bean business. Majority were found in major cities of each country: Bujumbura, Maramvya, Muyinga, Kirundo, Gitega for Burundi, South Kivu (Bukavu) and North Kivu (Goma) for DRC, Harare, Manicaland, and Nyanga for Zimbabwe and Lusaka for Zambia.

4.2. Sampling and data collection

To obtain the sample of off-takers, a search of listed major bean businesses from each country was done online and locally available reports. This activity was supported by national partners within the National Agricultural Systems (NARS). To obtain additional off-takers, snow balling method was used. Identified off-takers were engaged through meeting and follow up surveys using a standard pretested questionnaire were done.

4.3. THE DATA

Off-takers (Traders) were included as actors in the bean seed value chain because they create a demand pull for seed of preferred varieties in the market. Once their grain needs were established, the data fed into the demand for bean seed and seed requirements. During the study, data was collected from 117 off takers: 91 in Burundi, 12 from the Democratic Republic of Congo, 6 and 8 from Zambia and Zimbabwe respectively. Information was collected on the legal structure of business, workers employed, off taker

potential and volumes of bean traded, business support services, localities supplied, and challenges faced in trade.

5 | RESULTS

5.1 | PROFILING OF BEAN OFF TAKERS

5.1.1 | The nature of bean business

For this assessment, data was collected from different off takers representing bean buyers in the different countries. The average age (years in existence) of the off takers was 8.2, 11.3, 11.8, and 14.5 years in Burundi, DRC, Zambia, and Zimbabwe, respectively. This shows progressive bean business. In terms of legal structure, most of the off takers in southern Africa were registered as private limited companies while most in east Africa were either private nonregistered companies or sole proprietorships (Table 1). Several off takers in Zambia processed their beans, as processed grain or canned/precooked beans, before marketing as compared to those from Burundi, DRC, and Zimbabwe that mostly traded non processed bean grain. Processing is important value addition in creating bean seed demand as it facilitates targeted production of specific varieties.

Table 1: Form of ownership of off taker businesses and type of business operations

	Burundi (n=91)	DRC (n=12)	Zambia (n=6)	Zimbabwe (n=8)
Type of company	%	%	%	%
Private limited company	4.4	25.0	100.0	87.5
Private nonregistered company	49.5	50.0	0.0	0.0
Sole proprietorship	46.2	25.0	0.0	0.
Government/public entity	0.0	0.0	0.0	12.5
Form of bean business operations				
Non-processed grain trade	91.2	83.3	0.0	62.5
Processed grain trade	7.7	91.7	83.3	37.5
Processed grain (Canned/precooked)	0.0	8.3	66.7	25.0
Bean seed	1.1	0.0	0.0	0.0

Bean trade is a considered a source of employment along the bean value chain. First it creates employment opportunities and is a source of income for employees that work with bean traders/off takers and value chain supporters. Secondly, it is a form of employment for farmers who supply produce. Similarly, seed producers get business when farmers buy seed to produce grain. From the off-taker survey,

Zimbabwe and Zambia off takers had the largest number of employees ranging from 9 to 300 employees. They equally employed more youth (up to 100 youth for some off takers) Table 2.

Table 2: Employment opportunities offered by off takers

		Burundi (n=91)	DRC (n=12)	Zambia (n=6)	Zimbabwe (n=8)
Total No. of Employees	Mean	3.8	5.2	74.2	49.3
	Std. Dev.	6.5	3.8	112.7	64.6
	Min	1	2.0	9	12
	Max	40	15	300	200
Male Employees	Mean	2.6	1.6	31.7	22.6
	Std. Dev.	3.7	1.5	53.3	23.4
	Min	0.0	0	4	5
	Max	21.0	6	140	60
Female Employees	Mean	1.2	3.7	16.7	13.8
	Std. Dev.	3.8	3.1	23	14.8
	Min	0.0	1	0	4
	Max	30.0	13	60	40
Youth Employees	Mean	2.1	3.0	28.8	8.3
	Std. Dev.	3.7	4.1	37.6	11.8
	Min	0.0	0	3	0
	Max	21.0	15	100	35

Table 3 below shows the number of farmers that supplied the off taker. Bean off takers contracted an average of between 130 and 525 bean farmers to supply bean grain. Apart from Zambia where females constituted 38% of the farmers that supplied grain to the off taker, most of the farmers in DRC and Zimbabwe that supplied off takers were female with an even split in Burundi. Male youth were more (18 to 68% of grain suppliers) while female youth ranged between 9 to 31% of the farmers that supplied off takers.

Table 3: Number of farmers that supply off takers with grain

Variable		Burundi (n=91)	DRC (n=12)	Zambia (n=6)	Zimbabwe (n=8)
Farmers supplying	Mean	208.8	524.6	378.5	131.9
	Std. Dev.	342.8	1413.3	260.2	157.9
	Min	0.0	5.0	90.0	0.0
	Max	2000	5000	781.0	500
Percent of female	Mean	50.2	66.3	38.3	58.8

	Std. Dev.	24.1	21.3	11.4	80.6
	Min	0.0	20.0	30.0	0
	Max	100.0	100	60.0	100
Percent of female that are youth	Mean	29.9	30.8	25.3	9.4
	Std. Dev.	21.5	32.7	4.5	12.9
	Min	0.0	0.0	20.0	0.0
	Max	100.0	90.0	30.0	40.0
Percent of male that are youth	Mean	30.0	17.9	31.5	68.1
	Std. Dev.	19.4	16.4	7.2	76.8
	Min	0.0	0.0	22.0	0.0
	Max	80.0	60	42.0	100

5.1.2 | Grain sourcing and supply arrangements used by bean off takers

Only off takers in Zimbabwe used contracted farmers to supply bean grain. Off takers in Burundi, DRC, and Zambia relied on direct sourcing from random farmers that supplied grain. Companies that contracted farmers sourced 31.1%, 40%, 99%, and 58.3% of traded from contracted farmers in Burundi, DRC, Zambia, and Zimbabwe, respectively. All beans from contracted farmers were rated as premium in Zambia and DRC while 77.9% and 50% of off takers rated the beans sourced as premium in Burundi and Zimbabwe, respectively.

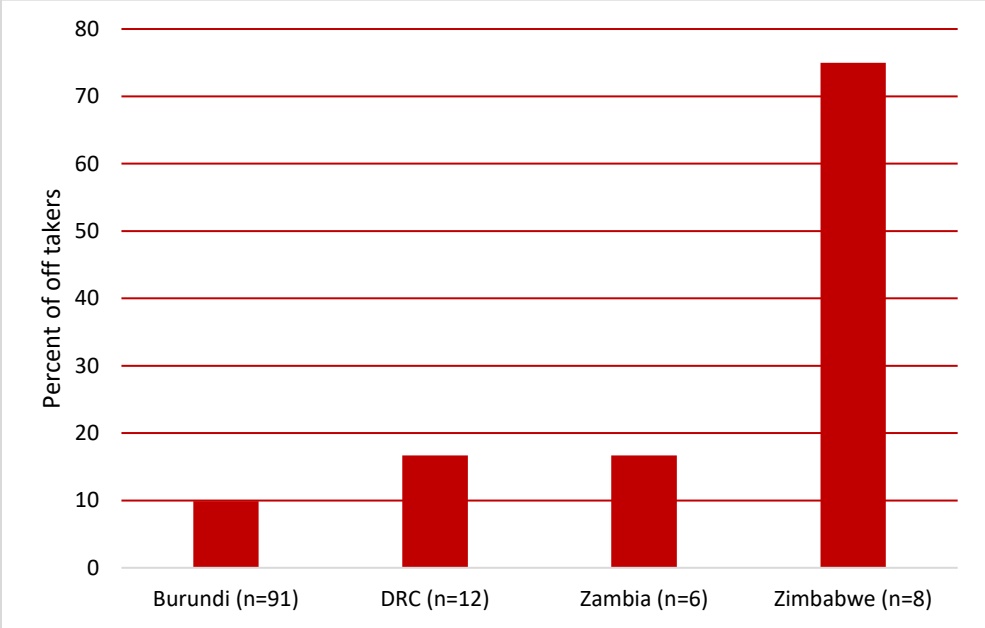


Figure 1: Proportion of off takers that sourced from contracted farmers

Traders that contracted farmers reported offering the following services. In Burundi the dominant facilitations were Fertilizer, Seed credit, farmer training, pre financing before repurchasing, and insecticides. In DRC, the support offered by off takers was seed credit, seed on cash, and aggregation. In Zambia, only one-off taker offered training, aggregation support, and seed on cash. For Zimbabwe, 6 of 8 sampled off takers offered contracted farmers support included fertilizer, seed credit, training, aggregation support, and seed on cash.

Since most traders sourced bean from non-contracted farmers, their perception on grain quality from these farmers were assessed using a three-point Likert scale (poor quality grain, grain of fair quality, and good quality grain). Most of the grain sourced from non-contracted farmers in Burundi and Zimbabwe was rated as having good quality while that in DRC and Zambia was rated by off takers as having fair quality. This finding has implications on the development of strategies for farmer engagement when seeking to meet grain requirements of off takers. Since several off takers indicated that the cost (side selling, monitoring production, aggregation, and enforcing defaults) of contracting farmers was high, random sourcing is a winning strategy if farmers in production hubs received quality seed of targeted varieties and capacity building on how to produce and handle beans post-harvest. The big question is about this approach is who meets the cost of these interventions because farmers supply grain to random grain buyer that offers a favorable price and or sources grain first.

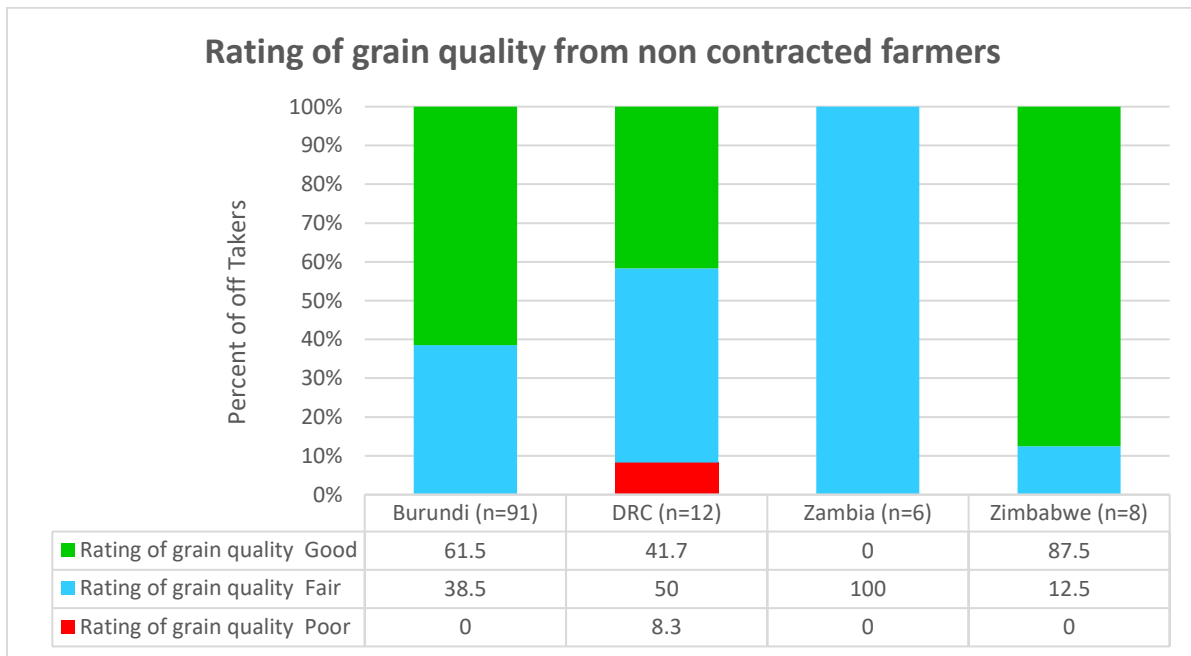


Figure 2: Quality rating of grain sourced from non-contracted farmers

5.2 | OFF-TAKER LINKAGES WITH OTHER SUPPORT SERVICES

Bean off-takers are not isolated. They seek support of other service providers for their businesses to function efficiently. Here the study documents the type of actors that support bean grain off takers. In Burundi, the study found that the dominant supporters to off takers were private aggregators. They sourced the grain from farmers for the off takers. However, about 38.5% of the off takers in Burundi reported not working with any other actor along the bean value chain (Figure 3). The Democratic Republic of Congo had three main actors: Seed suppliers, private aggregators, NGOs/CBOS; supporting off takers directly. Linking directly with seed suppliers is important in guaranteeing grain quality through use of quality seed. Zimbabwe had a mix of actors supporting extension agents as shown in Figure 3. Linking directly to seed suppliers has implications to seed trade and variety uptake. It creates direct business to seed producers for specific traded varieties, once the preferred varieties are of the improved type, it improves variety turnover.

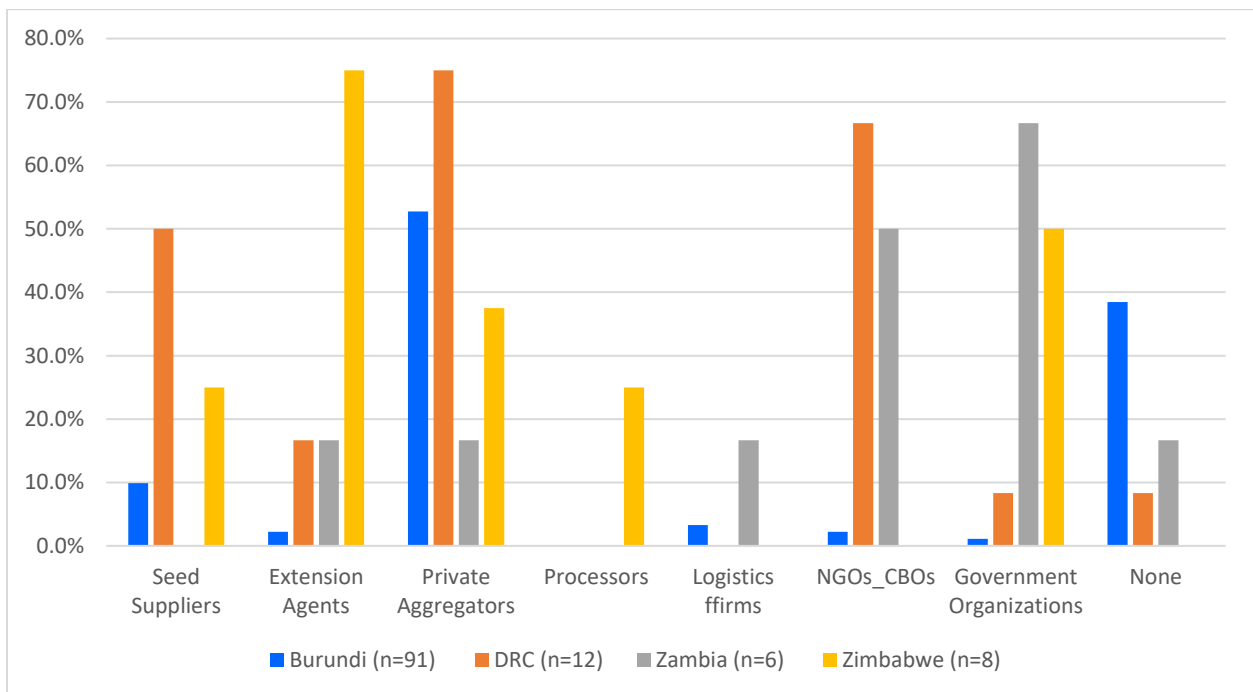


Figure 3: Actors that support operations of off takers

The analysis of grain buyers from off takers shows variations in types of buyers by country (Figure 4). Generally, the main buyers of grain were individual consumers. Bean off takers in DRC have the largest

diversity of buyers including individual buyers, hotels/food points, humanitarian agencies, and Non-Governmental Organizations. For Zimbabwe, the main grain buyers were processors and individual consumers while in Zambia, the proportion of processor and individual buyers was equal. Having mostly private bean buyers as opposed to humanitarian agencies and NGO buyers is key for the sustainability of the grain off taking business. This is true because private buyers have consistent demand and their demand for grain is responsive to market forces. The others category in Burundi includes retail traders, farmers, and farmer cooperatives while in Zimbabwe it includes wholesalers, retailers, and other off takers.

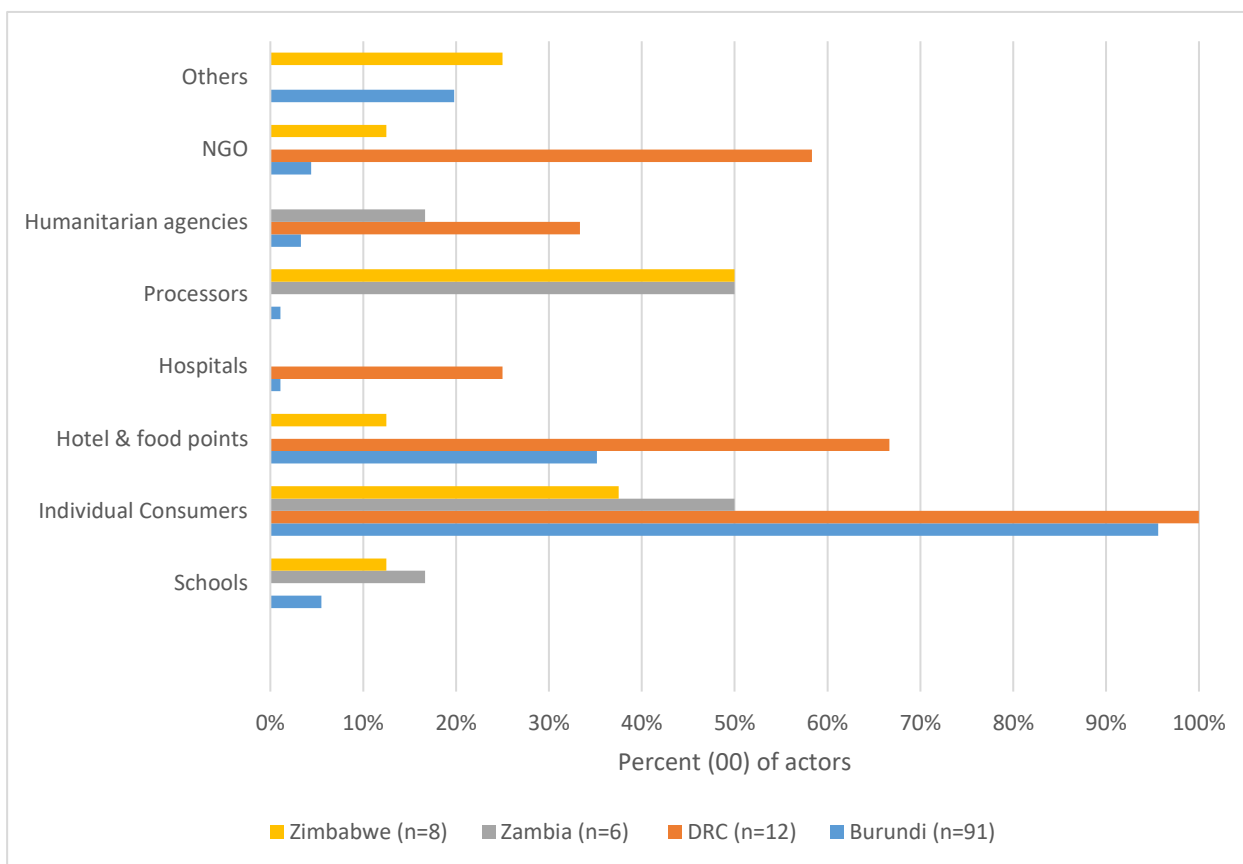


Figure 4: Buyers of grains from off takers

5.3 | TRADING CAPACITY AND VARIETIES HANDLED OF BEAN OFF-TAKERS

5.3.1 | Bean supply destinations

DRC had the largest percentage of exporting off takers (58.3%) compared to Burundi (2.2%) Figure 5. The main export destination for DRC was Burundi, Rwanda, and Uganda while that of Zambia was Botswana, Namibia, South Africa and Angola and Zimbabwe mostly exported to Zambia and Malawi. The sole exporter from Burundi reported selling to Tanzania. Off takers on average supplied two bean varieties while some supplied up to six bean varieties. Off-takers also supplied beans locally with most supply an average of two districts and a maximum of 4 to 11 districts. Off-takers in Zambia supplied for districts locally (Table 4).

Table 4: Bean variety supply and location information

Variable	Burundi	DRC	Zambia	Zimbabwe
	Mean (SD) Min[Max]	Mean (SD) Min[Max]	Mean (SD) Min[Max]	Mean (SD) Min[Max]
Number of bean varieties supplied	2.5 (1.1) 1 [6]	2.4 (0.5) 2 [3]	2.2 (1) 1 [3]	1.6 (0.50) 1 [2]
Number of districts supplying grain	2.2 (13) 1 [5]	2.2 (0.6) 1 [3]	3.8 (3.1) 1 [10]	2.9 (1.9) 1 [6]
Number of districts supplied with grain	2.2 (1.4) 1 [7]	2.3 (0.8) 1 [4]	4.2 (4.90) 1 [11]	1.6 (2.2) 1 [7]

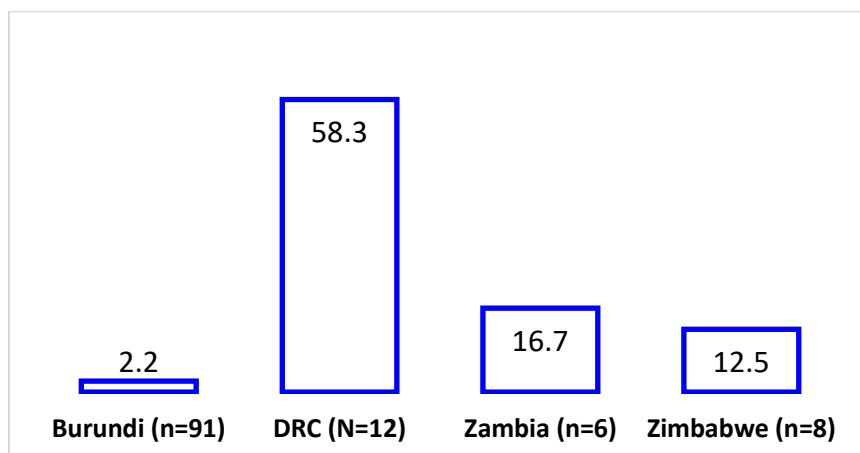


Figure 5: Proportion of off takers that exported grain

5.3.2 | Varieties supplied, volumes, market shares and trade value.

Burundi has a diverse portfolio (28) of bean variety traded in the market. However, five varieties: *Rufutamadene* (Sugar), *Kinure* (Red Kidney), *Mukungugu* (Khaki), *Ruhengeri*, and *Muhoro* (sugar) account for 77% of bean trade. Interestingly, 4 out of 5 of the most popular varieties are improved and the average age of these varieties is 9.25 years. Specifically, *Rufutamadene* is eight years, while *Mukungugu* is 15 years, *Kinure* is six years, and *Muhoro* is eight years. This shows significant adoption of newly released high yielding, disease and pest tolerant bean varieties in Burundi.

Overall, a supply gap to cover the potential of off takers was found to 2074 Metric tons, mostly of *Rudutamadene*, *Mukungugu*, *Kinure*, *Ruhengeri*, *Amatsimbatara*, *Musore*, and KAT B1. Compared to the

countries average 3-year local production (2019-2021), of 579,819 tons (FAOSTAT, 2023), the sampled off takers handle about 0.37% of the beans traded in Burundi. This is quite dismal and continuous evaluations will be required to identify and map other off takers and pathways through which beans get to the consumers in Burundi.

Table 5: Trading capacity and volumes traded by sampled off takers in Burundi (n=87)

Variety	Average off taking (Tons)		Total off taking (Tons)			
	Off taking potential (tons)	Volume off taken (tons)	Off taking potential (tons)	Volume off taken (tons)	Share by volume	Value of trade (\$ Million)
<i>Rufutamadeni</i>	15.59	9.75	841.68	526.24	24.78	0.394
<i>Kinure</i>	14.36	8.67	718.13	433.30	20.41	0.298
<i>Mukungugu</i>	46.91	11.89	1501.07	380.36	17.91	0.275
<i>Ruhengeri</i>	5.91	16.29	47.25	130.30	6.14	0.092
<i>Muhoro</i>	12.32	6.56	234.05	124.70	5.87	0.082
<i>Ruvuzo</i>	6.42	27.75	19.25	83.24	3.92	0.059
<i>Musore</i>	11.99	7.44	107.90	67.00	3.16	0.045
<i>Amatsimbatara</i>	41.00	31.50	82.00	63.00	2.97	0.041
<i>KATB1</i>	36.00	15.03	144.00	60.10	2.83	0.048
<i>Rusenyanzego</i>	100.00	60.00	100.00	60.00	2.83	0.040
<i>MOORE88002</i>	6.35	4.12	82.55	53.50	2.52	0.040
<i>IZO201543</i>	17.50	16.50	35.00	33.00	1.55	0.018
<i>Amasosera</i>	20.00	12.80	40.00	25.60	1.21	0.023
<i>Kaneza</i>	15.17	8.43	45.50	25.30	1.19	0.018
<i>Amakaki</i>	22.13	3.55	88.50	14.20	0.67	0.009
<i>Jaune</i>	11.63	4.05	34.90	12.14	0.57	0.011
<i>Moore88013</i>	20.00	8.00	20.00	8.00	0.38	0.005
<i>Musengo</i>	3.75	3.65	7.50	7.30	0.34	0.005
<i>Inaruhengeri</i>	11.00	3.00	22.00	6.00	0.28	0.004
<i>Khaki</i>	5.00	2.50	5.00	2.50	0.12	0.002
<i>MAC44</i>	4.00	2.00	4.00	2.00	0.09	0.001
<i>Amanyurane</i>	5.00	1.00	5.00	1.00	0.05	0.001
<i>Bitobito</i>	0.78	0.50	1.55	1.00	0.05	0.001
<i>Magorori</i>	2.00	1.00	2.00	1.00	0.05	0.001
<i>RWV1272</i>	6.00	1.00	6.00	1.00	0.05	0.001
<i>G13607</i>	1.00	0.80	1.00	0.80	0.04	0.000
<i>Musirimu</i>	0.60	0.60	0.60	0.60	0.03	0.000
<i>Faux jaune</i>	1.00	0.20	1.00	0.20	0.01	0.000
Total Capacity			4197.4	2123.4		1.51
Gap in Supply				2074		1.42

Note: 1 USD = 2096 Burundian franc

When matched with seed supply (from a separate seed producers survey within each country but linked to off-takers), seed producers supply seed that closely matches the varieties supplied by off takers were found (Figure 6 and Appendix A, Table 9A)

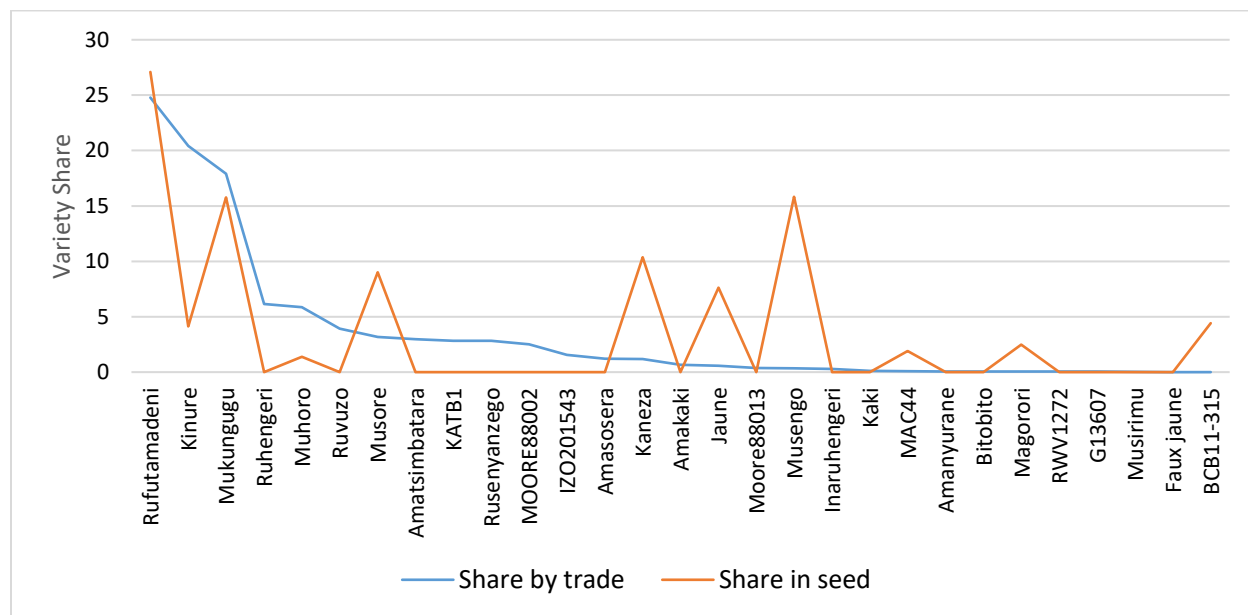


Figure 6: Variety share in Trade verse share in seed sold for Burundi

The most dominant varieties traded by off takers in DRC were Pigeon Vert (Yellow) and *Kablangeti* (Purple) accounting for 68.8% of all the beans traded (Table 6). The average age of the most popular variety (Pigeon Vert) is 31 years, while *Kablangeti* is 18 years. This calls for popularization of the most recent releases of similar varieties since they are more superior and could increase yields and thus outputs available for the market.

Overall, a supply gap to cover the potential of off takers was 129 Metric tons, mostly of Pigeon Vert, Make Mwema and Ma rouge. Compared to the countries local production of 261,348 tons (FAOSTAT, 2023), the sampled off takers handle about 0.9% of the beans traded in DRC. This is quite dismal as evaluations will continue to identify and map other off takers and pathways through which beans get to the consumers in DRC.

Table 6: Trading capacity and volumes traded by sampled off takers in DRC (n=12)

Variety	Average off taking (Tons)		Totals off taken (Tons)			
	Off taking potential (tons)	Volume off taken (tons)	Off taking potential (tons)	Volume off taken (tons)	Share of variety by volume	Value of trade (\$ Million)
Pigeon Vert	463.33	413.33	1235.00	1085.00	48.09	1.32
Kablangeti	50.56	51.89	455.00	467.00	20.70	0.57
Commando	250	250	250	250	11.08	0.31
Make Mwema	74.00	75.40	205.00	212.00	9.40	0.27
Ka rougé	200.00	200.00	200.00	200.00	8.87	0.27
Mellange/Mixed Beans	20.00	20.00	20.00	20.00	0.89	0.02
Ma rouge	5.00	6.00	10.00	12.00	0.53	0.02
M'Sole	5.00	5.00	5.00	5.00	0.22	0.01
Namaji	5.00	5.00	5.00	5.00	0.22	0.01
Total Capacity			2385	2,256		2.8
Gap in Supply				129		0.15

Note: 1 USD = 2046 Congolese franc

For DRC, two varieties *Make Mwema* and *Kablanketi* have seed supplied by seed producers. There seems to be a mismatch between the varieties supplied by seed producers and those handled by bean off-takers for other bean types. Seed producers produced newer varieties compared to what off takers are selling, there is thus a need to revise and match these variety portfolios by engaging off-takers more or breeding for the traits preferred by off-takers (Figure 7 and Appendix A, Table 10A).

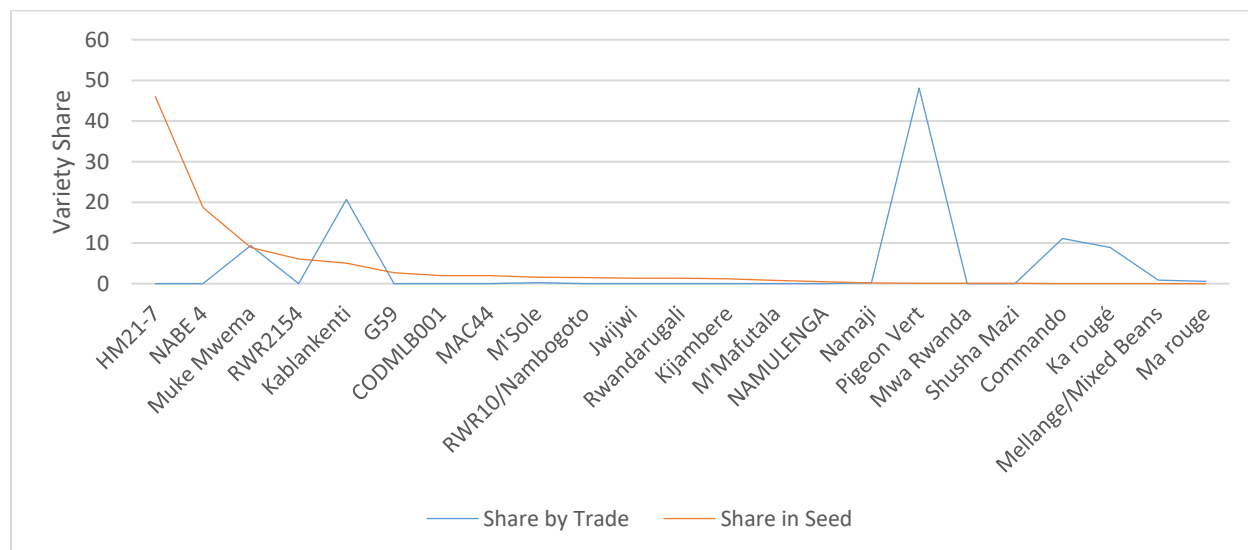


Figure 7: Variety share in trade versus share in seed sold in DRC

Table 7: Trading capacity and volumes traded by sampled off takers in Zambia (n=6)

Variety	Average off taking (Tons)		Total off taken (Tons)			
	Off taking potential (tons)	Volume off taken (tons)	Off taking potential (tons)	Volume off taken (tons)	Share of variety by volume	Value of trade (\$ Million)
Lungwebungu	2500	2300	2500	2300	63.12	2.50
White and Yellow	1000	500	1000	500	13.72	0.34
Mbereshi	217.5	94.5	870	378	10.37	0.31
Lwangeneni	250	200	250	200	5.49	0.11
White	92	55	184	110	3.02	0.10
Kabulangeti	300	79	300	79	2.17	0.05
Solwezi	70	50	70	50	1.37	0.04
Lusaka White	20	15	20	15	0.41	0.01
Lundazi	20	12	20	12	0.33	0.01
Total Capacity			5214	3644		3.48
Gap in Supply				1,570		1.23

Note: 1 USD = 18.385 Zambian Kwacha

In Zambia, the most popular variety is *Lungwebungu* accounting for 63.12% of what is traded on the market. The other popular variety is *Mbereshi*, the whites and yellows. *Lungwebungu* (Sugar type) was released in 2014 while *Mbereshi* (Red mottled) was released in 2012. The most popular white (*Lwangeneni*) was released in 2009 and the only released yellow bean (*Chambeshi*) was released 25 years ago. For Zambia, the varieties for which seed is producers closely match those sold by off-takers (Figure 8 and Appendix A, Table 11A).

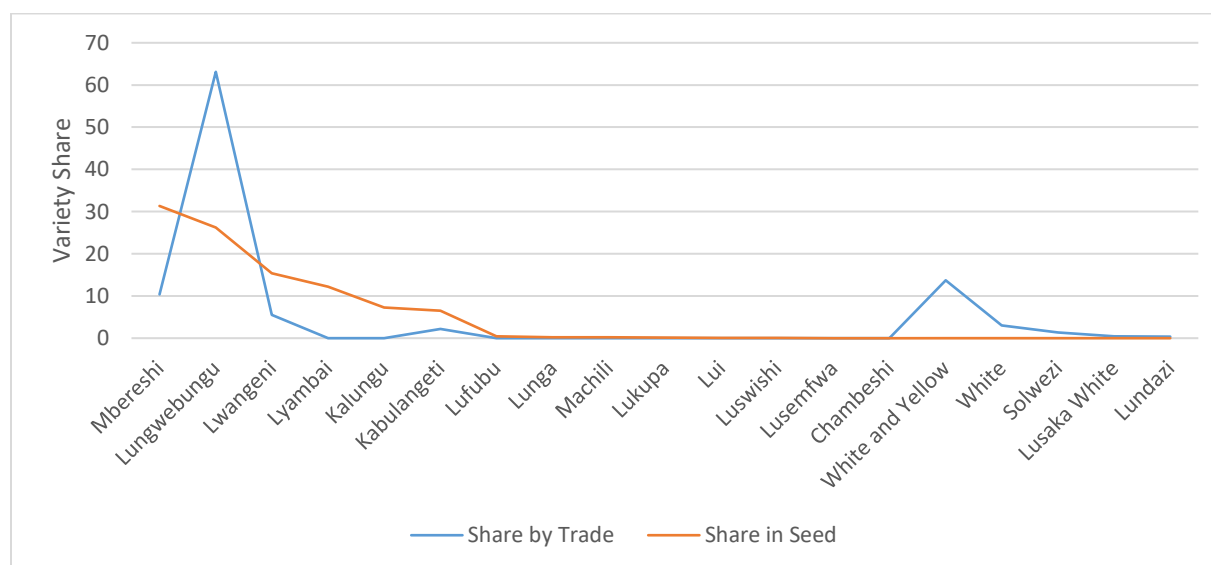


Figure 8: Variety share in trade versus share in seed sold in Zambia

This is an opportunity for seed producers to produce and sell more seed of similar varieties and create seed business around them. Supply gap of about 1,570 MTs, mostly of *Lungwebungu*, *Mbereshi*, White and Yellow, required to meet off taker needs were identified. Compared to average local production for 2019 to 2022 of 50,756 tons (FAOSTAT, 2023), the off takers sampled handled 7.2% of the beans produced locally. Evaluations will continue to identify off takers or pathways through which other beans produced reach the market.

Table 8: Trading capacity and volumes traded by sampled off takers in Zimbabwe (n=8)

Variety	Average off taking (Tons)		Total off taken (Tons)		Share of variety by volume	Value of trade (\$ Million)
	Off taking potential (tons)	Volume off taken (tons)	Off taking potential (tons)	Volume off taken (tons)		
Sweet William	2000	2000	2000	2000	45.96	2.20
Protea	4500	1400	4500	1400	32.17	1.60
Gloria	500	500	500	500	11.49	0.55
Sugar beans	113	93	340	280	6.43	0.30
Light speckled	70	90	70	90	2.07	0.09
NUA45	125	30	235	45	1.03	0.05
Valley seeds variety	200	24	200	24	0.55	0.03
Butterbeans	100	10	100	10	0.23	0.01
Cherry	2	3	2	3	0.07	0.00
Total Capacity			7947	4352		4.83
Gap in Supply				3595		4.12

The most popular varieties traded by the off taker surveyed in Zimbabwe were Sweet William (Sugar) released in 2016, Protea (white small) released in 2018 and Gloria (Sugar) released in 2010. Thus, the average age of the most popular varieties was eight years. The three varieties accounted for 90% of off-taker trade. Sweet William, a sugar bean is moderately to terminal drought tolerant variety with yield potential of 3.3 tons/ha. Generally, sugar bean are highly preferred in Southern Africa. Protea was bred specifically for the canning industry and is high yielding (4 tons/ha). Because of its canning quality, it is gaining economic importance in the country and among off-takers.

A supply gap of 3,595 tons (about US\$ 4.12 million) mostly of Protea, NUA 45, and other sugar beans was identified. This presents an opportunity for bean seed producers to provide the required seed and for farmers to produce grain. Seed was often cited as the main hindrance to grain production in Zimbabwe. There was a mismatch between the varieties of beans handled by off-takers and what seed producers are

offering on the market. For example, in 2022, a lot of NUA 45 seed was produced yet sweet William was the most preferred variety that year. Similarly, there was dismal production of Protea. To match shortages in grain, bean off-takers in Zimbabwe often resorted to importing grain for example the white canning bean from Ethiopia. Compared to average local production for 2019 to 2022 of 14,823 tons (FAOSTAT, 2023), the off takers sampled were handling 29.4% of total bean production in Zimbabwe. These are significant volumes compared to the industries share.

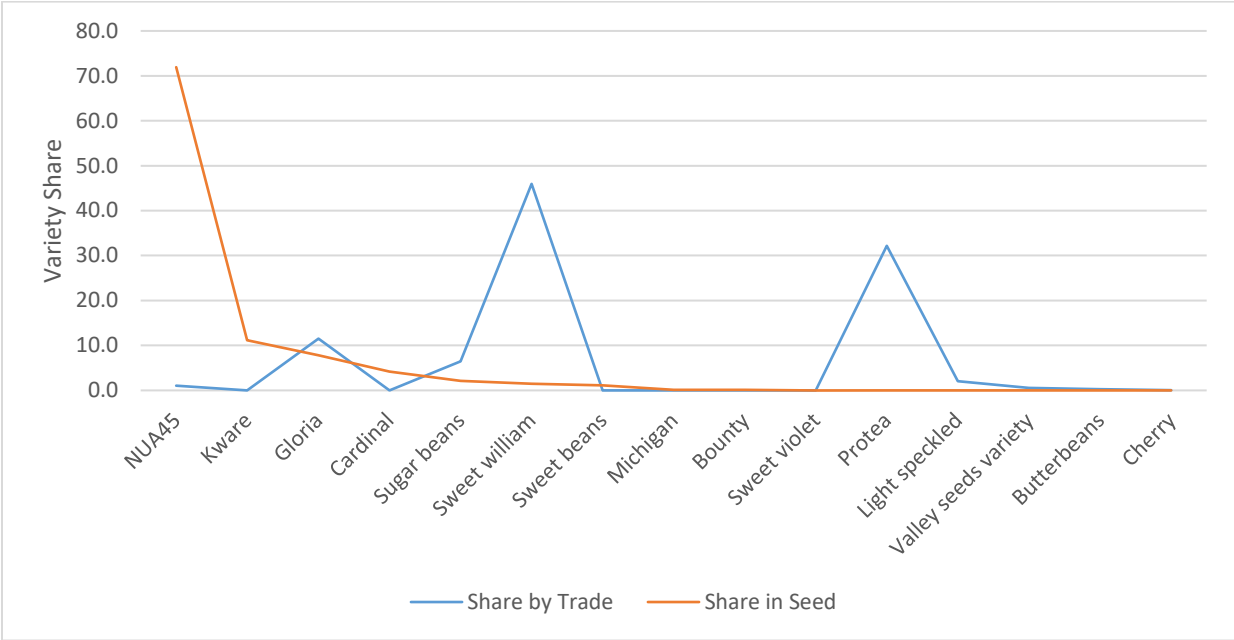


Figure 9: Variety share in trade versus share in seed sold in Zimbabwe

5.4 CHALLENGES FACED BY BEAN OFF TAKERS

Challenges faced by bean off takers in Burundi

The most dominant challenge cited by off takers in Burundi was price fluctuation which affected the bean marketing. Without stable prices, predicting purchase prices and marketing margins for beans was a challenge. The other was low investments due to a shortage of funds to invest in bean trade, yet credit was limited and the interest rates on loans were high. Off takers further cited limited volumes available for trade due to climate change related effects and the low production capacity of bean farmers. The scattered nature of bean suppliers increased the transaction cost of sourcing bean grain and the distance that the off takers had to travel. Also, beans were noted to be susceptible to pest attack which shortened the shelf life.

Challenges faced by bean off takers in DRC

Currency fluctuations especially exchange rates fluctuations and unfavorable rates were quoted as the main challenge by bean traders. This was because exchange rate changes and use of different currencies affected price predictions leading to losses. The second most important challenge was poor road infrastructure. This affected the transportation of beans and increased costs of doing business thus impacting the final price of beans. The other important challenge was insecurity along transport routes and in some markets which limited market accessibility. Off takers also cited high tax rates and illegal taxes as a predominant challenge in bean trade. All those challenges notwithstanding, the other major challenges were the shelf life for beans, limited or poor farmer organization, and supply of poor-quality beans, limited credit facilities, weak traders' associations, high communication costs and limited market information.

Challenges faced by bean off takers in Zambia

For Zambia, four major challenges were cited. (i) low quality of grain supplied by bean farmers, (ii) limited information on sources of certified bean seed, (iii) inadequate access to finance, and (iv) inadequate capital to invest on bean trade.

Challenges faced by bean off takers in Zimbabwe

Some of the predominant challenges faced by off takers in Zimbabwe were poor quality and inconsistent supply of bean grain coupled with low volumes supplied, regular defaults by contracted bean farmers, price instability due to constant fluctuation of Zimbabwean dollar and use of dual currency. Off takers also cited shortages of bean seed to meet production requirements of certain bean varieties which forces them to import grain to bridge shortages. Other challenges were limited and expensive financing to meet investment requirements of off takers, high competition for bean grain on the market and weak linkages between farmers and traders and between farmers.

6. CONCLUSIONS

Off takers have the potential of moving significant volumes of targeted and niche market bean varieties. From the study, they trade large in improved bean varieties though some varieties are too old. Results

show that the off takers in Zimbabwe were the oldest (about 15-year-old) and handled about 30% the total countries production. Off takers in Zambia handle about 7% of production while those from Burundi handle the least (about 0.4%) of total production. Where the volumes handled are dismal, there is need for continuous evaluations to identify and map other off takers and pathways through which beans get to the consumers. This is important if significant demand is to be created for the seed of traded varieties. Bean trades engaged other actors (seed producers, extension agents, private aggregators, government, non-governmental organizations and community-based organizations) which is important in value chain development and governance. There is a mismatch in seed and grain trade in several countries. It was possible to find a less traded variety with large volumes of seed produced or less seed for a more traded variety. As market for seed is being created, it is important to take such mismatches into account.

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Appendix A

Volumes of seed sold by off takers within similar geographies or linked to off takers

Table 9A: Bean varieties and volumes of seed sold in Burundi

	Total Sold (Tons)	Value (Million USD)	Average Price/Kg	Share	Variety Age*
Rufutamadeni	22.74	0.023	1.02	27.09	7
Musengo	13.3	0.012	0.92	15.84	14
Mukungugu	13.25	0.013	1.00	15.78	14
Kaneza	8.7	0.009	1.00	10.36	14
Musore	7.56	0.007	0.88	9.01	11
Jaune	6.4	0.009	1.34	7.62	7
BCB11-315	3.7	0.003	0.83	4.41	5
Kinure	3.48	0.003	0.86	4.14	4
Magorori	2.07	0.002	1.19	2.47	7
MAC44	1.6	0.002	0.95	1.91	7
Muhoro	1.15	0.001	0.95	1.37	7
Total/Average	83.95	0.084	0.995		8.8

*Reference year is 2022, n/a means not identified/ Unknown

Table 10A: Bean varieties and volumes of seed sold in DRC

	Total Sold (Tons)	Sold Value (Million USD)	Average Price/KG	Share	Variety Age*
HM21-7	68.68	0.112	1.63	45.99	
NABE 4	28.00	0.049	1.76	18.75	
Muke Mwema	13.30	0.016	1.19	8.91	
RWR2154	9.00	0.015	1.61	6.03	
Kablankenti	7.50	0.011	1.47	5.02	
G59	4.00	0.008	1.96	2.68	
CODMLB001	3.00	0.005	1.71	2.01	
MAC44	2.90	0.005	1.61	1.94	
M'Sole	2.40	0.003	1.44	1.61	
RWR10/Nambogoto	2.25	0.003	1.27	1.51	
Jwijwi	2.00	0.003	1.71	1.34	

Rwandarugali	2.00	0.002	1.12	1.34
Kijambere	1.80	0.003	1.39	1.21
M'Mafutala	1.20	0.001	1.22	0.80
NAMULENGA	0.70	0.001	1.96	0.47
Namaji	0.28	0.000	1.47	0.19
Pigeon Vert	0.13	0.000	1.96	0.08
Mwa Rwanda	0.10	0.000	1.56	0.07
Shusha Mazi	0.10	0.000	1.56	0.07
Total/Average	149.3	0.237	1.56	

*Reference year is 2022, n/a means not identified/ Unknown

Table 11A: Bean varieties and volumes of seed sold in Zambia

	Total Sold (Tons)	Value (Million USD)	Average Price/KG	Share	Variety Age *
Mbereshi	226.00	0.34	1.52	31.33	10
Lungwebungu	189.14	0.24	1.27	26.22	8
Lwangenzi	110.92	0.18	1.61	15.37	13
Lyambai	87.90	0.12	1.38	12.18	23
Kalungu	52.20	0.08	1.56	7.24	18
Kabulangeti	47.10	0.07	1.54	6.53	15
Lufubu	2.96	0.00	1.31	0.41	3
Lunga	1.63	0.00	1.31	0.23	8
Machili	1.60	0.00	1.31	0.22	3
Lukupa	0.97	0.00	1.02	0.13	23
Lui	0.70	0.00	1.45	0.10	3
Luswishi	0.19	0.00	1.02	0.03	3
Lusemfwa	0.09	0.00	1.02	0.01	3
Chambeshi	0.07	0.00	1.02	0.01	24
Total/Average	721.5	1.03	1.31		11.2

*Reference year is 2022, n/a means not identified/ Unknown

Table 12A: Bean varieties and volumes of seed sold in Zimbabwe

	Total Sold (Tons)	Value (Million USD)	Average Price/KG	Share	Variety Age*
NUA45	98.89	0.190	1.93	71.93	12
Kware	15.3	0.013	0.87	11.13	na
Gloria	10.72	0.013	1.20	7.79	12
Cardinal	5.75	0.006	1.12	4.18	15
Sugar beans	2.9	0.002	0.65	2.11	na
Sweet William	2.05	0.006	3.	1.49	6
Sweet beans	1.5	0.002	1.0	1.09	na

Michigan	0.2	0.0001	0.5	0.15	na
Bounty	0.17	0.0003	1.8	0.13	20
Sweet violet	0.01	0.00002	4.0	0.003	9
Total/Average	137.5	0.232	1.61		12.3

*Reference year is 2022, n/a means not identified/ Unknown

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