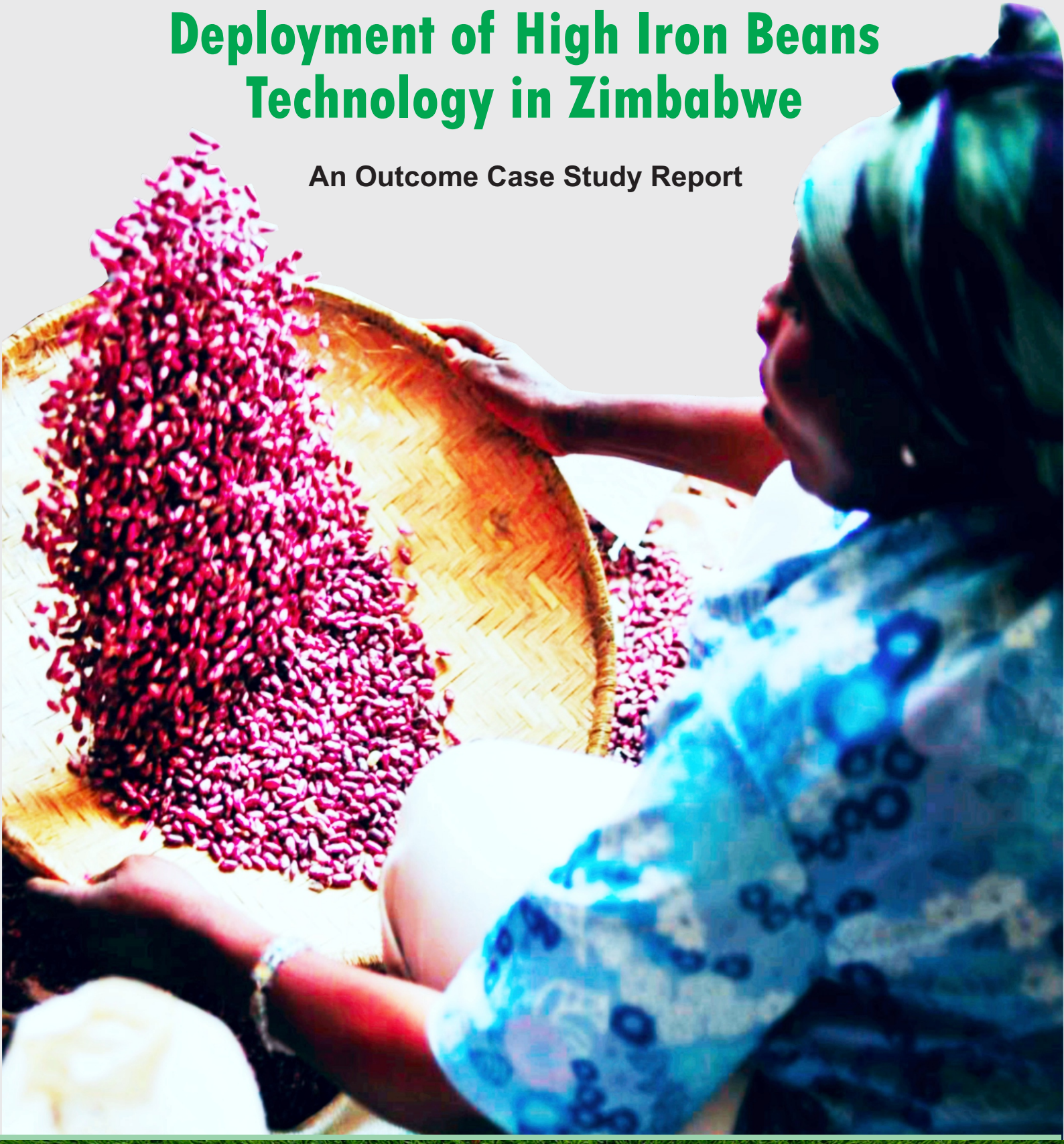
AFRICAN DEVELOPMENT BANK GROUP
GROUPE DE LE BANQUE AFRICAINE
DE DÉVELOPPEMENT

Technologies for African
Agricultural Transformation

TAAT Monitoring, Evaluation and Learning System

Deployment of High Iron Beans Technology in Zimbabwe

An Outcome Case Study Report



Deployment of High Iron Beans Technology in Zimbabwe

TAAT MEL Working Document No. 001

Rachel Zozo
Bruce Mutari
Justin Mabeya
Josey Kamanda
Denford Chimboza
Enid Katungi
Atayi Opaluwah
Sabra Lewis
Mpoko Bokanga

Correct Citation:

Zozo, R., Mutari, B., Mabeya, J., Kamanda, J., Chimboza, D., Katungi E., Opaluwah, A., Lewis, S. and Mpoko, B., (2020). Deployment of High Iron Beans Technology in Zimbabwe. Technologies for African Agricultural Transformation, Monitoring and Evaluation and Learning System. 20p TAAT MEL Working Document No. 001

Website: www.taat-africa.org

TAAT MEL Working Document No. 001

Acknowledgement
This study was conducted by the M&E Specialist in partnership with the HIB Compact team. We gratefully acknowledge the support of the African Development Bank through the Clearinghouse Unit for funding this study. We also acknowledge CIAT-Zimbabwe office for the logistics support, the DR&SS staff for their indefatigable facilitation during the study. We acknowledge the unreserved collaboration by all field staff, farmers and enumerators.

Table of Contents

Table of Contents

Acronyms	iv
Executive summary	v
Introduction and background	1
Rationale, objective and methodology of the study	6
Results and interpretations of findings	10
Implementation processes	10
Validated output results	13
Validated outcome results	14
Improved productivity	14
Return on investment	16
Lessons learned	17
Conclusions	18
Recommendations	19
Limitations of the study	19
References	20

Acronyms

Acronyms

AATF:	African Agricultural Technology Foundation
AEZ:	Agro-Ecological Zones
AfDB:	African Development Bank
AGRA:	Alliance for a Green Revolution in Africa
AGRITEX:	Agricultural Technical and Extension Services
BMGF:	Bill and Melinda Gates Foundation
CADS:	Cluster Agriculture Development Services
CBSPO:	Community Based Seed Production Organizations
CDTO:	Capacity Development and Technology Outreach
CGIAR:	Consultative Group on International Agricultural Research
CIAT:	International Center of Tropical Agriculture
DfID:	Department for International Development
DR&SS:	Department of Research and Specialist Services
ENABLE:	Empowering Novel AgriBusiness-Led Employment
EU:	European Union
EXTRA:	Extension and Training for Rural Agriculture
FARA:	Forum for Agricultural Research in Africa
FGD:	Focus Group Discussions
GAP:	Good Agricultural Practices
GDP:	Gross Domestic Production
HIB:	High Iron Beans
IBB:	Iron Biofortified Beans
IFAD:	International Fund for Agricultural Development
IFDC:	International Fertilizer Development Centre
M&E:	Monitoring and Evaluation
MEL:	Monitoring, Evaluation and Learning
OCS:	Outcome Case Study
PABRA:	Pan Africa Bean Research Alliance
PIA:	Priority Intervention Areas
RoI:	Return on Investment
RTDI:	Regional Technology Delivery Infrastructure
SFE:	Soil Fertility Enabler
TAAT:	Technologies for African Agricultural Transformation
TTO:	Technology Transfer Officer
USAID:	United States of Agency for International Development
ZIMSTAT:	Zimbabwe National Statistics Agency

Executive Summary

Executive Summary

This document presents the results of a case study on the outcomes of promoting nutrient-rich (Iron and Zinc) bean varieties and good agricultural practices to improve productivity and returns for farmers in Zimbabwe. These technologies were disseminated under the High Iron Bean (HIB) Compact of the African Development Bank's (AfDB) Technologies for African Agricultural Transformation (TAAT) program implemented by the International Center for Tropical Agriculture (CIAT).

The objective of the TAAT HIB Outcome Case Study (HIB-OCS) was to examine the outcome of productivity improvement reported by the TAAT HIB Compact, both planned and unplanned. The study strives to provide a summary through beneficiary feedback and onsite observations on successes/failures without statistically generalizing to a population of interest. It is intended that the results of the case study presented herein may be used to modify a generalization, including those related to causal inferences, and serve as a guide to future compact activities in TAAT. The study used both qualitative and quantitative data to determine the effects of program interventions on productivity improvement for HIB. It used triangulation through interviews (60 primary beneficiaries from 5 wards), focus group discussions consisting of approximately 12-14 participants and field observations to corroborate the findings and reduce biases in the summary of findings, conclusions and recommendations.

Main results indicate that despite impacts of cyclone Idai, adoption of the improved varieties enhanced productivity on average to 1.08t/ha for NUA45, Sweet Violet 0.72t/ha and Cherry 0.79t/ha from baseline yields of 0.6t/ha. These varieties offered high Returns on Investment to farmers by generating, on average, $8.35 for an average investment of $5.08 per farmer. Through the various interviews and ground truthing site visits, it is clear that products and services generated by the HIB Compact have proven tangible and are yielding positive results for framers who have a gained access to seed and knowledge of GAP and post-harvest activities. It should also be noted that climate change adaptation coupled with good disaster preparedness is a major driver of HIB productivity improvement in fragile agro-ecological zones such as the north-eastern bean corridor in the Manicaland province of Zimbabwe considered, in ancient days, as the food basket of the country. Unfortunately, crippled by cyclone Idai in March 2019, almost a year since the cyclone had hit the region, women and youth are yet to recover from the aftermath of the cyclone while men have shown greater resilience. The HIB Compact intervention was timely and brought a renewed focus on improving household livelihoods. The empowerment of women and youth to climate change adaptation of beans cultivation contributes to sustainability where entire communities experience the benefits of bean farming. While no single community can be considered “representative” for assessing the impact of an innovation, it is evident that there is impact on the ground.

Manunure Primary School children with the TAAT MEL team

1 Introduction and background

The Technologies for African Agricultural Transformation (TAAT) is a program initiated by the African Development Bank (AfDB) as part of its Feed Africa Initiative. The main objective of the program is to improve the business of agriculture across Africa by raising agricultural productivity, mitigating risks and promoting diversification and processing in 18 agricultural value chains within eight Priority Intervention Areas (PIA).

The program is implemented by International Institute for Tropical Agriculture (IITA) in close partnership with other CGIAR Centers and specialized technical centers (e.g. AATF, IFDC), FARA, national agricultural research and extension systems and private sector partners. TAAT is not a research program; it is an initiative to promote and disseminate proven high-performance food production technologies to millions of farmers in a commercially sustainable way through a network of people and institutions forming a Regional Technology Delivery Infrastructure (RTDI) within an enabling environment. It requires close partnership between the AfDB and other developmental partners such as the World Bank, International Fund for Agricultural Development (IFAD), Bill and Melinda Gates Foundation (BMGF) Alliance for a Green Revolution in Africa (AGRA), United States of Agency for International Development (USAID), European Union (EU), Department for International Development (DFID) and others. The technical coordination of the program is provided by the TAAT Clearinghouse, a semi-autonomous unit in the program's management structure that is independent of IITA and its implementing partners. The Clearinghouse serves as an honest broker in the identification and assessment of "proven" technologies and products that are ready for widespread dissemination, as well as linking these technical opportunities to wider national development agendas.

The TAAT program increases agricultural productivity through the deployment at scale of proven and high-performance agricultural technologies along selected value chains. TAAT operates as a network of interacting "Compacts" with nine devoted to specific

commodity value chains, and six others serving as "Enablers" that provide needed specialist services. The nine (9) value chain Compacts are rice, maize, cassava, wheat, sorghum, millet, orange-flesh sweet potato, high-iron beans, small ruminants and poultry, aquaculture Compacts. The six (6) enabler Compacts are soil fertility management, water management, capacity building, seed policy, fall army worm control and youth in agribusiness Compacts.

The TAAT Monitoring, Evaluation and Learning (MEL) component is an integral part of the program management. It plays an important role in project implementation as it helps stakeholders understand how the program is progressing and facilitates learning and feedback mechanisms. The MEL is designed to proactively provide management with pertinent information about how the program progress as well as generate new ideas which can direct the development of new initiatives. The TAAT MEL promotes accountability and transparency such that the results benefit a range of stakeholders including the donor (AfDB) and most importantly, the beneficiaries. The MEL can adapt to unexpected factors that may come up and can easily change the course of the program implementation if needed. The TAAT MEL also promotes ownership and supports the need for capacity development within implementing institutions to appreciate the need for and how it contributes to the sustainability by end of the program as a legacy.

In this regard, in partnership with the High Iron Beans (HIB) Commodity Compact, the M&E Specialist supported by the Compact Coordinator and the Technology transfer Officer (TTO) in collaboration with partners conducted an Outcome Case study to assess the productivity improvement of HIB varieties deployed in Zimbabwe. The HIB Compact is implemented in eight countries (Burundi, DR Congo, Kenya, Malawi, Rwanda, Tanzania, Uganda and Zimbabwe) and is led by the International Center of Tropical Agriculture (CIAT). The Compact is operational in Manicaland Province, Mashonaland Central and Midlands Province of Zimbabwe. For the purpose of this study, we focused on Manicaland (Nyanga, Mutasa and Chimanimani), Mashonaland Central (Tsunda) and Midlands (Shurugwi and Gokwe).

Zimbabwe, a country of about 14.8 million people in Southern Africa, has faced political and economic challenges that disrupted its previous standing as a relatively prosperous and resilient country (World Bank 2017; ZIMSTAT 2015; USAID 2018). The GDP growth declined from 11.9% in 2011 to 0.6% in 2016. In Zimbabwe, 70% of the local population depends on rain fed agriculture, which is also subsistence-based; yet, agriculture is the backbone of the economy. This means that rainfall and temperature variations have severe implications on production and food security (Unganai and Murwira, 2010). Over 92% of Zimbabwean rural households practice agriculture as their primary livelihood, with food crop production and casual labor being the most important sources of income (ZimVAC, 2017). Based on the household hunger score (ZimVAC, 2017), 10% of rural households experienced severe hunger in 2017. In March 2018, USAID reported that stunting levels vary geographically from 19% in Bulawayo province to 31% in Matabeleland South and are higher in rural areas (29%) than urban areas (22%). Differences in stunting levels can also be seen according to maternal education and wealth levels. At least 25% of children whose mothers have secondary education are stunted, while the prevalence rises to 45% of children whose mothers had no formal education. Stunting slows down children's growth and brain development affecting performance in school and its impacts are felt later in life. The stunting reflects micronutrient deficiencies in the country. For instance, about 72% of children 6 to 59 months are living with iron deficiency, and one in three have iron deficiency anemia (FNC, 2018). In women of reproductive age, six in ten women have iron deficiency, while 26% are anemic. Childbearing begins early in Zimbabwe. In 2015, it was recorded that 48.3% of adolescent girls begin childbearing by age 19, with estimates of 27.7%, 30.9% and 23.9% for Manicaland, Mashonaland Central and Midlands, respectively (ZIMSTAT and ICF, 2016). Early motherhood is a key driver of malnutrition (Fink et al., 2014), it exposes adolescent mothers to high risk of being malnourished, deliver low birth weight babies likely to become as well malnourished and be at increased risk of ailment and death, compared to babies born to older mothers. Young maternal age and short birth intervals are risk factors for restricted linear growth, which implies that lowering adolescent fertility and increasing birth intervals has the potential to substantially reduce the number of stunted children.

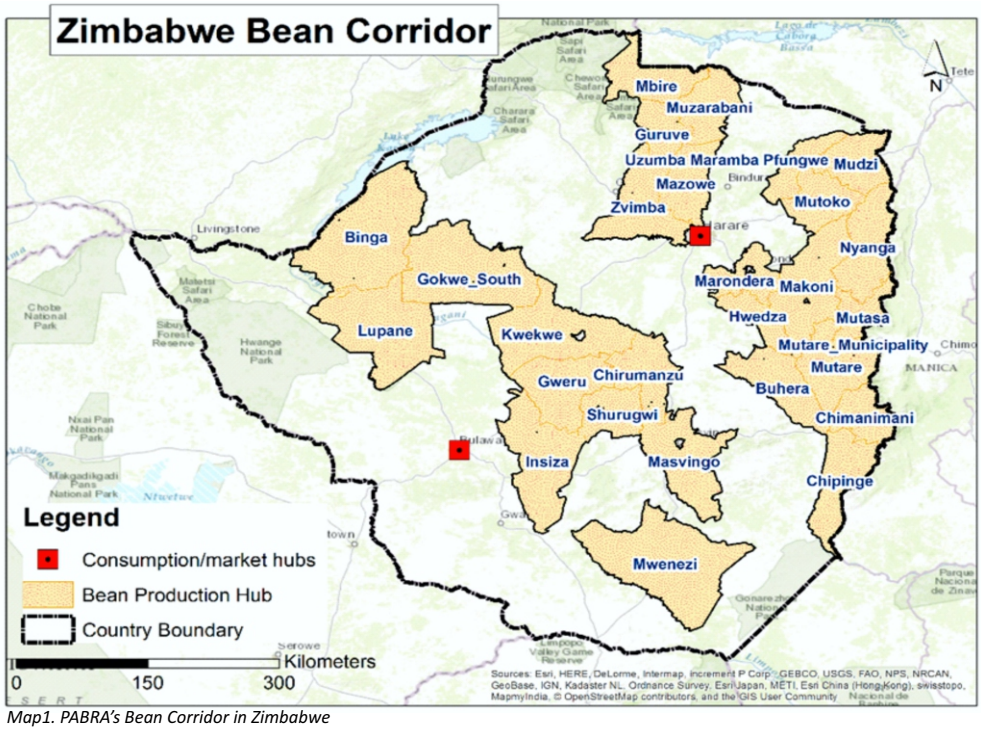
Prior to the intervention of the TAAT HIB Compact, most of the farmers especially in Nyanga and Chimanimani Districts and some parts of Gokwe

South were growing bean landraces (unimproved and non-biofortified varieties) for subsistence and income generation. The yield and market value of these varieties were very low leading to discouragement among farmers. To address the productivity gap, the TAAT HIB Compact introduced climate-smart, high yielding and micronutrient-rich varieties (Iron and Zinc). In 2016, the Pan African Bean Research Alliance (PABRA) in collaboration with the Department of Research and Specialist Services (DR&SS) and Agricultural, Technical and Extension Services (AGRITEX) conducted a baseline study to establish the status of bean yield in Zimbabwe. The results showed that there are significant variations is terms of bean yields with about 35% of the households producing >1t/ha, 17% produce 0.5 – 1t/ha and 47% produce <0.5t/ha across different agro-ecological zones within the country.

1.2 Compact activities in Zimbabwe

In November 2018 in collaboration with LEAD Trust Feed the Future, and Extension and Training for Rural Agriculture (EXTRA) projects, the TAAT HIB Compact engaged 40 primary schools and 28 farmer groups (youth, women and mixed) formed by about 793 people to produce HIB grain for sale and processing of HIB value added products. The groups are in the Manicaland Province, Mashonaland Central and Midlands Province of Zimbabwe. The activities of the groups were selected in line with the bean corridor model, developed by PABRA. The bean corridor is a market-driven approach for transformation of rural agriculture that focuses on “bean flow” intensifying production, linking farmers and businesses, and mainstreaming nutrition in the value chain. The PABRA bean corridor mapping considers Zimbabwe as a corridor on its own having the sugar bean type as the driving product (PABRA, 2017). To kick-start activities, farmer groups received start-up packs of 5kg per HIB variety (NUA45 and Sweet Violet) for multiplication and intensification during the 2018/19 season. Although all the 28 farmer groups received start-up packs, only 20 groups with 467 direct beneficiaries successfully managed to plant the HIB seed and most especially in the Manicaland Province, the highest bean-producing province in Zimbabwe. The other groups failed to plant due to the long dry spells that were experienced in most parts of the country associated with cyclone Idai that had shaken the country in March 2019 sweeping away crops and destroying lands in the lowlands. The DR&SS partners (AGRITEX, LEAD Trust Feed The Future) who work in direct contact with the beneficiaries provided the list of beneficiaries interviewed during the study.

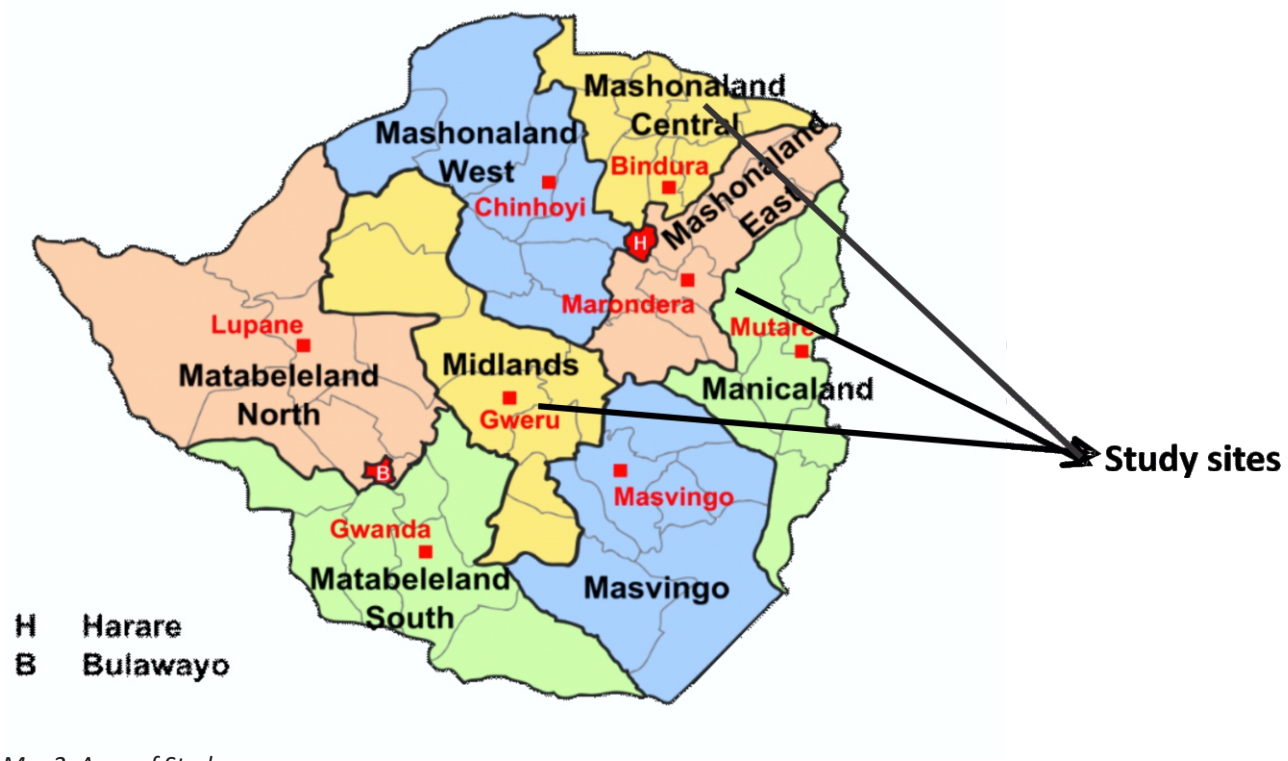
In collaboration with CIAT-HarvestPlus, the TAAT HIB Compact embarked upon promotion of production and consumption of HIB grain through joint promotional campaigns (awareness creation campaigns, field days, agricultural shows and food fairs) and capacity building sessions of farmers around Community Based Seed Production Organizations (CBSPO). The awareness creation campaigns aimed at improving farmers' knowledge on GAP and benefits associated with increased consumption of HIB grains and processed HIB by-products. The capacity building covered different segments of the bean value chain including Good Agricultural Practices (GAP) in bean production, nutritional benefits of HIB, processing of HIB by-products (value addition) and linkages to the markets (marketing skills). The GAPs introduced included seed dressing, appropriate use of organic and inorganic



Map1. PABRA’s Bean Corridor in Zimbabwe

fertilizer, cropping systems (sole cropping, row cropping, crop rotation), appropriate spacing, weed control (use of pre and post emergence herbicides), appropriate use of agrochemicals for insect pest and disease management, and use of hermitic storage bags.

The TAAT HIB Compact developed innovative institutional arrangements to address the potential challenge of limited access to breeder seed and facilitate subsequent production of foundation and certified seeds. TAAT funds were used to catalyze development of the seed system for HIBs and focusing primarily in Manicaland and Midlands Provinces supporting farmer groups (including women groups, youth groups and schools) who are involved in production, value addition and school feeding. This offered better opportunity for breeder seed production, mobilization of private sector to engage in HIB foundation and certified seed production, capacity building on seed entrepreneurship (technical and business aspects of seed production), linkage of seed companies with producers, awareness creation campaigns on HIB to create demand for high quality seed. In this regard, members of the Manunure irrigation scheme group received inputs (ammonium nitrate, compound D, diazonon, fungicides and insecticides) to cover an area of 6.25ha for HIB breeder seed (used to produce Foundation seed) production under performance contract with the HIB Compact in partnership with



Map2. Area of Study

The HIB TTO inspecting Mhakwe Primary School's garden in Chimanimani

2 Rationale, objective and methodology of the study

Under the TAAT program, CIAT in partnership with DR&SS, through breeding and deployment of high iron and zinc beans, have made efforts to reduce micro/macronutrient deficiency (Nchanji and Mutari, 2019). The introduction of HIB varieties in Zimbabwe was a response to solving malnutrition challenges in the country. Iron deficiency is largely due to an inadequate dietary intake of bio-available iron, increased iron requirements during rapid human growth periods (such as pregnancy and infancy), and/or increased blood loss due to parasites or infection (Mulamba et al., 2017). Besides contributing to improved productivity and household incomes, they are also deployed to enable farmers adapt to climate challenges especially in fragile agro-ecological areas susceptible to climate change shocks. According to Jiri, Mafongoya and Chivenge (2017a), common beans among other legume grains such as cowpeas and tepary beans are drought tolerant crops which are majorly grown by smallholder farmers for food security in Zimbabwe. Besides the potential of beans in the food security, nutrition and human health nexus in Zimbabwe, HIB varieties present several values for Climate Smart Agriculture (CSA), including:

- HIB varieties sustainably increase agricultural productivity and incomes. In Rwanda, Funes et al. (2019), notably assessed the impact of Iron Biofortified Beans (IBB) varieties on farmers' livelihoods. They found out that IBB growers had significantly higher yields (23% for bush and 22% for climbing bean types), and potential incomes (24% for bush and 25% for climbing bean types) than farmers that grew non-biofortified (improved or traditional) beans. Higher yielding HIB varieties enable farmers to double their productivity for household food security and income.

- Market preferred HIB varieties that are micronutrient-rich, fast cooking, taste good, and have low flatulence ensure demand and incomes for farmers and other bean value chain actors (Katsi, 2020).

- They suitably adapt and build resilience to climate change because of early maturity.

- Drought and heat tolerant HIB varieties that can withstand increased temperatures and droughts during the growing period.

- Pest and disease tolerant HIB varieties provide resilience in the face of increased insect pest attacks resulting from climate change.

- They are proved to reduce greenhouse gas emissions. HIB improve soil fertility through biological nitrogen fixation and freeing up of soil-bound phosphorous, thus minimize the climate change impacts of fossil fuel used to produce fertilizer.

- In terms of food, all parts of the plant are utilized. The grain is eaten fresh or dried and the haulm (stems and pod shells) used as livestock feed. Because of its nutritive value (rich in iron and zinc) the HIB grain is canned by processors and milled into flour, which is then used to produce various products such as bread and complimentary porridge for children

Even though HIB are first and foremost grown for subsistence and mostly by female farmers, about 20% of the total production is used for consumption to improve dietary intake of household members and therefore reduce the consequences of iron deficiencies (Funes, at al., 2019) while 80% sell their produce is sold (PABRA, 2016). The income generated from HIB grain marketed is used by farmers to cater for household needs, pay children's school fees, re-investment on the farm and diversification into other commercial enterprises. HIB therefore offer alternative opportunities for improved incomes of bean growers, input suppliers, traders, processors among other value chain actors. It is important to note that about 94.5% of bean farmers in Zimbabwe use sole cropping systems unlike in many other African countries where beans are mainly intercropped with other crops such as maize (PABRA, 2016).

To facilitate the implementation and monitoring of the TAAT HIB compact activities to venture in profitable seed production entrepreneurship, the Regional Technology Delivery Infrastructure (RTDI) for the compact was established. Some of the key actors in the platform include Cluster Agriculture Development Services (CADS), LEAD Trust Feed The Future, AGRITEX, DR&SS, CIAT-HarvestPlus, Seed companies, Off-takers, Processors and Local Government representatives. Late 2018, Tosek/Zadzamadura seed company entered into formal agreement with DR&SS to multiply and market NUA45 HIB seeds. To ensure sustainability, early 2019 through a partnership agreement with the CIAT-HarvestPlus, 17 Community Based Seed Production Organizations (CBSPOs) with a total of 485 members were linked to Tosek/Zadzamadura seed company to produce foundation and certified seeds of NUA45 through performance contract. In this regard, through the interface of DR&SS, Tosek/Zadzamadura seed company and other seed houses received breeder seed (3.9MT of NUA45, 1.7MT of Sweet Violet and 100kg of Cherry) for the subsequent production of foundation and certified seed). In return, Tosek/Zadzamadura and other seed houses involved in HIB seed multiplication produced 590MT of foundation seed (NUA45/310MT, Sweet Violet/230MT and Cherry/50MT) and 1165MT of certified seed (NUA45/640MT, Sweet Violet/480MT and Cherry/45MT).

Zimbabwe is one of the countries where the HIB Compact interventions reached many beneficiaries in the first year of implementation (over 140,000). This outcome case study seeks to provide further insight on the reported data on productivity improvement and draw lessons that can be applied in other countries in order to successfully deploy TAAT technologies. Field work was facilitated by a two-man team from DR&SS supported by implementing partners of CIAT-PABRA and the CIAT-HarvestPlus for seed production, LEAD Trust Feed The Future (working in North Eastern Corridor) and EXTRA Project (working in South Eastern Corridor) I n grain production for selling and value addition.

Objective

The objective of the TAAT HIB Outcome Case Study (HIB-OCS) on productivity improvement was to examine the outcome reported by the TAAT HIB Compact, both planned and unplanned, and seek to provide explanations by making causal inferences about the reasons for successes or failures without

statistically generalizing to a population of interest. However, the results may be used to modify a generalization, including those related to causal inferences, by refuting it or by providing more details about how Compact activities implementation can be enhanced.

Methodology

The TAAT HIB-OCS used descriptive and explanatory program effects case study as the most appropriate for determining the effects of program outcomes towards productivity improvement for farmers involved in the HIB sector. Triangulation by interviews, focus group discussions and observations to corroborate the findings reported and reduce biases in conclusions and recommendations as presented in this report. Both qualitative and quantitative data collection methods were used to validate successes and identify lessons learned to inform management decision making.

(I) Interviews were used to bring more clarity on qualitative data that was collected and helped to better understand the interviewee's impression and actual experiences on TAAT HIB Compact's intervention in Zimbabwe. Interviews provided forum to interact with the people and obtain clarification on responses by gathering in-depth information about the beneficiaries' attributes, knowledge, attitudes, beliefs and behavior with regards to the HIB Compact intervention. A random sampling of 12 beneficiaries per ward was selected within the corridor of Manicaland and Midlands Provinces giving a total of 60 people interviewed across 5 wards from a sampling frame of 467 beneficiaries.

(ii) The Focus Group Discussion (FGD) was used to tap into existing knowledge and experience of a diversity of key stakeholders and partners supporting the HIB Compact in Zimbabwe. In each of the 5 wards, 12-14 people were selected to participate in FGD. In total, 5 FGDs were organised and lasted approximately 2hours. The plenary session, gathering all small groups formed during the FDG session, allowed all participants to share their experiences and ideas regarding the TAAT HIB Compact activities and

Farmers during the Focus Group Discussions

experiences and ideas regarding the TAAT HIB Compact activities and processes, and have real time information from direct beneficiaries. Participants included representatives of different groups: farmers, community leaders, District extensionists (Bindura, Chimanimani, Gokwe South, Guruve, Kwekwe, Mazowe, Mutare, Mutasa, Nyanga, Shurugwi and Zvimba), researchers and CBSPOs.

(iii) Observations through ground truthing field visit helped the team to verify results, ongoing activities at CBSPOs working directly with schools and to meet the beneficiaries at their homesteads. Observations also helped appreciate the school feeding program and other famer group activities such as the women groups processing flour meal for babies. It also helped the team to identify any significant changes that happened on course of implementation. Success stories were captured and documented to recognize key Compact beneficiaries whose livelihood standards had changed as a result of producing HIB seeds. Records of implementation were interrogated to verify results of CBSPOs records kept and their bookkeeping among others.

No	Farmer Groups	District (Province)	Ward	Number of members	
				Male	Female
1.	Kuwirirana youth group	Nyanga (Manicaland)	19	2	13
2.	Shingirirai mixed group	Nyanga (Manicaland)	22	5	34
3.	Shingai mixed group	Nyanga (Manicaland)	18	1	19
4.	Self-Help mixed group	Mutasa (Manicaland)	6	6	14
5.	Simukai youth group	Mutasa (Manicaland)	40	12	28
6.	Hamamaoko women group	Mutasa (Manicaland)	6	-	16
7.	Manunure Irrigation Scheme group	Mutasa (Manicaland)	7	10	14
8.	Zimunda A women group	Chimanimani (Manicaland)	9	-	10
9.	Zimunda B youth (women) group	Chimanimani (Manicaland)	9	-	10
10.	Kumusha Youth (women) group	Chimanimani (Manicaland)	17	-	12
11.	Arise and Shine women group	Chimanimani (Manicaland)	17	-	20
12.	Hamamaoko women group	Chimanimani (Manicaland)	17	-	20
13.	Kwaedza (youth)	Chimanimani (Manicaland)	18	-	10
14.	Busy Lady (women)	Chimanimani (Manicaland)	18	-	10
15.	New Recor (women)	Chimanimani (Manicaland)	18	-	12
16.	Shungudzevhu youth irrigation scheme group	Shurugwi (Midlands)	19	20	2
17.	Shungudzevhu women irrigation scheme group	Shurugwi (Midlands)	19	1	10
18.	Kubatana women group	Shurugwi (Midlands)	11	-	20
19.	Njelele Horticulture youth group	Gokwe South (Midlands)	15	24	13
20.	Gukure Garden Cooperative mixed Group	Gokwe South (Midlands)	9	10	89
	Total			**91**	**376**

Table 1. Composition of the beneficiaries

Chimanimani Busy Lady women group displaying their HIB by-products during the study visit

3 Results and interpretation of findings

The key findings presented in this report mainly relate to the implementation processes (inputs and activities) and the results reported as outputs and outcomes. The analysis of results presented here, do not reflect those of Tsunda irrigation scheme group.

Implementation Processes

The TAAT HIB Compact in Zimbabwe is implemented in the bean corridor of Manicaland, Mashonaland Central and Midlands Provinces. Through the partnership agreement with DR&SS, LEAD Trust Feed The Future and CIAT-HarvestPlus, the TAAT HIB Compact funded the procurement and supply of agrochemical inputs delivered 467 beneficiaries (ref. Table 1) to grow HIB varieties: NUA45, Sweet Violet and Cherry. The table below shows that among the five groups, the biggest investment is in Manunure Irrigation Scheme group ($2,506) followed by Shungudzevhu Irrigation Scheme ($1,920),

Chimanimani groups ($1,484) and lastly Njelele Youth group ($715). In Shungudzevhu, TAAT HIB Compact took advantage of the fact that the Shungudzevhu irrigation scheme group receives annual financial support from the Anglo-American Platinum Company – Unki Mines as part of their corporate social responsibility to supply the ward with electricity at an affordable cost. This has allowed the group to grow the HIB throughout the year by pumping water in their fields.

In terms of activities carried out, the outcome case study strives to understand the implementation processes by the TAAT HIB Compact and if the intervention has addressed the needs of beneficiaries through the interface with partners such as DR&SS and CIAT-HarvestPlus. During the study, the M&E Specialist observed that there is high prevalence of malnutrition in the intervention sites. The TAAT HIB intervention was demand driven by farmers to have access to and use HIB, to enhance food and nutrition security and increase intake of micro-nutrients by women and children under 5

Group Name	Inputs package		Investment per group	Rank
	Farmers Contribution	**TAAT Contribution**		
Manunure Irrigation Scheme group				
	Inputs valued at $2,256: top dressing fertilizers, basal fertilizers, fungicides, herbicides, insecticides	10kg seed valued at $250	$2,506	**1**
Chimanimani groups				
Busy Lady Group	Inputs valued at $121 per group: top dressing fertilizer; basal fertilizer, fungicide (copper oxychloride), insecticides (dimethoate, diazion & lambda cyhalothrin)	10kg seed valued at $250/group	$371	**3**
Resource Group			$371	
Arise Group			$371	
Yellow Rose Group			$371	
Shungudzevhu Irrigation Scheme groups				
Youth group	Inputs valued at $320 and $1,100 for youth and women groups respectively: top dressing fertilizers, basal fertilizers, fungicides, insecticides	10kg seed valued at $250/group	$570	**2**
Women group			$1,350	
Njelele Youth group				
	Inputs valued at $465: top dressing fertilizers, basal fertilizers, fungicides, herbicides, insecticides	10kg seed valued at $250	$715	**5**

Table 2. Inputs provision for HIB Compact

years of age. According to USAID (2018), poor infant and young children feeding practices contribute to child malnutrition in Zimbabwe. In 2018, 26% of children younger than 5years of age were stunted, well above the WHO threshold of 20%. After discussion with beneficiaries during the FGD and one-on-one interviews with farmers, the M&E Specialist found out that the Compact's intervention was relevant, demand-driven and very much in line with beneficiaries' needs and expectations. The demand for bio-fortified beans came at the right time and addressed the needs of women and children to enhance their nutrients intake at an affordable cost. HIB are conventionally bred varieties with relatively higher iron levels than most traditional varieties. To shrink malnutrition due to resource constraints, the consumption of HIB results in increased iron intake and contributes to diminishing iron deficiency anemia as farmers cannot afford the cost of buying milk, meat, eggs and other protein-based food on daily basis. The following key activities were successfully implemented from June 2018 to July 2019:

- Linkages to seed companies for foundation and certified seed production.
- Training of farmers onGAP so as to venture into both grain and seed production and to meet the standards required by the seed certifying authority.

- Training on bean production and establishment of grain multiplication plots.
- Training on post-harvest handling activities and marketing strategies.

- Training on value addition of HIB and processing of by-products such as yoghurt, biscuits, cakes, bean flour for baby food.
- Organization of various field days to promote the consumption of HIB (e.g. NUA45) and other biofortified products for breastfeeding mothers and children.
- Organization of school feeding program campaigns to support schools to grow HIB and feed children with biofortified beans.
- Training on good eating habits for pregnant women and processing of baby meals such by mixing NUA45 flour with maize, soybeans, vegetables (carrot, spinach), milk/egg to make a 4-star meal for babies to fight against stunting.

Processed HIB flour for porridge by Busy Lady women group in Chimanimani

The 4 Star Meal constitutes: 1) Staples (maize, wheat, rice, millet, sorghum) even roots and tubers; 2). Animal source food (meat, fish, offals, eggs, milk and milk products); 3). Legumes (beans, cowpeas, soya, peas, groundnuts) and seeds such as Sesame, pumpkin seeds etc. and; 4). Vitamin A rich foods

Validated output results

The products and services generated by the HIB Compact are very tangible. These have been accessed and utilized by direct beneficiaries. The results include:

- The Compact trained approximately **20,000** people in Zimbabwe during the first year of implementation. With the training received on GAP, farmers are now able to use correct agronomic practices and rates of fertilizers to improve soil fertility for increased production.

- At the household level, **65%** of farmers interviewed confessed to have improved their knowledge and are able to produce quality breeder seed with minimum supervision from extensionists as stated in the performance contract. Farmers are also able to carry out post-harvest activities such as sorting and grading of seeds, efficiently before delivery to the warehouse, where records of the volume delivered by each farmer are maintained.

- With **24** members, the Manunure Irrigation Scheme group signed a performance contract to produce breeder seed with DR&SS who in turn signed contracts with seed companies such as Zimbabwe Super Seeds, Champion Seeds, National Tested Seeds, Mkushi Seeds, ARDA Seeds etc, to produce Foundation and Certified seeds and subsequently market the varieties.

- At the time of the case study, **12 tons** of breeder seeds were available in the Manunure Irrigation Scheme warehouse ready for collection by DR&SS staff to be shipped to Harare and dispatched to seed companies to produce foundation and definitely certified Seed

- **70%** of women interviewed now can process HIB grains into flour to cook meals for infants and feed their babies with HIB-NUA45 porridge flour.

- **1** school, Mhakwe Primary School in Chimanimani District sow 10kg of HIB varieties (Sweet Violet and NUA45) and harvested **400kg**. Unfortunately, **one** of the school's farmland was washed away by the cyclone Idai that hit the country in March 2019. This contributes to the School Feeding Program efforts initiated by the Government of Zimbabwe to fill in the gap created by the cyclone. A Children Committee with **7** members aged between **7** and **12** years supported by the School Directorate, was established to promote planting and consumption of HIB beans to improve children protein intake at school and at home.

- In collaboration with LEAD Trust Feed The Future Program in Zimbabwe (funded by USAID) and supported by the Provincial Minister of Agriculture of Manicaland, the Chimanimani Busy Lady women group with a membership of **10** women has secured a stand to participate in the open provincial nutrition campaigns in November where babies will be exposed to HIB based nutritional foods. This is a new momentum for the group to showcase and sell their products, but also attract new financial support from donors and other partners.

- **94** women in Chimanimani District have engaged in processing of HIB-NUA45 into baby 4-star meals. They are looking up to undertake more hygienic and sound processing methods if the project continues to support them. Right now, they are a reference in their neighborhoods and have received high profile visitors including the Provincial Minister of Agriculture.

- In Chimanimani District, a youth group comprising of **10** members has just joined the program, but they are very optimistic that they will make profitable gain out of seed production and marketing of NUA45.

- After the training on value addition in Chimanimani District (in reference to table 1), women groups of Zimunda B, Hamamaoko and Busy Lady are venturing into profitable enterprises by processing NUA45 into high value added products such as juice, sausages, cakes, biscuits and baby

porridge flour for sale. They showcase their innovations at field days and agricultural shows in the District to promote the consumption of High Iron Beans (mainly NUA45) and other biofortified products targeting mainly breastfeeding mothers and their babies. However, some farmer groups still prefer to sell HIB grain instead of HIB value added products due to additional investments needed to produce value added products since the technology is relatively new for most farmers. In additional, these women groups received financial support from the Ministry of Lands, Agriculture, Water, Climate and Rural Resettlement at the District level to organize community sensitization at Health Centres and marketplaces to raise awareness on the nutritional benefits of biofortified beans and

- particularly the NUA45.

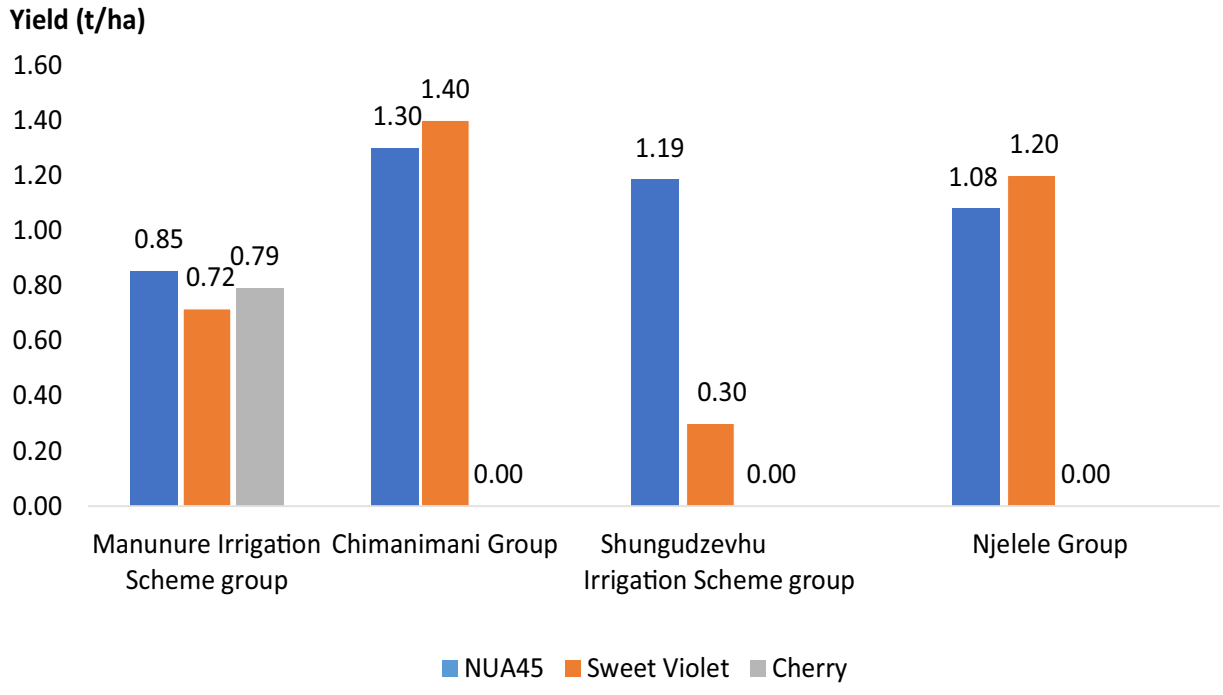
Validated outcome results

As a result of the outputs (services and products) delivered to direct beneficiaries through deployment of HIB varieties, there has been productivity, production and income gains in the intervention areas as illustrated in the sub-sections below. Data on land coverage was also collected to help us understand the production system. However, we did not get into the details of farming seizure, but we solely limited the study on the acreage allocated for HIB production.

Improved productivity

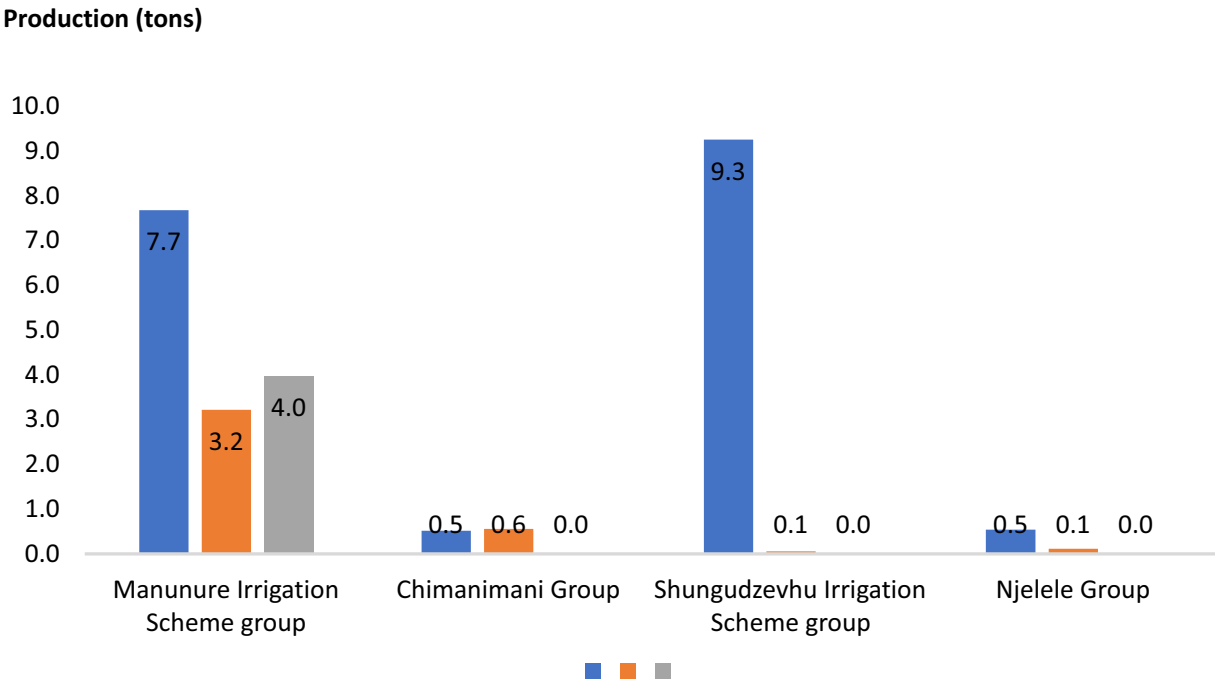
Prior to the interventions, farmers in the study areas were using farmer saved seed and landraces which have degenerated, often prone to diseases with very low productivity. Farmers also lacked knowledge on GAP associated with bean production and diversification, resulting in low productivity averaging 0.6t/ha. Through its partnership arrangement with DR&SS, LEAD Trust Feed The Future, AGRITEX and CIAT-HarvestPlus, the TAAT HIB Compact trained farmers to acquire new knowledge and improve their skills to improve on productivity. As verified and validated, results have shown that productivity improved on average by 1.08t/ha for NUA45, Sweet Violet 0.72t/ha and Cherry 0.79t/ha and as presented in Graph1 in the next page.

According to farmers, the actual yield in Manunure was lower compared to other sites for NUA45 because of Cyclone Idai, which destroyed a large proportion of the crops at germination stage in the lowland hence the need for disaster preparedness training/awareness for mitigating the effects of natural disasters on HIB. It was noted that the soils in these wards are degraded, they need to be fertilized



Graph1. Yield (ton/ha) of NUA45, Sweet Violet and Cherry HIB varieties

natural disasters on HIB. It was noted that the soils in these wards are degraded, they need to be fertilized. This is an area where the Soil Fertility Enabler Compact can come in to support the HIB Compact on soil fertility management. The graphs also show that, compared to NUA45 and Sweet violet, Cherry variety is not yet widespread as observed and as a result, this is mainly grown by the Manunure irrigation scheme group.

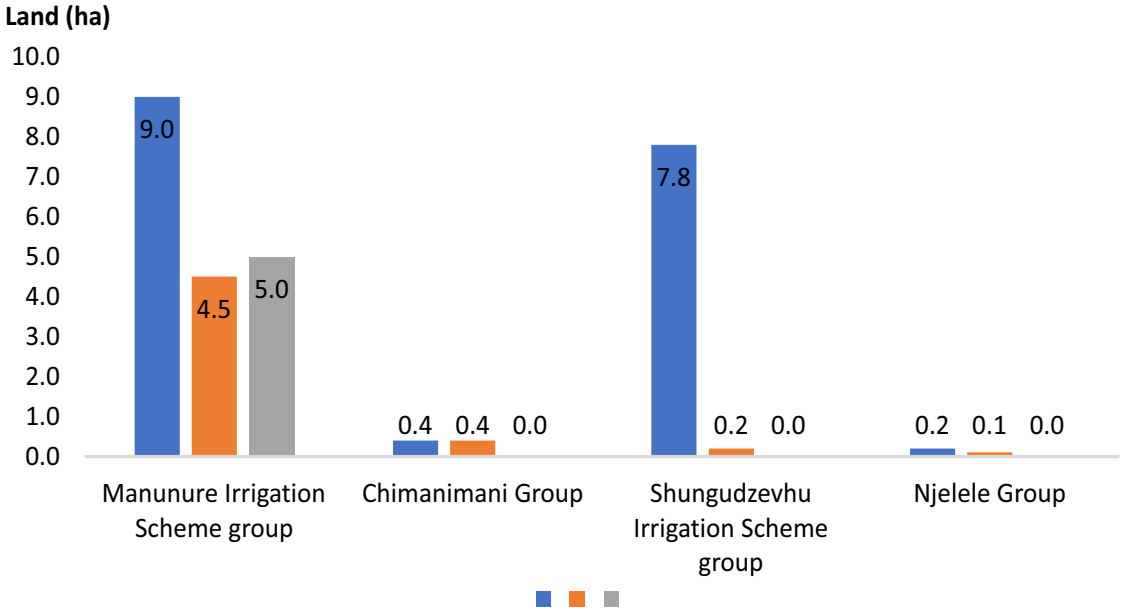


Graph2. Production (tons) of HIB varieties in the intervention areas

The HIB varieties were introduced to the farmer groups for the first time during the 2018/19 season. It clearly appears that the variety NUA45 is being produced more than Sweet Violet and Cherry varieties (Graph2). It was revealed that most farmers are venturing more into NUA45 production as may be seen

by the land under NUA45 because of its palatability, fast cooking attributes, short season duration and better returns compared to the other varieties.

Before the HIB Compact intervention in Manicaland, Mashonaland Central and Midlands Provinces, the farmer groups that were engaged had not previously cultivated HIB. The land coverage is establishing on a **0**-baseline value.



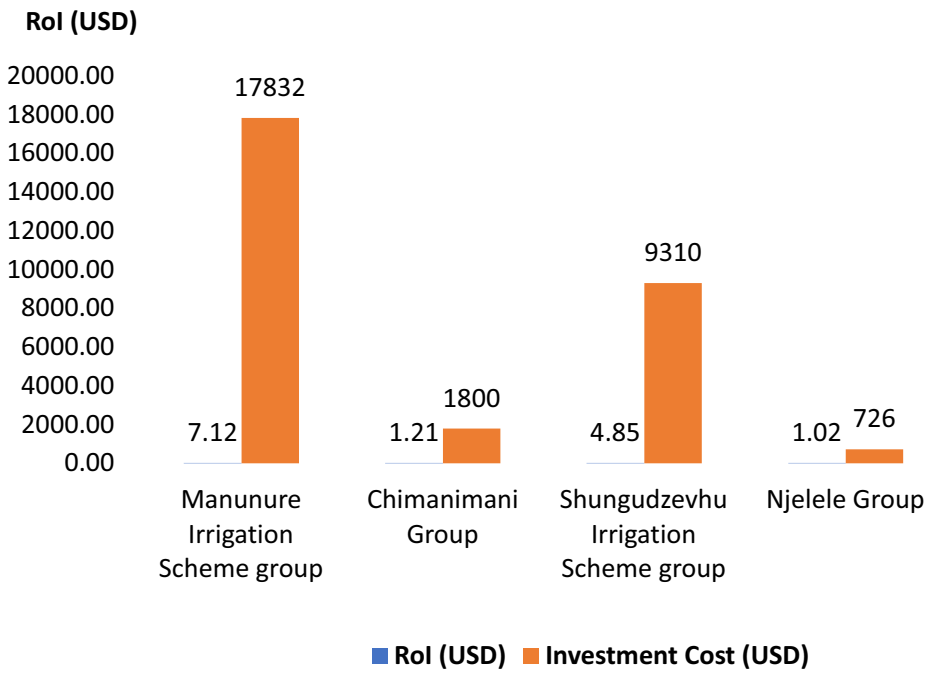
Graph3. Land (ha) covered by HIB varieties in the intervention areas

Graph 3 shows that Chimanimani and Njelele have the least acreage allocated to NUA45 and Sweet Violet varieties. This is basically because the fields on the lowlands were washed away by the cyclone Idai compared to those on highlands.

Farm abandonned after cyclon Idai in Chimanimani

Return on Investment

The study also wanted to analyze the RoI over investment cost per each group to understand how the different groups are making profits over the investment done to engage into profitable seed system.



Graph 4. Return on Investment versus Investment Cost per group

Graph4 shows that when farmers invest higher amount of money for seed production, they are likely to get higher RoI. For instance, the Manunure's investment of $17,832 was translated to $7.12 RoI, Shungudzevhu's investment of $9,310 translated to $4.85 RoI and Njelele group ranked last with a RoI of $1.02 for an investment of $726. The two first groups are likely to continue investing in HIB seed production because they get a premium from seed companies by producing NUA45 seeds and they have higher returns than others.

- In Manunure, the HIB agri-enterprises are financially viable, and the value of production is enough to cover the farmers' total variable costs of production. They, thus, have a positive impact on the return of capital. Improved awareness in GAP, especially the importance of using certified HIB seed, coupled with more involvement of youths have had a positive effect on increased production area and volumes as well as utilization rate of HIB technologies.

- In Chimanimani, the HIB enterprises per group are financially attractive for participating households. This comes as no surprise as the participating farmers were exposed to HIB GAP and are thus realizing the benefits of using high yielding, certified HIB varieties as well as working collectively in production and marketing.

- In Shungudzevhu, the analysis of the HIB enterprises confirms that the interventions are financially attractive for participating households since they were able to at least cover the cost of production during the season given the positive impact on the return to capital. Participation of youths is encouraging, they now own plots dedicated to them. This ensures they are independent and can therefore take farming as a business.
- In Njelele, the financial results show that the incremental returns are attractive for the youth farmers as they can cover the cost of producing HIB with the resultant positive return to investment. The high investment (65% of total investment) by farmers is a positive indicator for sustainability of the HIB interventions. There is a notable high yield level attributed mainly due to collective action (hence exchange of knowledge) and application of GAP

Lessons learned

As part of learning processes, a couple of lessons were learned during the study:

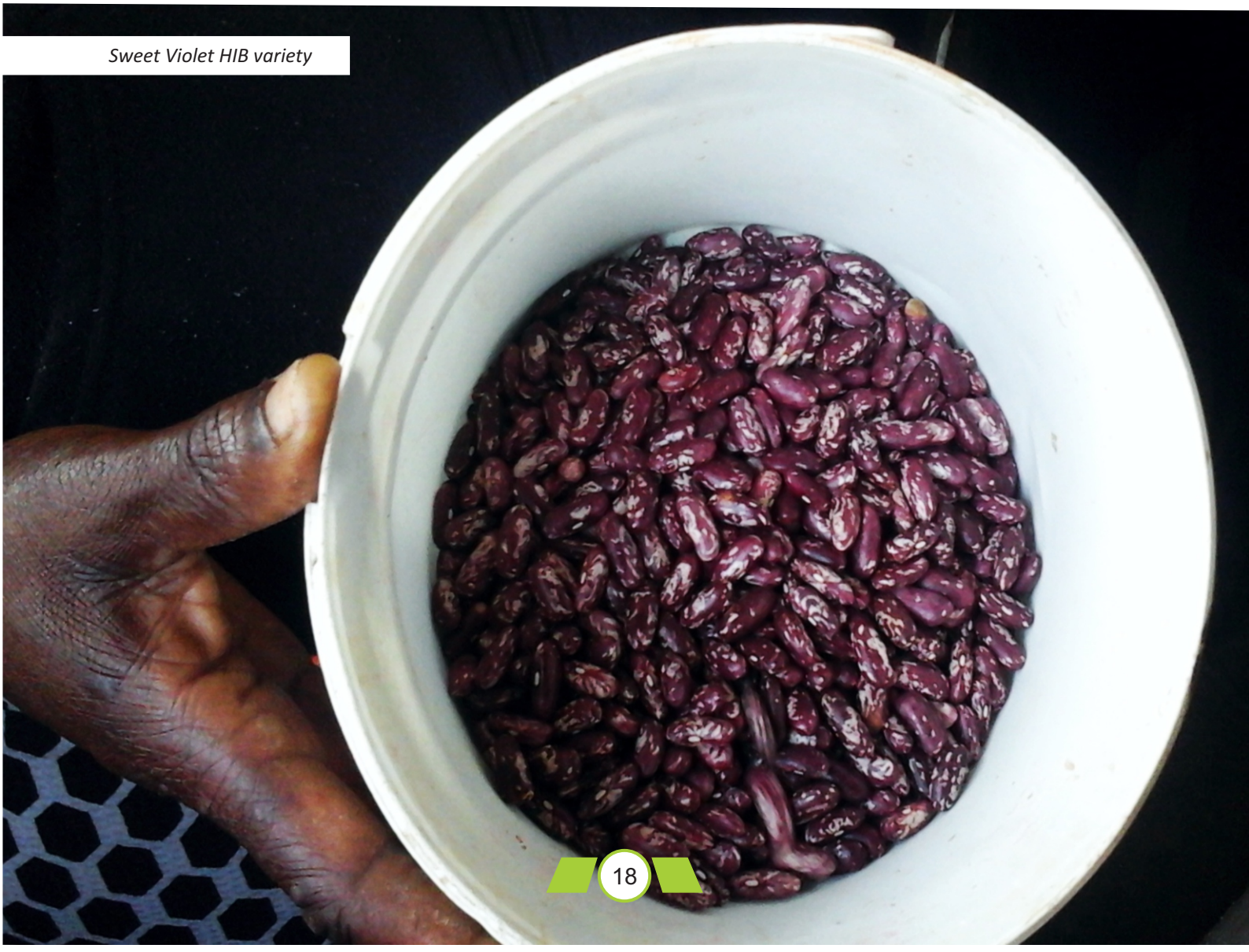
(i) Women and youths are engaged mainly in HIB grain production for value addition to improve on household dietary requirement and food diversification. On the other hand, men are engaged in seed production where they get premium prices through contract agreement with seed companies. This helps them to improve on their livelihood system by changing house structure, meeting school fees and catering for medication. Men are the champions of the HIB seed system in Zimbabwe. Prior to TAAT HIB intervention in these communities, bean production was considered not lucrative and women's crop. But with the TAAT HIB Compact, it is a game changer for sustainable seed system.

(ii) Another lesson learned is that in Chimanimani District, despite the fact that women are engaged in entrepreneurship and value addition through processing of HIB grains into different by-products, they still lack good knowledge on entrepreneurship, marketing, business plan development food hygiene and safety. They are exposed to serious environmental threats, women who used and planted HIB improved varieties to enhance household food and nutrition security, reported to have been left more vulnerable by the aftermath of the cyclone with high risk of falling into food and nutrition insecurity. They had also reported that investment in subsequent seasons will be reexamined as they do not have access to weather forecast and information for better disaster preparedness to make sound decision CSA practices.

Conclusions

Climate change adaptation coupled with a good disaster preparedness is a major driver in productivity improvement for fragile agro-ecological zones such as the north-eastern bean corridor in the Manicaland province of Zimbabwe which was cripplingly hit by cyclone Idai in March 2019 while the area is considered as the food basket of the country. During the study, it was observed that most HIB growers are women and youths. These were seriously impacted by the repercussion of the cyclone Idai, albeit men were also affected but they have a greater capacity to rapidly recover from threats than women and youths. The empowerment of women and youths to climate change adaptation is contributory to sustain the actions of the TAAT HIB Compact in Zimbabwe. Increasing awareness creation, access to information on CSA and knowledge on weather forecast through community sensitization campaigns as requested by women, will increase greater uptake of HIB technologies and GAP; and enhance the resilience of communities and food systems to climate shocks and disasters (FAO, 2018). Nevertheless, the World Bank, FAO and IFAD (2015) recommends that policies, institutional arrangements, and investments to create an environment conducive to gender- responsive CSA are the major pillars that countries need to develop plans for climate change adaptation and mitigation in agriculture. In this perspective, it is our view that the TAAT HIB Compact should engage a Policy dialogue with the Government of Zimbabwe to address climate change given the importance of HIB intervention for farmers.

The study has revealed that as a result of the TAAT HIB Compact interventions, farmers have increased productivity averaging 1.08t/ha for NUA45, Sweet Violet 0.72t/ha and Cherry 0.79t/ha across the 4 groups. The study also revealed that the HIB Compact has generated on average a RoI of $8.35 for an average investment of $5.61 per farmer. Women and youths are now engaged in profitable entreprises along the HIB processing while men are engaged in seed production to get higher returns as described in previous sections.



Sweet Violet HIB variety

Recommendations

From M&E points of view, the following recommendations have been formulated to be considered by the Compact in order to improve on the delivery processes of results:

The Compact should work closely with Enablers to create a conducive environment for scaling in areas needed. For instance, work with the Soil Fertility Enabler (SFE) Compact to support farmers in soil fertility management issues, the soils in most of the areas visited are degraded; Capacity Development and Technology Outreach (CDTO) Enabler Compact to capacity build the groups in areas identified, ENABLE-TAAT to address youth entrepreneurship issues building on their current expertise to engage youth in agribusiness, etc.

There is need to support the women groups to register as cooperative so that they can operate as business-oriented entities and penetrate the market. In this regard, the Compact should direct its efforts in facilitating collective action though capacity building and ensure that farmers have access and use of warehouse facilities to aggregate their produces and increased bargaining power for better market prices and higher returns.

Mowing forwards since HIB is a CSA crop, the HIB Compact should focus its efforts towards adoption and uptake of this technology by more women, youth and other vulnerable groups for effective management and sustainable agriculture and food system actions to fight against food and nutrition security in other agro-ecological zones.

Although women venture into promising agri-entrepreneurship, the processing of HIB into by-products is done in very antiquated conditions without meeting food safety standards and requirement. An area of improvement by the TAAT HIB Compact to ensure that all processing equipment are available and affordable by farmers and especially women to produce value added products safe for human consumption and health. In this regard, capacity building of different groups is key for proper agribusiness development. The Compact may envisage training on post-harvest handing techniques, high quality HIB flour processing, food safety and hygiene handling to meet certain international standards, record keeping and marketing.

The Compact should become more visible by participating in agricultural activities at the ward, district, provincial, national and regional levels during food shows and festivals to showcase HIB work in the country and gain more visibility for scalability country-wide.

Limitations of the study

The study was conducted in 3 Provinces (Manicaland, Mashonaland Central and Midlands) in 6 Districts and in 5 wards. However, to clearly assess the outcomes of the TAAT HIB intervention and after analysis, data collected from the Tsunda Irrigation Scheme group in Bindura District at Mashonaland Central Province were dropped out. This is a CBSPO working with CIAT HarvestPlus and Tosek/Zadzamadura seed company but had not benefited from TAAT funds and the leadership was solely that of CIAT-HarvestPlus and therefore would not qualify for inclusion as an outcome from TAAT funding and leverage. On this basis we dropped it out from the report.

References

FAO. (2018). Tackling Climate Change Through Rural Women's Empowerment. CA0178EN/1/07.18

Fink, G., Sudfeld, C.R., Danaei, G., Ezzati, M., and Fawzi, W.W. (2014). "Scaling-Up Access to Family Planning May Improve Linear Growth and Child Development in Low and Middle-Income Countries." PLoS ONE 9(7): e102391. Doi: 10.1371/journal.pone.0102391.

FNC, (2018). Zimbabwe National Nutrition Survey. Available online https://www.unicef.org/zimbabwe/media/1056/file/Zimbabwe%202018%20National%20Nutrition%20Survey%20Report.pdf, consulted on 15/10/2019

Funes, J., Sun, L., Benson, T., Sedano, F., Baiocchi, G. Birol, E. (2019). Impact of iron biofortified beans on yields and farmers' incomes: The case of Rwanda. Conference paper/Presentation. Available online https://www.researchgate.net/publication/335741560_Impact_of_iron_biofortified_beans_on_yields_and_farmers'_incomes_The_case_of_Rwanda, consulted on 03/03/2020

Jiri O., Chivenge P., and Mafongoya L., (2017a). Climate Smart Crops for Food and Nutritional Security for Semi-Arid Zones of Zimbabwe. *Afr. J. Food Agric. Nutr. Dev. 2017; 17(3): 12280-12294*Katsi, M. (2020). Biofortified Crops Improve Farmers' Livelihoods in Zimbabwe. Available online http://www.ipsnews.net/2020/01/biofortified-crops-improve-farmers-livelihoods-zimbabwe/ consulted on 03/03/2020

Mulambu, J., Andersson, M., Palenberg, M., Pfeiffer, W., Saltzman, A., Birol, E., Oparinde, A., Boy, E., Herrington, C., Asare-Marfo, D., Lubobo, A., Mukankusi, C. and Nkalubo, S. (2017). Iron beans in Rwanda: Crop development and delivery experience. *Afr. J. Food Agric. Nutr. Dev. 2017; 17(2): 12026-12050*

Nchanji, E. and Mutari, B. (2019). High Iron and zinc beans: The new panacea for malnutrition in Zimbabwe. Available online http://www.pabra-africa.org/high-iron-and-zinc-beans-the-new-panacea-for-malnutrition-in-zimbabwe/consulted on 27/02/2020, consulted on 03/03/2020

Obert Jiri Paramu L. Mafongoya Pauline Chivenge, (2017b). Building climate change resilience through adaptation in smallholder farming systems in semi-arid Zimbabwe. International Journal of Climate Change Strategies and Management, Vol. 9 Iss 2 pp. 151 – 165

PABRA. (2018) Available online. https://cgspace.cgiar.org/bitstream/handle/10568/96153/13.%20Zimbabwe%20Corridor%20Brief_CGSPACE.pdf?sequence=1&isAllowed=y, consulted on 03/03/2020

Unganai, L.S. and Murwira, A. (2010). Challenges and opportunities for climate change adaptation among small-holder farmers in southeast Zimbabwe. Second International Conference: Climate, Sustainability and Development in Semi-arid Regions, Harare

USAID. (2018). Available online. https://www.usaid.gov/sites/default/files/documents/1860/Zimbabwe_CDCS_2016-2021.pdf, consulted on 10/10/2019

USAID. (2018). Available online https://www.usaid.gov/sites/default/files/documents/1864/Zimbabwe-Nutrition-Profile-Mar2018-508.pdf, consulted on 10/10/2019

World Bank. (2017). Zimbabwe Country Factsheet. Available online https://data.worldbank.org/country/zimbabwe, consulted on 10/10/2019

World bank, FAO and IFAD (2015). Gender in Climate-Smart Agriculture. Module 18 for the Gender in Agriculture Sourcebook.

ZIMSTAT. (2015). Facts and Figures. Available online http://www.zimstat.co.zw/sites/default/files/img/publications/Facts%20and%20Figures/Fact_Figures_2015.pdf, consulted on 10/10/2019

ZimVAC. (2017). Available online https://reliefweb.int/sites/reliefweb.int/files/resources/ZimVAC-2019-Rural-Livelihoods-Assessment-Report.pdf, consulted on 15/10/2019

Zimbabwe National Statistics Agency and ICF International. 2016. Zimbabwe Demographic and Health Survey 2015: Final Report. Rockville, Maryland, USA: Zimbabwe National Statistics Agency (ZIMSTAT) and ICF International.

AFRICAN DEVELOPMENT BANK GROUP
GROUPE DE LE BANQUE AFRICAINE
DE DÉVELOPPEMENT

Technologies for African
Agricultural Transformation

For more information, please contact:
TAAT Programme Management Unit, IITA HQ, Ibadan – Nigeria
TAAT Clearinghouse, IITA Benin, Cotonou – Benin
TAAT-Africa@cgiar.org +229 60855188

PARTNERS: