Annual Project Result Report

Project Title: Improving Bean Production and Marketing in Africa (IBPMA)

Project Number: P000734

Country/Region: Africa (PABRA Countries)

Name of the Implementer: The Alliance of Bioversity International and the International Center for Tropical Agriculture (CIAT) and the Pan-Africa Bean Research Alliance (PABRA)

Reporting Period: April 2020- March 2021

Date of Report: 12th April 2021

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Total Project Budget: CAD 11 million

Project start and end date: Dec 2016 – September 2022

Alliance

Bioversity International

CIAT International Center for Tropical Agriculture Since 1967 Science to cultivate change

Canada

PABRA Pan-Africa Bean Research Alliance Better Beans for Africa

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List of Acronyms

$	Dollar sign
CAD	Canadian dollar
CAMCOCA	Cameroon, Congo Brazzaville, Central African Republic Corridor
CCFL	Community Complementary Feeding Learning Approach
CGIAR	Consortium of International Agricultural Research Centers
CIS4B	Climate Information Service for Beans
DLB	Demand Led Breeding
DRC	Democratic Republic of Congo
EAREM	East Africa Red Mottled Corridor
EiB	Excellence in Breeding
FinTech	Financial Technology
FOB	Free On Board
GAC	Global Affairs Canada
GDP	Gross Domestic Product
GENDER Platform	Generating Evidence and New Directions for Equitable Results Platform
GREAT	Gender-Responsive Researchers Equipped for Agricultural Transformation
HIBs	High Iron beans
ICM	Integrated Crop Management
ICT	Information Communication Technology
MFN	MasterCard Farmer Network
MT	Metric Ton
NARS	National Agricultural Research Systems
PABRA	Pan-African Bean Research Alliance
PMF	Performance Measurement Framework
SMEs	Small and Medium Enterprises
SEMAGUI	Senegal, Mali, Guinea-Bissau Corridor
TAZAMA	Tanzania, Zambia, Malawi Corridor
TOGHABU	Togo-Ghana-Burkina Faso corridor
US$	United States Dollars
YEBECO	Yellow Bean Corridor

Introduction

The IBPMA project is being implemented across 31 PABRA member countries with the goal of: "**Reducing poverty among smallholder farmers, especially women, in sub-Saharan Africa by reducing food insecurity, increasing incomes and strengthening climate-smart agriculture".** The project has facilitated the deployment of the Commodity Corridor principles across 31 bean growing countries, with emphasis given to 23 countries that make up nine corridors: East Africa Red Mottled (EAREM), Yellow Bean (YEBECO), Red Bean, White Pea Bean, Large White, Tanzania, Zambia, Malawi Corridor (TAZAMA), TOGHABU, SEMAGUI and CAMCOCA. Bean corridors follow major bean trade flows from areas of production to consumption zones, connected by distribution networks. The focus on bean corridors and related research aims to increase efficiency in the flow of bean-based products, by intensifying efforts at production, distribution and consumption hubs to address bottlenecks, ultimately achieving the above stated project goal. At inception, the project mapped nine major bean intensification corridors that are informed by production and trade of the major bean market types and related business services. These corridors are now the project nodes of investment in production, distribution and consumption hubs.

This report outlines four years of progress towards the ultimate, intermediate and immediate outcomes of the project in various bean corridors of the eastern, central, southern and western Africa regions. The project is in its fifth year and has made significant progress towards achieving set targets. It has also introduced fundamental innovations and transformation in the corridors, highlighted below:

- The number of Small and Medium Enterprises (SMEs) have increased fourfold since project inception in 2017, without leaving women behind: SMEs led by women have grown from 7.7% in 2017 to 21.8% in 2020.
- There has been exponential growth in the use of the Information and Communication Technology (ICT) platforms, particularly the use of WhatsApp groups for knowledge exchange and information across bean corridors. This growth is also attributed to the onset of the COVID 19 pandemic in 2020 and consequent containment measures that have restricted movement. Virtual tools have facilitated continued partner interactions with farmers thus sustaining information exchanges on bean production. This is expected to continue into 2021.
- Since the project inception, 207,520 men and 117,382 women have accessed market and advisory services.
- Access to and consumption of High Iron Beans (HIBs) in Burundi, Malawi, Uganda, and Zimbabwe has increased from 6,809,463 people (7.9%) in 2019, to 9,300,916 (10.15%) in 2020.
- Consumption of processed bean-based products has also remarkably improved during the last year, increasing from 1.2% (907,784) people in 2019, to 1.9% of population, around 4 million, in 2020 across seven countries.
- The school feeding approach for scaling up access to HIBs introduced in Tanzania in 2018 has grown. School feeding activities grew from 23 schools in five districts, reaching 15,830 school children, to 285 schools in 20 districts, reaching 196,156 school children by 2020.
- Innovations promoted in 2020 to enhance farmer resilience to the impacts of climate change are diffusing fast. For example, the Climate Information Service for Beans (CIS4B) is now used by 12,032 farmers to decide which bean variety to plant based on length of season and predicted total seasonal rainfall. The information on weather and climate is also disseminate through radio programs, with an audience of 1.78 million listeners daily.

- PABRA released the first ever Tepary bean in Botswana. The Tepary bean is superior to common bean in terms of heat tolerance. The release of this bean will be promoted in heat-prone areas of eastern, western and southern Africa, to improve resilience of bean farmers.

1. Outcomes Achieved – progress on or towards the expected outcomes

Ultimate outcome: Reduced poverty amongst smallholder farmers, especially women, by reducing food insecurity, increasing incomes and strengthening smart climate agriculture

Analysis of progress towards poverty reduction and food security: Ethiopia and Uganda case study
Cumulative Progress since project inception to date towards poverty reduction and food security

In 2020, a lot happened in Ethiopia and Uganda that disrupted project progress towards reducing poverty. The two countries experienced desert locust invasions; recurrent climatic shocks such as flooding and drought, combined with the socioeconomic impact of COVID-19. Ethiopia also experience political conflict. These natural and man-made calamities displaced a significant number of people from their homes and disrupted farming activities.

For example, in Ethiopia, an additional one million people were internally displaced. The desert locust infestation damaged about 365,015 hectares of cropland across multiple regions of the country, devastating crops and livelihoods in at least 76 woredas, mainly in non-bean growing areas of Ethiopia[i]. Real per capita GDP growth declined from the average of 6.3% experienced in the last three years of the project, to -0.1% per annum (estimate from World Bank, 2021)[ii]. As a result, the number of people living below the poverty line in 2020 increased from 26 million people in 2019 to 31 million in 2020. The value of bean export revenues also dropped, from US$160 million in earnings, using a Free On Board price of US$525 per ton in 2019, to US$101.3 million. The drop in bean export revenues is due to slow business turnover as traders adjusted to border closures, lockdown measures in importing countries, and hikes in transportation costs in the context of COVID-19 standard operating procedures. Production shocks also reduced volumes available for export[iii].

Similar trends also occurred in Uganda, where an unknown number of homes were submerged due to flooding. There was a decline in real per capita GDP growth (-0.1% per annum) from the average of 2.2% experienced in the last three years of the project (estimate from World Bank Data). Private consumption demand declined from a growth rate of 6.3% to 2.7 % in 2020 (estimate from World Bank, 2021). Despite these natural calamities, beans in Uganda maintained a significant role in the livelihoods of producers, as government purchased in bulk for food aid during the lockdown, causing bean prices to shoot up.

In Zimbabwe, farmer linkages to profitable markets, capacity building in bean value addition and access to resilient high-yielding technologies, is contributing to transformative change, increasing food security and reducing poverty. A follow-up study conducted in 2020 on selected farmer organizations, revealed that because of these interventions, families that participated in the project interventions have increased their bean revenues. One farmer organisation that is into bean grain production made a profit of 98.53 USD after harvesting 136.67 kg from an average investment of 38.13 USD variable costs in 2018/19 season. In the following season (2019/20), the average profit increased to 547.6 USD following average sales of 1000kg of beans upon investing 452.40 USD.

Intermediate outcome 1: Increased income of smallholder farmers, many of whom are women, and the rural poor involved in the bean trade

Under this intermediate outcome, the project set to measure two indicators: 1) Change in volume of dry beans traded; and 2) Level of satisfaction among men, women and youths benefiting from the bean trade.

Cumulative progress on intermediate outcome 1 from project inception to date

Change in volume of dry bean traded: Increases in traded volumes signify a likely increase in incomes from the bean trade. During the last four years of the project, bean volumes traded have shown an upward trend, increasing from 1.9 million tons in 2017 to 5 million tons in 2020. This growth represents an increment of about 3.127 million tons between 2017 and 2020. Total volumes traded have been aggregated across 16 countries in the major bean corridors of EAREM, White Pea Bean corridor (Ethiopia), TAZAMA, CAMCOCA, and country specific corridors such as Madagascar.

Ethiopia (White Pea Bean), Tanzania and Uganda (EAREM) and Tanzania (YEBECO) continue to be the major production hubs for the increased regional and international trade, supplying major consumption hubs in Europe, the Middle East, Kenya, South Africa, and South Sudan among other destinations.

Progress made in the last four years has surpassed the project target of 3 million tons by about 2.027 million tons. This is because of farmer links to profitable markets and the growth in bean productivity, as the area allocated to improved technologies has grown (Katungi et al., 2020a[iv]; Katungi at al., 2020b[v]; Habte et al., forthcoming).

In 2020/2021, about 1.28 million tons of bean grain were traded from seven bean corridors, namely: EAREM (732,892); TAZAMA (102,959); YEBECO (64,664); White Pea Bean (145,664); Large White (18,900); CAMCOCA (62,581), and TOGHABU (400). This represents a 61% achievement against the annual target. The shortfall in bean volumes traded is attributed to the COVID-19 pandemic and the strict measures put in place. These negatively affected production and consequently reduced marketable volumes, as decision-makers preserved food to mitigate against uncertainties caused by the pandemic (Nchanji et al., 2020[vi]; Nchanji et., 2021a[vii]; Nchanji et al., 2021b[viii]). The project introduced a new strategy of tracking bean volumes traded by partner SMEs in 2020 to complement national level statistics recorded since the project started. Using this method, PABRA recorded 201,550 tons of beans traded by 79 SMEs under the project. High volumes traded by SMEs show their importance in achieving the project objective of structuring the bean trade to enhance efficiency in bean corridors.

Level of satisfaction among men, women and youths benefiting from the bean trade: The level of satisfaction among bean traders captures their subjective assessment of profits, trust and ease of transacting through SMEs, business platforms and facilities such as the MasterCard Farmer Network (MFN). The project has assessed the levels of satisfaction among cooperative leaders, off-takers[ix], men and women bean producers and aggregators. These are based on transactions through digital payment

platforms and benefits derived from the bean trade across three countries and three corridors. The corridors and countries are EAREM (Uganda and Tanzania), YEBECO (Tanzania) and CAMCOCA (Cameroon).

The levels of satisfaction, measured using a Likert scale, related to bean trade partnerships, digital payment services and profits across the three countries, range from 80% and 94% for both men and women. Key factors contributing to high levels of satisfaction across bean value chains in these countries are the possibility of higher incomes from profitable and reliable markets, and bean types being in demand.

As illustrated in the impact studies recently conducted in Burundi, having access to profitable markets allows traders to negotiate for higher prices, compared with those yet to join market platforms. In Kenya, a women-only group (Ushirikiano-Nakuru[x]), made an additional US$10 per ton as a result of linking with a woman-owned bean processor, Smart Logistics Ltd. In addition, both of these enterprises now trade in highly demanded varieties that attracted better prices (Katungi et al 2020a). In addition, increased transparency across bean value chains and partnerships contribute to higher levels of satisfaction. The findings on levels of satisfaction from Tanzania and Uganda point to slightly higher satisfaction with market linkages and bean trade than the anticipated targets of 80% from year four of the project. Compared to conventional markets where buyers are revealed at the market, these linkages allow farmers to become aware of buyers and terms of transactions early when still making production decisions, which helps them optimize their profits and derive higher income from the trade relationship.

During the current reporting year, a study on levels of satisfaction was conducted on a sample of 302 farmers (165 women), randomly selected from a list of all farmers linked to buyers, using digital payment solutions - MFN in EAREM corridor (Uganda). Results showed that out of the women sub-sample, 86% were satisfied with the financial solutions (FinTech). About 80% of men were equally satisfied with the technology, with 89% of those who had never used digital payment systems, reporting that they were willing to embrace its use. During the same period, levels of satisfaction among bean traders were assessed on a sample of 421 (155 women) from cooperatives, community enterprise agents and off-takers in Uganda and Tanzania. Data on the levels of satisfaction with digital bean trading platforms were collected using individual interviews. Results indicate that producers, aggregators and off-takers were highly satisfied with digital collection. On a Likert scale of 1 to 5, trading and payment services of MFN were rated at 5 (100%) for men, and 4.7 (94%) for women.

In the new year, efforts to scale out digital bean trading and payment services will continue in both Tanzania and Uganda, and scale up to Rwanda. An assessment of how the bean trade translates into better incomes for farmers, especially women, will be conducted in the coming year. PABRA will also monitor trade volumes associated with all SMEs in the project.

Progress in immediate outcomes

The two immediate outcomes below contribute to intermediate outcome 1.

Immediate outcome 1: Enhanced partnerships and linkages for increased access to markets in a gender-equitable manner

Cumulative progress on immediate outcome 1 since project inception to date

This immediate outcome is assessed based on three indicators stated in the PMF as: 1) Number of SMEs led by men and women entrepreneurs trading in bean and bean-processed products; 2) Number of male and female farmers linked to profitable markets; and 3) Number of women and youth in platform leadership positions compared to men.

Number of SMEs led by men and women entrepreneurs trading in bean and bean processed products: Since its inception four years ago, the project has continued to increase partnerships by involving more SMEs in bean production, bean processing and grain trade. The number of SMEs has increased from a baseline of 52 to 238; which represents 95% of the 250 SMEs target for the five years of the project. The number of women-led SMEs also increased from its baseline value of 4 to 52 by March 2021, mainly in EAREM, YEBECO and TAZAMA Corridors. There is also a significant improvement in the share of SMEs led by women over the four years of the project, growing from 7.7% in 2017 to 21.8% in 2020. This represents growth of 14.2% among SMEs led by women.

Bean grain processing appears to be a major driver for the growing number of women-led SMEs as these businesses require low startup capital and focus on nutrition and health. However, when compared with the target set at the beginning of the project, progress represents 45% of the target of 116 women-led SMEs. This is due to inadequate access to market information, lack of business advisory services, financial assets, and mentors. Most women entrepreneurs are not willing to take the risk of acquiring loans due to high interest rates. There are few women business mentors in the agricultural sector to coach new entrepreneurs. Funding towards market studies and product placement in different market spaces is still a challenge. And, lastly, incubation centers where business advisory services are available are scarce. Focus will therefore be on supporting women involved in the informal bean businesses, mostly as retailers in community markets, to play a bigger role in the bean corridors. In addition, new partnerships will be explored with organizations such as ACELI, to provide additional business advisory services through business incubators for women and female youth interested in the bean business.

***Number of male and female farmers linked to profitable markets*:** At the start of the project, there were 297,500 farmers trading in profitable markets in three countries: Burundi, Ethiopia, and Zimbabwe. Cumulatively from 2017, the project has linked 2.26 million farmers in ten countries to profitable markets; of whom 1.134 million (50%) were women. The established partnerships with SMEs were instrumental in raising access to profitable markets for the 2.26 million famers in ten countries over the last four years. These SMEs have potential to provide better prices to producers, especially those involved in bean processing. Market uncertainties, such as unreliable buyers and prices, are reducing as the project addresses constraints along the bean value chain by facilitating linkages, giving producers, especially women, more confidence to engage in market-focused production driven by the bean corridor model.

The project target of linking one million men and women farmers to profitable bean markets has been surpassed by about 126% due to positive engagements by SMEs, including bean traders, processors and producers, supported by the bean business platforms, and demand-led production. There was an

improvement in the number of women linked to markets from 47.5% cumulatively to 49%. We also observe that the proportion of women farmers (49%) linked to the SMEs is within the expected range of the proportion of women trading in beans; which confirms that SMEs are working with both men and women farmers.

Number of women and youth in platform leadership positions compared to men: The project set to get 110 women into leadership positions in five years. Over the last four years, the number of women holding leadership positions in bean value chains and platforms across Burundi, Cameroon, Madagascar, Rwanda, Southern Tanzania, and Zimbabwe has grown to 144 while that of men is now 200. The progress towards the target of 110 has been exceeded. Because many women continued to engage in down-stream points of the value chain, promotion of gender equality in the platforms through trainings and awareness creation between 2017 and 2019 was the push that led to increased women participation in platforms and leadership positions. In 2020, however, COVID-19 restrictions limited implementation of some activities such as physical platform meetings. For this reason, there were few platform reorganization activities, which meant that leadership changes could not take place. Despite these challenges, the progress in the indicator is on course as per project expectations.

Progress on immediate outcome 1 during the reporting period

***Number of SMEs led by men and women entrepreneurs trading in bean and bean processed products*:** In the current reporting period, the project added 25 SMEs to the network of partnerships distributed across corridors as follows: Ten in EAREM; Four in TAZAMA; Two in YEBECO; Eight in White Pea Bean and one in Large White corridors.

Number of male and female farmers linked to profitable markets: During the current reporting year, approximately, 413,300 farmers (210,791 women), were linked to profitable markets offered by the SMEs, slightly exceeding the target of 400,000 producers set for the year. The producers linked to SMEs are in EAREM (242,658); TAZAMA (18,900); YEBECO (32,759); White Pea Bean (110,000); Large White (6,500); CAMCOCA (2,000); TOGHABU (500). In 2020/2021, the proportion of women producers accessing profitable markets also increased by 2%.

The project will monitor the market access linkages and strengthen them to improve further incomes for farmers, especially women, in the next year. In the coming year, PABRA will put more emphasis on increasing market participation and business skills for women and youth. Promotion of business cases for investing in key PABRA flagship products such as precooked beans and bean composite flours will continue, as they provide a more stable and remunerative market for small scale producers, especially women.

***Number of women and youth in platform leadership positions compared to men*:** An additional eight women ascended to leadership positions within one of the platforms in Uganda, in the EAREM Corridor, during this reporting period. In 2019, there were only three women enterprise agents in *in the EAREM corridor this has increased* to 12 in 2020. The bean business platforms are increasing their use of digital payments via MFN *across EAREM and Yellow bean corridor, with anticipation to scale further to TAZAMA bean corridor in the next year*. PABRA has recruited interns with support from the CGIAR GENDER Platform to work with grain aggregators[xi] in increasing the participation of women and

entrepreneurs as agents of MFN, banks and mobile networks, to achieve economic empowerment. With continued gender and bean business training for collective marketing, more women and youth can be part of decision-making along the value chains. We expect to see more changes in leadership positions in the next year, as platform leadership changes usually occur every two to five years. The project will continue supporting the changes and supporting the increased participation of women and youth in the platforms.

Immediate outcome 2: Increased access to market and advisory support services for men and women farmers and entrepreneurs.

The progress in this outcome is assessed by one indicator provided in PMF, which is the percentage and number of men and women participants who have accessed market and advisory services.

Cumulative progress on immediate outcome 2 since project inception to date

The project aimed to increase the number of men and women accessing market and advisory services from zero to 350,000 in five years. Over the last 4 years, the project has enabled 324,902 men and women to access the services. Approximately 90,363 women (36%) have accessed market and advisory services over the last four years, having risen from 0 in 2017. The MFN platform continued to scale digital payment services and digital literacy and lending services, especially deepening usage by producers in EAREM (32,000) and YEBECO (270,000). Other non-finance related services include market information in the TAZAMA corridor and Large White bean corridors. Access to digital services has also reduced transaction costs between smallholder producers, especially, women and key buyers. As it becomes easier to attribute incomes to beneficiaries through digital payment services, there is growing opportunity to enhance access to banking services for SMEs. In Uganda, Equity Bank is already extending credit to SMEs and some agents will be trained as bank and mobile money agents next year.

Progress on immediate outcome 2 during the reporting period*:*

Interest in digitalization remained high during the reporting period, with the number of transactions doubling from about 5,000 in 2019 to 10,000 in 2020. Through the MFN, transactions amounting to US$ 8,582,510 were made between producers in cooperatives, groups and individuals, and key off-takers in 2020/2021. The number of women agents in Uganda rose from three in 2019 to 12 out of 29 agents in 2021. Higher numbers of female agents will encourage more women to participate in the bean trade and utilize support services such as digital payment services. To increase the number of women participating in MFN, more women groups were sensitized and trained on how to use MFN. In addition, more women agents were engaged to reduce the gap between male and female enterprise agents.

During 2020, the project reached about 15,440 (5,583 women – 36.1%) producers with digital payment services from Tanzania and Uganda in the YEBECO and EAREM bean corridors. This number includes those using MFN, constituting the majority of those accessing the services in those corridors as part of efforts to scale up usage among producers and agents. These efforts were also intended to curb physical movement and contact while collecting and selling produce, due to the COVID-19 pandemic.

The project thus increased support to recruit new agents and train existing ones in Uganda and Tanzania through consultancies, internships and cooperative resource persons. The activity will continue in 2021 to expand within the same countries and beyond while observing standard operations procedures in each country. (KT not sure what you mean)

Intermediate outcome 2: Improved food and nutrition security in a gender equitable sustainable manner

Cumulative progress on intermediate outcome 2 from project inception to date

Indicator: % change in consumption of High Iron Beans (HIBs) and bean-based products

The project set to increase the proportion of people consuming HIBs and value added products by 5% in at least three countries. Over the last four years, the proportion of people consuming HIBs has increased in four countries: Burundi, Malawi, Uganda, and Zimbabwe. Countries such as Burundi, Uganda and Zimbabwe, which introduced HIBs at the start of the project, achieved or exceeded the project target of 5%. In Uganda (EAREM corridor), the consumption of HIBs increased from 0% to 4.95% (2,104,335 people) of the total population between March 2017 and December 2020. This is 99.5 % progress towards the set target of 5%. In Burundi (EAREM corridors), where the population is smaller, the proportion of people consuming HIBs continues to grow above the target. Cumulatively, the numbers have grown to about 653,294 people (5.76%) since 2017.

Zimbabwe registered the highest progress, with a 21.64% (5,859,491) change in the proportion of people consuming HIBs by December 2020, due to aggressive nutrition sensitization activities by PABRA partners led by the Zimbabwe Department of Research and Specialist Services (DR & SS) and HarvestPlus, through eight different promotional materials translated into local languages. Well-developed private companies mainstreamed HIBs in their products, with the help of PABRA technical and resource support. Compared to 2019 where three countries, Burundi, Uganda, and Zimbabwe, registered an exponential increase in HIBs consumption, this year Malawi also recorded an increase in the number of people consuming HIBs. In Malawi under the TAZAMA sugar bean corridor, where the development of HIBs seed systems was initiated in 2018, the cumulative change in the proportion of people consuming HIBs has increased from zero to 3.62% (683,796) over the last three years.

In the current reporting year, consumption of HIBs increased by 0.46% in Uganda, 0.12% in Burundi, 9.8% in Zimbabwe and 2.1% in Malawi. The surge in HIBs intake in Malawi is due to the collaboration with complementary projects implemented in the country. Leveraging initiatives targeting mother care groups and adolescents, particularly women and children in poor setting of Malawi, has enabled the project to reach vulnerable populations. Across seven countries: Burundi, Kenya, Malawi, Rwanda, Tanzania, Uganda, and Zimbabwe, an additional 1.15 % of the people consumed HIBs in 2020.

Aggregately, the project has increased the proportion of people consuming high iron beans across the seven countries, Burundi, Kenya, Malawi, Rwanda, Tanzania, Uganda, and Zimbabwe, from zero to 3.0% (7,380,667 people) since its inception in 2017. It is therefore plausible that the 5% target has already been surpassed in Burundi, Uganda and Zimbabwe, and 60% achieved in seven countries over a period of four years. Lessons learnt from the four countries continue to inform design of strategies to accelerate consumption of HIBs in other PABRA countries.

Consumption of processed bean-based products has remarkably improved in the last four years. In seven countries: Burundi, Kenya, Malawi, Rwanda, Tanzania, Uganda, and Zimbabwe, consumption of processed bean-based products such as flour grew from zero in 2017 to 1.9% of the population, around 4 million. The growth clearly indicates increased availability of bean-based products and the fact that they are acceptable to consumers, tasty and nutritious. This implies that efforts put into promoting value addition through processing and preservation techniques is likely to have an impact on the bean market as well as nutritional outcomes of consumers. In the current reporting period, consumption of processed bean-based products in the above countries grew from 1.2% (907,784) people in 2019 to 1.9% in 2020; a change of 0.7%.

Immediate outcomes 3: Increased access to bean and dry bean product consumption amongst poor households in a gender equitable manner

This immediate outcome contributes towards intermediate outcome 2, via increased access to HIBs and value-added products by consumers, especially women and children. The progress on this outcome is assessed based on two indicators stated in PMF: 1) Number of women and men consumers accessing HIBs and value-added products; and 2) Level of satisfaction among women and children consuming HIBs and value-added products using a Likert scale of 0-5, with 5 as most satisfied.

Progress on the immediate outcome 3 from project inception to date

Number of women and men consumers accessing HIBs and value-added products: Since its inception, the project has made significant progress in increasing the number of men, women, girls and boys accessing HIBs and value-added bean products, most of which are developed from HIB varieties. Cumulatively, the total number of people accessing HIBs has increased from a baseline of 720,000 people in 2017 to 10.4 million across EAREM, TAZAMA, and CAMCOCA bean corridors[xii] over the last four years. There is an increase of 9,755,226 people above the baseline in three corridors, representing an achievement of 104.8% against the target of 10 million.

The increase in the number of women and men accessing HIBs shows the efforts of PABRA and its partners in disseminating HIBs. Similarly, the cumulative number of consumers accessing flour and other bean-based products has increased from 907,784 to 3,479,196 between 2017 and March 2021. Of the documented cumulative consumers in three corridors, 65% (2,407,068) were women.

Access to the HIBs and value-added products is on the rise because governments and development agents are increasingly getting involved in promoting biofortified crops. For example, under the EAREM and TAZAMA bean corridors, Tanzania has successfully mainstreamed HIBs into school feeding programs, while the government policy of fortification in Zimbabwe drove private seed companies to embrace biofortified varieties. These favorable policies and engagements of key stakeholders raised awareness among consumers and subsequently stimulated demand. The increased demand is further sustained by high satisfaction among customers of HIBs and associated products because they are tasty, nutritious and appealing.

Level of satisfaction among women and children consuming HIBs and value-added products using a Likert scale of 0-5, with 5 as most satisfied: The level of satisfaction has been assessed in four countries: Malawi, Cameroon, Mozambique and Uganda. Across all four countries, findings demonstrate high levels of satisfaction with HIBs, corroborating our earlier assertion that demand for HIBs is driven by their favorable attributes. Levels of satisfaction from all four countries are above 90%, on average 4.5 on a Linkert scale of 1-5, and above the target of 80%. It is important to note that satisfaction with HIBs is based on tangible traits like taste, yield, cooking time and color, and not yet on nutritional quality since this is implicit.

Progress on immediate outcome 3 during the reporting period

Number of women and men consumers accessing HIBs and value-added products: During the current reporting year, 2,254,944 people (54%, 1,217,670 women) in EAREM, TAZAMA, and CAMCOCA bean corridors accessed HIBs, representing a growth of 27.9% in one year. Compared to the annual target of 1,630,000 for 2020/2021, the project exceeded the target by 38.3% (624,944 people), because country partners stepped up efforts to create awareness about HIBs benefits among value-chain actors, including consumers. For instance, in 2020, there were more efforts directed towards engaging stakeholders to include beans in their feeding programs in respective institutions. All these efforts resulted in uptake of HIBs in the feeding programs of several institutions.

During the same period, the number of consumers accessing value-added, bean-based products has risen by 1,423,890 (65% women) in EAREM, TAZAMA and CAMCOCA bean corridors. PABRA's main target consumers for value-added, bean-based products include women of reproductive age and children under five. This approach involved establishing a self-sustaining nutrition strategy to add value in our focal countries. Women have also been targeted with beans and value-added products because, in Africa, women prepare the food in most households.

Moreover, women entrepreneurs have embraced bean processing to make nutritious porridge flour and other products—and are targeting other women as clients. Considering the role women play in food value-chains, this is encouraging. In the coming year, we will include strategies to empower women to access energy-saving food preparation technologies, and increase their consumption of bean-based products for food, nutrition and income security. The utilization of biofortified beans in 2020/2021 expanded to twelve more countries[xiii] across three corridors: EAREM, TAZAMA and CAMCOCA.

Level of satisfaction among women and children consuming HIBs and value-added products using a Likert scale of 0-5, with 5 as most satisfied: In 2020, we assessed the level of satisfaction among men and women consumers with bean products in Uganda and Mozambique, using a 1-5 Likert scale. In Uganda under the EAREM corridor, a sample of 434 (274 being women) tasted composite bean flour porridges, developed and produced by SME EADCL in Soroti. All participants liked the porridge very much except 3% that remained neutral. In Mozambique under the TAZAMA sugar bean corridor, about 92% of women and men involved in the study liked the bean composite porridge. This is higher than the 60% target of the project. Reasons for the high level of satisfaction given by participants are

associated with bean products being tastier, nutritious and appealing in the eyes of the consumers. Also during the tasting surveys, the process is well prepared, with training materials translated into appropriate local languages. Participants not only tasted and evaluated what they cooked, but also shared the food among themselves. The cooking demonstrations were highly participatory. The training will be shared among other households. Given that these are new products, from newly established processors, this outcome demonstrates substantial knowledge sharing across networks.

Intermediate Outcome 3: **Increasing smallholder farmers' resilience to climate change in a gender-equitable manner**

Three indicators contribute towards this outcome: 1) Change in yield loss among men and women farmers utilizing climate-resilient practices; 2) Annual bean productivity amongst men and women farmers compared with the long-term average; and 3) Area occupied by resilient varieties. The first indicator will be due only in year 4 and 5 as stated in the PMF, while we report on indicators 2 and 3 below.

Cumulative progress on intermediate outcome 3 from project inception to date

Annual bean productivity amongst men and women farmers compared with the long-term average: For the first three years after the project launch in 2017, bean yield grew in Uganda, under EAREM, from a baseline of 1,500 kilograms per hectare per year to a national average of 1,704.6 in 2019. However, in 2020, excessive rainfall accompanied by flooding in some parts of the country reduced the average country yield to 1,190 kilograms per hectare. Similarly, in the White Pea Bean corridor of Ethiopia, excessive rainfall caused massive productivity losses of up to 30% from yields of 1,796 kilograms per hectare in 2019, to 1,275.2 in 2020. Cumulatively, Ethiopia has suffered a drop of 23% in yields when compared with the baseline of 1,667.5 kilograms per hectare in 2017.

The high variability in bean productivity observed across the corridors is due to the highly heterogeneous bean growing environments, management practices and seasonal climate. In 2020/2021, incidences of drought and excess rainfall affected bean productivity in varying proportions across other countries as well. In Rwanda for example, there was a 10% reduction in bean productivity in 2020 compared to the 2019 cropping seasons. This was attributed mainly to heavy rain, especially in the north in 2020, which caused an increase in fungal diseases that affected bean productivity. In Cameroon, rains stopped very early at the beginning of November, compared with previous years when rains extended into December, reducing productivity. Similar incidence of drought occurred in Kenya. Plans to capture yield data disaggregated by corridor in association with project interventions were proposed at the beginning of 2020, but disrupted by Covid-19. They will resume in 2021.

Area occupied by resilient varieties: The project is on track to meet its target. The cumulative area planted with varieties with resistance to multiple diseases in the last four years has grown by 953,823.7 hectares above the baseline of 612,276 hectares (8% of the total bean area) in 2017. This means that since 2017, total bean area planted with resilient varieties is 1,566,099.7—representing 22.4% of the total bean area[xiv] and 89.6% progress towards the target of 25% of the total area. The EAREM and Red Bean corridors account for 70.8% (675,176 hectares) of resilient varieties planted in the thirteen countries. White Pea Bean (Ethiopia) and Large White (Madagascar) bean corridors combined planted

106,826 hectares (11.2% of the total). The 18% remaining area is in the YEBECO, TAZAMA and CAMCOCA corridors. The area occupied by resilient varieties and Integrated Crop Management (ICM) in 2020/2021 was 176,918 hectares. This comprised of East Africa Red Mottled and Red Bean Corridor with the largest area at 107,842 hectares followed by the White Pea Bean (29,429h hectares) and Sugar Bean Corridor (28,260 hectares).

Immediate outcome 4: Increased access to climate-smart agricultural technologies, practices and information for bean production

Two indicators contribute to this outcome: 1) Number of women and men farmers accessing climate-smart varieties and ICM practices; and 2) Level of satisfaction among men and women with existing climate-smart varieties and ICM technologies, using a Likert scale of 0-5, with 5 as the most satisfied.

Cumulative progress on immediate outcome 4 from project Inception to date

Number of women and men farmers accessing climate-smart varieties and ICM practices: The project set out to have at least 6 million more farmers accessing climate-smart varieties alongside ICM (60% being women) cumulatively. This was against the baseline of 1.9 million farmers, 45% being women. From April 2017-March 2021 the project had reached 9,164,624 farmers (50% women) in 16 countries: Burundi, Botswana, Cameroon, DRC, Eswatini, Ethiopia, Kenya, Lesotho, Madagascar, Malawi, Mozambique, Rwanda, Tanzania, Uganda, Zambia and Zimbabwe. These encompass six corridors: EAREM, Red Bean corridors, TAZAMA, YEBECO; White Pea Bean and Large White bean corridors.

Progress on immediate outcome 4 during the reporting period

Number of women and men farmers accessing climate-smart varieties and ICM practices*:* The year 2020/21 was a unique and challenging year compounded by the COVID-19 pandemic that affected agricultural performance in the region. Despite this, the project facilitated at least 2,826,700 (58.2% women) households across bean corridors to access bean varieties and ICM technologies against the annual target of 2 million households. The EAREM bean corridor had the highest number of farmers (645,087), followed by the YEBECO corridor (360,585); White Pea Bean corridor (350,340); Sugar bean corridor (336,424); Red Bean corridor (275,459) and TAZAMA (106,490). The rapid growth in the number of farmers accessing climate-smart varieties and ICM practices over the period of the project can be attributed to intensified support and an increase in the number for private sector producers supplying improved seed. The number of seed companies across PABRA countries has grown from 36 in 2017 to 58 in 2021 in Burundi, DRC, Ethiopia, Kenya, Malawi, Rwanda, Tanzania and Uganda.

Level of satisfaction among men and women with existing climate-smart varieties and ICM technologies, using a Likert scale of 0-5, with 5 as the most satisfied: The level of satisfaction among men and women with existing climate-smart varieties and ICM technologies is being assessed for Burundi, Ethiopia, Kenya, Rwanda, and Tanzania in the ECABREN corridor. In Kenya, the level of satisfaction was further assessed based on several other traits such as drought and disease tolerance, and those with Iron and Zinc versus those without. Preliminary results indicate that varieties with unique traits are highly preferred. Analysis by varieties and trait will be completed and made available in the next reporting year.

Immediate outcome 5: Increased access to skill, information and knowledge through training

Progress on this outcome is assessed based on the following quantitative and qualitative indicators: 1) Perceptions of men, women and youth on skills, information and knowledge acquired from project training, using a Likert scale of 0-5, with 5 as most satisfied; 2) Number of lessons learned and disseminated across different themes of this project.

Cumulative progress on immediate outcome 5 from project inception to date

***Perceptions of men, women and youth on skills, information and knowledge acquired from project training, using a Likert scale of 0-5, with 5 as most satisfied*:**
The project aimed to raise satisfaction levels in the skills and information provided to actors from zero, at baseline, to at least 60% in year three and 80% by year five, as well as to identify and provide learning opportunities. A study to monitor perceptions was done in Burundi, Cameroon, Malawi, and Tanzania. Approximately 90% of seed entrepreneurs trained in Burundi, were satisfied with knowledge acquired from the sessions on seed business management. In Malawi, in Balaka, out of the 125 males who evaluated the nutrition information, 92% (63% like very much, 29% like slightly) liked the content, design, length and delivery of the workshop and they said it will likely benefit their nutritional wellbeing. Out of the 478 female, 96% (65% like very much, 31% like slightly) were satisfied with the training. In respect to the 5-point Likert scale, participants scored overall satisfaction at an average of 4.8 (females scored at an average of 4.7 and males at an average of 4.6). In Ntchisi, of the 14 male adolescents who evaluated the nutrition information, 78% (57% like very much, 21% like slightly) liked the content, design, length and delivery of the workshop and said it will likely benefit their nutritional wellbeing. Out of the 25 females, 88% (76% like very much, 12% like slightly) liked the content, design, length and delivery of the workshop.

In respect to the 5-point Likert scale, participants scored overall satisfaction at an average of 4.44 (females scored at an average of 4.56 and males at an average of 4.21). The high levels of satisfaction are explained by the use of familiar and locally available foods and techniques in training. High levels of satisfaction were equally reported in Cameroon from data collected during a training session in 2019. In both countries, the 60% target was surpassed by the third year of the project. Fast progress is attributed to the increased use of targeted information channels and user-friendly languages. Use of respected trainers, and participatory methods that give trainees the opportunity to take part in the learning process (to get hands-on experience) as well as ample time allocated to the training have also better learning and hence positive perceptions.

Number of lessons learned and disseminated across different themes in the project: There has been a significant effort to identify learning opportunities since project inception. The baseline was zero and the target for this phase was set at 25. Cumulatively, the total number of lessons identified and documented has grown from zero to 18 lessons learnt across different themes of breeding, gender, ICM, markets, seed systems, skills, information, knowledge, impact assessment and nutrition over the last three years. This is about 72% of progress towards the target of 25 lessons. Of the total lessons documented, four were from Burundi, eight from Zimbabwe, three from Tanzania and three from Kenya. Thematic teams played key roles in identifying these lessons. Most of these lessons appeared in various blog posts on the PABRA websites, while others featured in policy briefs and guides put

together by local implementing teams in Annex 3. Social media, particularly WhatsApp, was the most commonly used channel for dispatching the lessons to PABRA partners.

2. Reach

The project continued to expand in terms of geographical and social reach. During the year, countries such as Malawi continued processing beans into value-added products, while others increased the breadth of value-added products, such as in Burundi and Zambia. Bean value addition continues to be an attractive business venture in these countries due to strong promotional efforts provided under the project. Through presentations made by the project on precooked beans and bean flour, wider uptake and investments have been initiated in these countries. Promotion of HIBs has also widened in geographical scope. New countries reported access to HIBs for the first time in 2020, including Central African Republic, Ethiopia, Eswatini, Guinea Conakry, Mozambique, and Togo. This expansion in the geographical scope is attributed to the germplasm exchange program of PABRA and the breeding network to fast-track, release and access varieties in multiple countries. However, as expected, use of HIBs in new countries is still very low and expected to grow with time.

Approximately 10.5 million (52% women) people from five corridors of TAZAMA (Malawi and Zimbabwe), EAREM (Burundi, Kenya, Rwanda, Tanzania and Uganda), Red Bean (Ethiopia), YEBECO (Burundi and Tanzania) have accessed HIB varieties, increasing the number of countries with HIBs from 7 to 12. Governments, development partners and consumers are interested in HIBs for their nutritious attributes, which have played a significant role in the promotion and adoption of HIBs in countries such as Burundi, Malawi, Rwanda, Uganda, and Zimbabwe. Around 1.7 million households have access to the beans, with 6 people in a household. The project has reached 9.2 million farming households with climate-smart varieties, 1.7 million of whom are HIB beneficiaries.

Approximately 238 SMEs are involved in aggregation, processing or export, buying produce from 2.3 million farmers in 11 bean business platforms of five corridors (EAREM, YEBECO, TAZAMA, CAMCOCA and White Pea Bean). While the proportion of women-led SMEs grew from 7.7% in 2017 to 21.8% in 2020, we see the proportion of women producers linked to SMEs remains stable, explained by the low volumes handled by women-led SMEs. Therefore, the effect of men-led SMEs on linking producers to profitable markets is growing faster than that of women-led SMEs, which calls for additional strategies to support women-led businesses. Bean processing businesses attracted more women than men because of their specialty with food handling. and this presents an opportunity to support women-led SMEs to grow. Food processing businesses have a positive spillover effect on women employment, as women are more likely to employ women agents for marketing processed foods, as observed in Burundi and Zimbabwe,, and more likely to buy bean grain from other women, as seen in Kenya.

3. Changes to the Theory of Change, Logic Model and Performance Measurement Framework

In 2020/2021, there were no changes in the TC , LM and PMF

4. Lessons learned and actions taken, recommendations and next steps

The corridor approach continues to attract and accelerate private investment in the bean trade, targeted towards consumer preferences. These include grain mass density for profit-driven producers and traders, uniform colour for exporters, and thick soup for low-grade restaurants. The high preference for yellow beans is already pulling in new investment, accelerating partnerships with new off-takers and facilitators. PABRA is collaborating with Enabel (Belgian Development Agency), a facilitator in the YEBECO corridor to work with two yellow bean grain off-takers. The collaboration will be enhanced through introduction of the MFN to these off-takers in the new year. The demand for other traits is being analysed to inform the development of new bean varieties to satisfy market preferences.

From project monitoring and strategic value-chain studies, sugar and purple beans were identified as growing in market demand. In the coming year, a review of the corridors that started in 2020 will continue to characterise these new corridors for purple and sugar beans. Ongoing studies in DRC and Uganda will provide additional data needed for the pending analyses in the coming year.

We have also learnt that relying on secondary data sources to monitor some indicators such as productivity and volumes sold is less reliable. Sometime data is not available on time or fluctuates in quality depending on the method used by primary users. In 2020, the project started exploring new methods of data collection directly from partners, especially SMEs, on trade. Results suggest that with digital tools, if expanded to all SMEs, it is possible to get better data from partner transactions with farmers.

In the coming year, PABRA will explore how to embed additional variables into such digital tools. The COVID-19 pandemic provided new lessons on the role of digital tools in improving the efficiency of information transmission in the bean value-chain. These tools were used to disseminate information to farmers and to promote efficient transactions. So far, expansion of digital tools to include more farmers has been achieved in Tanzania and Uganda, while at the same time exploring opportunities to scale to other countries.

To increase the use of MFN among producers and cooperatives in Tanzania and Uganda, under the YEBECO, the project collaborated with MasterCard to acquire affordable smartphones that would be repaid over several seasons. The SMEs made arrangements with AMCO agents who were expected to receive partial payments for the phones over three seasons so that aggregators could have access to the technology. The project also engaged two additional resource persons to complement PABRA staff and increase training with the agents. This has improved the diffusion and use of the MFN services in these countries.

Impact assessment studies conducted in Burundi taught us that when women are trained in ICM, they are more likely than men to use new technical knowledge, skills, and make changes in bean production. However, women's participation in profitable markets is often constrained by lack of access to production inputs such as seed. The strategy of seed credit has been piloted in Kenya and Uganda and we have seen a corresponding increase in the volume of grain sold by women.

Cross-cutting themes

Environmental sustainability: Bean growing regions continue to suffer adverse weather conditions that negatively impact bean production and productivity. In the reporting year, some countries experienced climatic shocks such as flooding or drought. Incidences of pest and diseases were on the increase, partly due to the changing climatic conditions. Despite this, from production methods and technologies to knowledge products and institutional arrangements, the project has continued to promote environmental sustainability in the bean value-chain.

To ensure environmental sustainability, the project prioritized mitigation as well as adaptation measures, such as:

- Use of multiple-stress-tolerant bean varieties and integrated crop management options to suppress the use of pesticides. Over the period 2020/2021, three drought-tolerant bean varieties and four varieties with resistance to multiple diseases were released in Tanzania and DRC-East. Other countries previously released similar varieties, bundled with climate-smart ICM practices and deployed in packages in stress-prone areas (KT what was the result in these previous examples?). The year 2020 was also a special year for bean breeding within PABRA. The first ever Tepary bean, superior to common beans in terms of heat tolerance, was released in Botswana. This will go a long way to improve resilience of bean farmers in the heat-prone environments of parts of western, eastern and southern Africa. Breeding for pathogens and pest-resistant varieties suppresses pesticide use that would otherwise undermine biodiversity. As these varieties are also high-yielding, the breeding strategy curbs soil erosion, slowing down conversion of new land to crop production.
- PABRA members/ partners promote low-cost and environmentally smart technologies, such as seed dressing, bio-fertilizers and bio-pesticides as pest and disease management options in bean production. Seed dressing entails using low doses of pesticides coated on seed, which serves as immunization, protecting the beans from attack by pest and diseases. This ultimately reduces use of pesticides at later stages of crop establishment. Seed dressing has been found to be effective in root rot prone areas as well as for control of bean fly, white fly and aphids.
- Several countries such as Malawi, Zambia and Zimbabwe are deepening their research on diverse non-chemical solutions to environmental stresses. For example, in 2020, Zimbabwe evaluated the economic feasibility of four integrated crop management practices and inputs under climatic risk and identified two bio-fertilizers (i.e. Trichoderma and Rhizobia) as economically resilient to rainfall variability. In other countries such as Mauritius, Madagascar and DR Congo, our partners promote use of bio-pesticides made from chilies, neem, garlic, Mexican marigold and other natural extracts to control pest such as aphids and whiteflies in beans. This shift is driven by environmental sustainability and the requirement to meet food safety regulations that are now at the core of food systems. PABRA has also increased its virtual backstopping efforts to support technology performance and promote wider uptake of technologies recommended

by partners. Combining economic and technical validation is expected to increase the adoption of appropriate integrated pest and disease management options.

- Countries have stepped up efforts to monitor incidence and severity of pests and diseases, identifying target areas for efficient dissemination of ICM. In Zambia for example, the team is rolling out an ICT-based tool to gather data and leverage the use of Artificial Intelligence (AI) to beat bean pests and diseases. This will complement the PestDisPlace (https://pestdisplace.org/) tool being deployed by The Alliance to monitor the emergence, occurrence and global distribution of pests and diseases.
- The project is implementing a strategy to strengthen the capacity of farmers in adapting to the impacts of climate change. In 2020, the project rolled out climate information services and climate-smart agricultural techniques and related information (Refer to outcome 3) to enable bean producers to make sound decisions about what to plant and when, taking new varieties and technologies into account to mitigate against extreme climate events such as drought, flooding, frost and heat. PABRA has begun training National Agricultural Research Systems (NARS) and their partners in using climate information services based on the PICSA approach, drawing from successful experiences in Rwanda.
- The project promoted various aspects of conservation agriculture including cover crop, rotation and minimum tillage, to conserve water and regenerate soil fertility. In Tanzania, the Tanzania Agricultural Research Institute (TARI) is working with the Conservation Farming Unit (CFU) in nine districts to promote use of hand, ox-drawn and tractor-drawn minimum tillage technologies.
- PABRA has promoted fast-cooking beans through rapid breeding, bean processing, and development of value-chains for fresh beans.

Innovations introduced in the bean corridors: Transformative innovations introduced in the last four years continue to gain traction:

- The school feeding approach for scaling up access to HIBs introduced in Tanzania in 2018 has grown more than 10-fold, from 23 schools in five districts, to 285 schools in 20 districts by 2020. The number of school children accessing the HIBs through these school feeding initiatives has increased from 15,830 to 196,156 children by 2020
- The scope and depth of digitalization along the value-chains expanded during the COVID-19 pandemic through webinars, use of digital tools such as Teams, and WhatsApp platforms. When COVID-19 hit, PABRA adopted these and other ditigal tools[xv] to keep in touch and backstop partners in the region through virtual meetings, sharing information and photos on WhatsApp, and maintaining performance monitoring. However, poor quality internet connectivity has been a challenge in some countries.
- The project has also introduced a number of new digital and remote technologies and initiatives to enhance farmers' resilience to the impacts of climate change. These are:
    - Digital Agro-Climate Advisory (DACA) app - a collection of digital climate maps and other mobile tools that deliver location-specific weather, climate and bean advisory services introduced in 10 countries with 72 experts trained.

- Climate Information Service for Beans (CIS4B) was introduced in October 2020, now used by 12,032 farmers to decide which bean varieties to plant and when, based on length of the season and predicted total seasonal rainfall.
- Radio programming through '*Radio Huguka,'* potentially reaching 8.9 million people in Rwanda, was introduced as a climate information service, with 1.78 million people listening daily to weather and climate information broadcast on the community station.
- PABRA has successfully developed and released Tepary bean in Botswana, a variety that is highly heat tolerant, enabling bean production in areas threatened by increasing temperatures due to the adverse impacts of climate change.

The gender perspective:

A Gender Equality Strategy was developed at the start of this project in 2017 to address gender inequalities[xvi] in the bean value -chain across the production, distribution and consumption hubs in nine bean corridors[xvii] across sub-Saharan Africa. In late 2017/2018, we conducted a gender analysis to understand the role and responsibilities of men, women and youths[xviii] across the corridor, to address gender gaps and implement possible changes[xix]. Low integration of gender considerations within institutions was identified as a gap and steps were taken to address it. These included encouraging the adaptation of the Logical Model and Performance Measurement Framework (PMF) to make gender outcomes more explicit, building capacity among project implementers to integrate gender, and increasing women's involvement in leadership positions and decision-making bodies.

The commercialization of beans has resulted in higher incomes from beans. As a consequence, our research indicates that men have taken more control over decision-making around how money from the sale of beans is used. To increase women's control over bean proceeds, we are now working with MasterCard Labs to provide financial inclusion and increase entrepreneurship for women in the corridors. This has been explained in immediate outcome 2 above. The MFN tool digitizes marketplaces, payments, workflows, and farmer financial histories within the agriculture sector. We have learned that digitalization increases not only women's control over income, but also creates business opportunities. Women have been able to generate multiple financial transactions with aggregators, which can be assessed by banks for possible loans disbursement. In 2020, we trained more women as MFN agents, increasing the number from 7 to 17 in Uganda. We are also working with CEDO to create an alternative source of income for women farmers through credit at less than 2% interest. Challenges moving from cash to mobile money include the extra cost that comes with withdrawing mobile money and the distances to mobile money agents. In recent months, we have had discussions with Equity bank to reduce 20% of the cost from farmer withdrawal bank charges. While the scope of this work is still limited to two countries, future efforts will strive to scale out to other countries.

We are increasingly reaching women and men farmers with cost-saving technologies such as the multi-crop threshers developed in Tanzania and Burundi. By focusing on youth entrepreneurship in the bean value-chain, we have targeted youth entrepreneurs championing and leading the way for other youths. In Tanzania, Imara Tech[xx] a youth-owned entrepreneur has developed a portable multi-crop thresher. As of 2020, the entrepreneur sold threshers to over 400 other entrepreneurs serving more than 25,000 farmers. He has been able to engage 40 technicians and 20 permanent young workers in his business.

In addition, other youths like Pastory[xxi] have been working with The Alliance of Bioversity International and CIAT (The Alliance), in collaboration with TARI Maruku, to distribute good quality seed and mechanization services to over 1,250 farming households in Missenyi District in Tanzania in 2020. Pastory has served 50 farming households from 8 villages with threshing services, earning 1.6 million Tanzanian Shillings, approximately US$690, in just six months. We learned that working with youths is easier when there is a champion and mentor they can look up to. Challenges, which still exist, are limited access to business skills, credit and structures.

Women are also innovating to mitigate the impacts of changing climate. Gender focal points in Cameroon, Ghana, Kenya and Zimbabwe are working with women and men farmers to use alternative crop management techniques[xxii] to address climate issues. In Cameroon for example, beans are dried in a barn built on the farm to reduce post-harvest loses during the rainy season. This year, beans are now being dried at home on sticks built to prevent the rains from getting into the crop. This technology was readapted from Burundi. In Burkina Faso, Kenya and Zimbabwe, men and women farmers are using conservation technologies to reduce soil erosion and preserve soil moisture. In 2020, we saw an increase in the use of conservation and regenerative agriculture to conserve moisture in bean production in the Rift Valley area in Kenya.

In 2020, we also carried out a COVID-19 survey to assess the impact of the virus on different value-chain actors. In different countries, we could clearly see gender differences among farmers and entrepreneurs[xxiii]. For example, in Uganda[xxiv], access to credit and seed was a problem for women farmers who were located far away from the aggregators like CEDO. CEDO[xxv] is recovering from the pandemic and reorganizing its activities to reach more farmers with credit, seed and training in alternative business opportunities.

In Tanzania, women traders[xxvi] suffered from the low purchasing power of the clients and lost market usually created by tourists. Men were not spared as the socio-economic impact of COVID-19 led to jobs losses, affecting their purchasing power. This exacerbated gender-based violence to worrying levels in many countries. PABRA has trained two gender focal persons in Uganda to carry out awareness creation exercises and train power holders in the community about the negative impact of gender-based violence, hindering women's access to, and decision-making power over, agricultural technologies. The existing partnership models have also eased the effect of COVID-19, through credit provisions, market restructuring and knowledge dissemination.

Materials to integrate gender in the bean value-chain have been developed pending branding. These materials range from gender tools to brochures. With the COVID-19 pandemic, we are now developing illustrations and animations to reach farmers through digital means. These materials are more visual, engaging and can be understood easily. These materials will be published in the coming months.

To strengthen gender-responsive breeding and develop gendered product profiles, we partnered with other CGIAR centers like the International Potato Center, International Center for Agricultural Research in the Dry Areas, and the International Institute of Tropical Agriculture to pilot the gender and customer and product profile tool. We are also building the capacity of NARS through the GREAT crop breeding courses to strengthen these activities in different countries. The gender tool is still under

development and there is more to learn. We look forward to more discussion with the demand-led breeding team to scale out this innovative tool to universities across Africa.

Sustainability indicators: The project continues to mainstream sustainability in the project through:

- Multi-stakeholder ownership of the corridor concepts. PABRA members, including NARS, have worked together to implement the bean corridor approach, which is now an integral part of their annual work plans and engagements with their governments, partners and other donors. Increasingly, there is more interest in the bean corridor approach by governments and donors who support the idea, even targeting specific crops. For example, the World Bank project in DRC and Burundi, IFAD in Tanzania, USAID through Feed the Future (FtF) / Legume innovation lab, Seed Systems for development (S34D) project, etc.
- The corridor approach has strengthened the organizational capacity of farmers, who have learned more about collective marketing, making it feasible to promote digital transactions. This has greatly improved the efficiency of SMEs in coordinating transactions and payments, creating an enabling environment for other partners to invest in bean value-chains. For example, new partnerships have been established with firms, MasterCard MFN, Sharing our best, ACELI, etc. This broadens incentives for farmers to commercialize their production. These improvements are also coming at a time when macro-economic factors such as population growth, nutritional and health awareness is growing, driving demand for beans, projected to grow over 100% in some countries.
- There is increasing private sector investment in the bean corridors. SME numbers are increasing, as are the grain volumes they handle, expedited by the introduction of mechanization and bundling of technology with seeds. Banks are also indicating a growing interest in investing in SMEs and smallholder farmers.
- With improvements in technology, production and access to resources and more profitable markets, farmer's incomes from beans are anticipated to grow. Although this is yet to be rigorously evaluated until year five, some results from impact assessment studies conducted in Burundi and Zimbabwe suggest a positive correlation between productivity and profits from bean production; while productivity has reportedly grown positively by a significant margin.
- The project has endeavored to be inclusive, generating benefits for men, women and youth in their production hubs. Promoting social inclusion has involved innovating and providing opportunities to derive more income from beans and bean-based products for diverse groups, from supporting farmers with fresh grain businesses, through to advising entrepreneurs making processed products.

Annexes:

Annex 1: Outcome Reporting Worksheet April 2020-March 2021

Annex 2: Story of change

Annex 3: Communications between Sept 2020 - March 2021

Annex 4: Project complementing IBPMA project contribution in 2020/21.

Annex 5: PABRA New Partnerships 2020 -2021

Special appendices:

Appendix 1: IBPMA Performance measurement framework

Appendix 2: 2021/2022 Narrative work plan for Improving Bean Production and Marketing in Africa (IBPMA)

Appendix 3: Risk Analysis and Management and Strategy

Appendix 4. Gender strategy

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[i] https://africa.cgtn.com/2021/03/07/desert-locust-invasion-destroys-massive-cropland-in-ethiopia-un/.

[ii] World Bank, 2021. Macro poverty outlook for Sub-Saharan Africa. Country-by-country analysis and projects for the developing world. https://www.worldbank.org/en/publication/macro-poverty-outlook/mpo_ssa

[iii] The Defining Moments in Ethiopian Seed System

[iv] https://www.researchgate.net/publication/348944093

[v] https://cgspace.cgiar.org/handle/10568/10912

[vi] https://cgspace.cgiar.org/handle/10568/110731

[vii] https://pesquisa.bvsalud.org/global-literature-on-novel-coronavirus-2019-ncov/resource/en/covidwho-1116747

[viii] https://cgspace.cgiar.org/handle/10568/110999

[ix] **An off-taker is a major buyer linked to producers as their market outlet or organizer of their produce marketing**

[x] https://www.agrilinks.org/post/seed-revolving-fund-women-uplifting-their-community-kenya

[xi] **an aggregator is an individual, group or a firm that takes up the roles of collecting and bulking a commodity, usually small quantities from many individual producers and further transferring or selling to other buyers**

[xii] Cutting across 12 countries: Burundi, Cameroon, DRC, Eswatini, Kenya, Madagascar, Malawi, Mozambique, Rwanda, Tanzania, Uganda, Zimbabwe,

[xiii] Countries are Uganda, Rwanda, Kenya, Burundi, Zimbabwe, Tanzania, Malawi, ESWATINI, Madagascar, Mozambique, DRC and Cameroon

[xiv] Assuming a total bean area of 7 million Ha

[xv] https://www.pabra-africa.org/capitalizing-on-digital-tools-to-sustain-bean-production-trade-and-consumption-amidst-covid-19/

[xvi] https://www.slideshare.net/CGIAR/commodity-corridor-approach-facilitating-gender-integration-in-development-research-at-different-scales-in-africa.

[xvii] https://cgspace.cgiar.org/bitstream/handle/10568/80540/PABRA20_Bean_Corridors_BRIEF.pdf?sequence=5.

[xviii] https://cgspace.cgiar.org/handle/10568/97764

[xix] https://cgspace.cgiar.org/handle/10568/97765.

[xx] https://www.imaratech.co/

[xxi] https://www.pabra-africa.org/youth-agri-entrepreneur-transforming-his-community-through-job-creation-in-tanzania-case-of-pastory-tarasisi/

[xxii] https://www.pabra-africa.org/women-building-resilience-in-sub-saharan-africa/

[xxiii] https://alliancebioversityciat.org/news_and_blogs/pabra-responding-to-the-effects-of-covid-19-on-smallholder-bean-farmers-in-kenya-and-uganda/

[xxiv] https://youtu.be/Pc6Fe6zRilw

[xxv] https://www.youtube.com/watch?v=WlFmUvuwxOI&t=86s&ab_channel=Pan-AfricaBeanResearchAlliance

[xxvi] https://www.youtube.com/watch?v=dxpg5e80rJM&t=3s&ab_channel=Pan-AfricaBeanResearchAlliance