



Service Delivery Model Analysis

Africa Improved Foods,
Rwanda
Public case report

June 2021

Introduction of IDH and the SDM analysis

Importance of Service Delivery

Agriculture, including forestry, plays a key role in the wellbeing of people and planet. 70% of the rural poor rely on the sector for income and employment. Agriculture also contributes to climate change, which threatens the long-term viability of global food supply. To earn adequate livelihoods without contributing to environmental degradation, farmers need access to affordable high-quality goods, services, and technologies.

Service Delivery Models (SDMs) are supply chain structures which provide farmers with services such as training, access to inputs, finance and information. SDMs can sustainably increase the performance of farms while providing a business opportunity for the service provider. Using IDH's data-driven SDM methodology, IDH Farmfit analyzes these models to create a solid understanding of the relation between impact on the farmer and impact on the service provider's business.

Our data and insights enable businesses to formulate new strategies for operating and funding service delivery, making the model more sustainable, less dependent on external funding and more commercially viable. By further prototyping efficiency improvements in service delivery and gathering aggregate insights across sectors and geographies, IDH Farmfit aims to inform the agricultural sector and catalyze innovations and investment in service delivery that positively impact people, planet, and profit.

IDH Value Chain Development

This specific SDM analysis was commissioned by the IDH Value Chain Development Program, which focuses on Africa and is aimed at creating economically viable, inclusive and resilient agricultural value chains. It supports SMEs and smallholder farmers to meet the quality, volume and compliance requirements of global brands, retailers and traders. To support this approach, the scope of this SDM analysis has been adjusted to provide insight into the business case for partner in the value chain, like cooperatives and input providers. In this way the SDM can help to inform the design of potential subsequent technical assistance (TA) support or investment.

Thanks

IDH would like to express its sincere thanks to Africa Improved Foods for their openness and willingness to partner through this study. By providing insight into their model and critical feedback on our approach, Africa Improved Foods is helping to pave the way for service delivery that is beneficial and sustainable for farmers and providers.



Chapter overview

Throughout the report, you can click the corresponding icons on the left of each page to be taken to the first page of that chapter



1. Executive Summary

- States the current situation and the purpose of the analysis
- Lays out the main findings, recommendations and potential next steps



2. Recommendations

- Contains all the recommendations to improve the business model and overcome challenges
- Provides all the supporting arguments to back up the recommendations



3. Annex

- Outlines the context in which the SDM operates
- Provides an insight in the strategy and financial performance of Africa Improved Foods
- Provides details on the income projections for different farmer segments
- Lists all the relevant underlying assumptions for the analyses



1. Executive summary



This section:

- *States the current situation and the purpose of the analysis*
- *Summarizes the main findings, recommendations and potential next steps*

This SDM analysis aims to answer the question: How can Africa Improved Foods increase and sustain volumes of locally grown maize sourced for its Rwandan production facility?

Situation

- Africa Improved Foods (AIF) is a public-private partnership involving Royal DSM, Government of Rwanda, IFC, CDC Group and FMO. AIF provides solutions to malnutrition via local production of highly nutritious foods and is operational since December 2016.
- AIF is a social enterprise and partners with non-profit institutions, such as the World Food Programme & Governments, as well as making affordable commercial products for the mass market.
- AIF currently sources 30,000 MT of grade 1 maize, of which up to ~50% comes from Rwandan maize farmers.
- Africa Improved Foods (AIF) in Rwanda aims to increase its volume of grade 1 maize sourced from Rwandan farmers to 30,000MT, with the objective of:
 - Improving farmer livelihoods; and
 - Contributing to rural development.

Complication

- Yields, quality and contract compliance of Rwandan maize farmers are currently too low for AIF to achieve its local sourcing ambition
- In order to address these challenges, AIF has partnered with IDH, Yara and Syngenta on the “Yield Improvement Project”:
 - Nov '20 – June '21
 - Project objectives:
 - Enhance maize productivity of 17,000 farmers;
 - Improve the livelihoods and nutrition of farmers and rural communities;
 - Increase youth and women empowerment;
 - Improve agricultural practices and know-how;
 - Strengthen capacity building of 34 cooperatives;
 - Increase access to post-harvest handling services;
 - Improve registration of agrochemicals in Rwanda.

Solution

The key question of this SDM analysis is: “**How can AIF increase and sustain volumes of locally grown maize sourced for its Rwandan production facility?**”

This SDM analysis report is structured to answer this question along the following elements:

- (1) By understanding the [total cost of sourcing](#) per MT sourced through different sourcing channels;
- (2) By understanding [growth opportunities](#) for AIF and partners; and
- (3) By strengthening the [long-term sustainability](#) of the local sourcing model.

Based on the outcomes of the analysis, we have formulated findings and recommendations that should support the AIF in further strengthening the local maize value chain in Rwanda

- Our SDM analysis demonstrates that it is possible for AIF to source their full maize requirement locally and profitably by 2025, while having a positive impact on farmer livelihoods in Rwanda. A few things should be explicitly mentioned as context:
 - For AIF to claim an impact on farmer livelihoods through local sourcing, it is not sufficient to source locally or even directly from cooperatives. **The impact on farmer livelihoods is achieved through onboarding cooperatives and farmers onto a Service Delivery Model (SDM)** such as the Yield Improvement Project, as our farmer and cooperative income projections demonstrate;
 - Sourcing from cooperatives that are onboarded onto the Yield Improvement Project is only [slightly more expensive](#) per kg for AIF than sourcing through the cheapest sourcing channel, sourcing partnerships.
- All partners that we studied benefit from participating in the Service Delivery Model established by the Yield Improvement Project:
 - [Farmer incomes](#) will continue to be very low (the gap to living income will still be 81% for farmers in the East 1 and 90% in the South) but their net income will increase by 71% and 11% respectively;
 - [Coops](#) can grow revenues and net income tremendously through predictable and sustained growth in trade of maize and high-quality inputs, and benefit from higher member loyalty;
 - The Yield Improvement Project provides [Yara and Syngenta](#) with sufficient market to establish operations locally;
 - [AIF](#) can achieve its target of sourcing all maize from SDM cooperatives in a financially sustainable way, but potential bottlenecks exist from the working capital requirements and existing silo storage capacity.
- Our analysis assumes that the Yield Improvement Project leaves potential value creation untapped: we expect that farmers will not be able to afford 100% of the recommended inputs made available by Yara and Syngenta, and no adequate financing is currently available to bridge this gap. For that reason, we recommend AIF to strengthen the long-term sustainability of the local sourcing model by ensuring farmers gain access to adequate financing by:
 - Strategic investment in [cooperative development](#) to increase the resilience of cooperatives as business partners;
 - The set-up of [financing solutions](#) for the purpose of purchasing high-quality inputs, that are channelled through cooperatives.
- Assuming that any additional costs related to cooperative development and financing solutions are not carried by AIF, the further increase in sourcing efficiency through cooperatives is expected to reduce the gap between the total cost of sourcing through SDM cooperatives and that of the cheapest sourcing channel [by another 25%](#).



2. Recommendations



This section:

- *Contains all the recommendations to improve the business model and overcome challenges*
- *Provides all the supporting arguments to back up the recommendations*

We recommend AIF to assess the total cost of sourcing per MT for different sourcing channels

Recommendation 1:

We recommend AIF to assess the total cost of sourcing per MT for different sourcing channels

Pillar 1

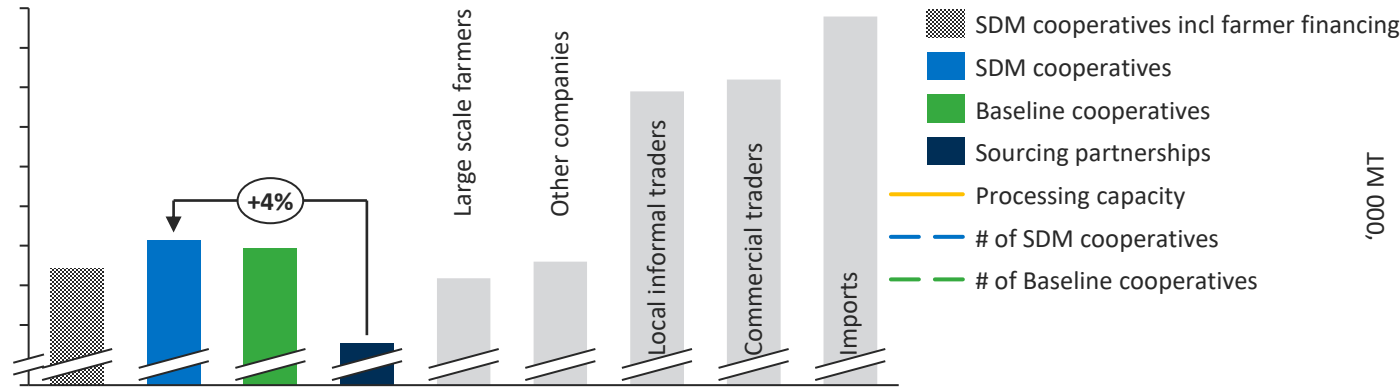
1.A

In order to source all required maize directly from Rwandan cooperatives by 2025, we project that AIF will only need to onboard a total of 43 cooperatives onto the Yield Improvement Project

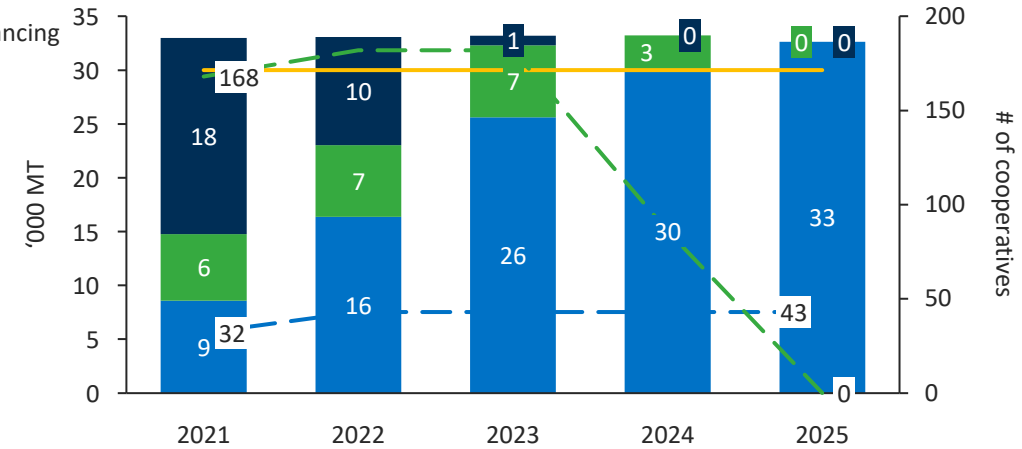
2. Recommendations | Recommendation 1.A: Total cost of sourcing

In order to source all required maize directly from Rwandan cooperatives by 2025, we project that AIF will only need to onboard a total of 43 cooperatives onto the Yield Improvement Project

Cost of sourcing per sourcing channel
RWF/kg



Annual volume projection per sourcing channel & # of coops required
'000 MT/year



Explanation

- AIF currently sources from numerous other sourcing channels, and it is AIF's ambition to transition towards sourcing primarily from Rwandan cooperatives at the latest by 2025. For the purpose of this analysis, we consider two types of cooperatives from which AIF sources maize: an **SDM cooperative** is onboarded onto the Yield Improvement Project, a **Baseline cooperative** is not. Sourcing through an SDM cooperative has impact on [farmer livelihoods](#) and [rural development](#) and is therefore considered the preferred sourcing channel.
- Our analysis concludes that the total cost of sourcing through this channel is only █ RWF/kg more costly than sourcing through the cheapest alternative channel – **sourcing partnerships**¹. This difference is reduced from 4% to 3% in the hypothetical situation in which farmers have access to adequate financing, as it would allow farmers to further increase total production through increased adoption of recommended quantities of high-quality inputs. This gives cooperatives bigger volumes to aggregate from the same number of farmers, increasing the efficiency of the sourcing channel and reducing the total cost of sourcing per kg for AIF.
- It is interesting to note that cooperatives onboarded onto the Yield Improvement Project (typically **larger** than the average coop) will see such **increases in volumes** of grade 1 maize, that as of 2025 a group of merely **43 East Rwandan cooperatives**² can supply AIF with the required **30,000 MT**³ of grade 1 maize.

¹Sourcing partnerships are organizations that support vulnerable cooperatives with linkage to buyers (such as AIF). They partners help organize the contracts between cooperatives and buyers. ²The actual number of cooperatives needed will depend on the actual vs modelled size of the cooperatives. ³For 30,000 MT to be available for processing, slightly more than 30,000 MT needs to be sourced to account for losses and rejections.

We recommend AIF to understand the growth opportunities for all critical partners in the value chain

Recommendation 2:

We recommend AIF to understand the growth opportunities for all critical partners in the value chain

Pillar 2

2.A

Farmer incomes will continue to be very low, but will increase

2.B

Coops can grow revenues and net income tremendously through predictable and sustained growth in trade of maize and high-quality inputs, and benefit from higher member loyalty

2.C

The Yield Improvement Project provides Yara and Syngenta with sufficient market to establish operations locally

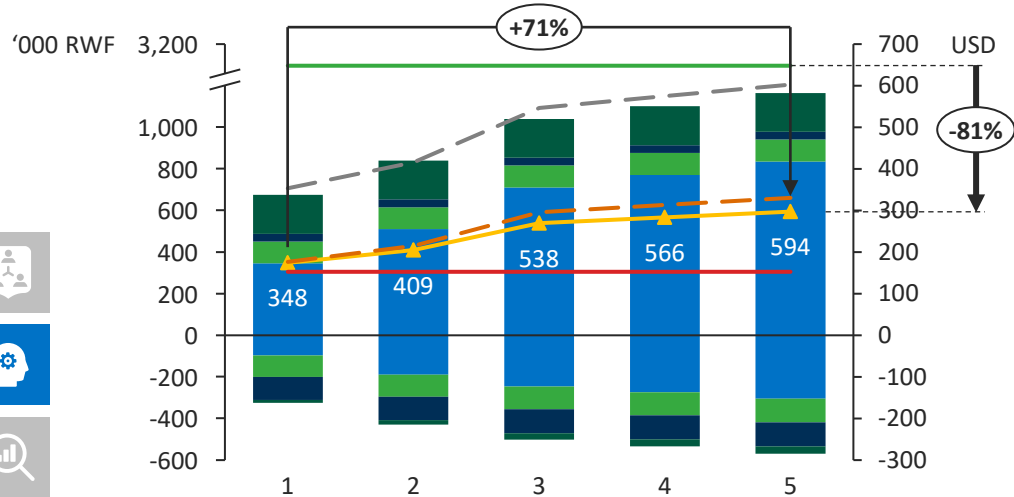
2.D

AIF can achieve its target of sourcing all maize from SDM cooperatives

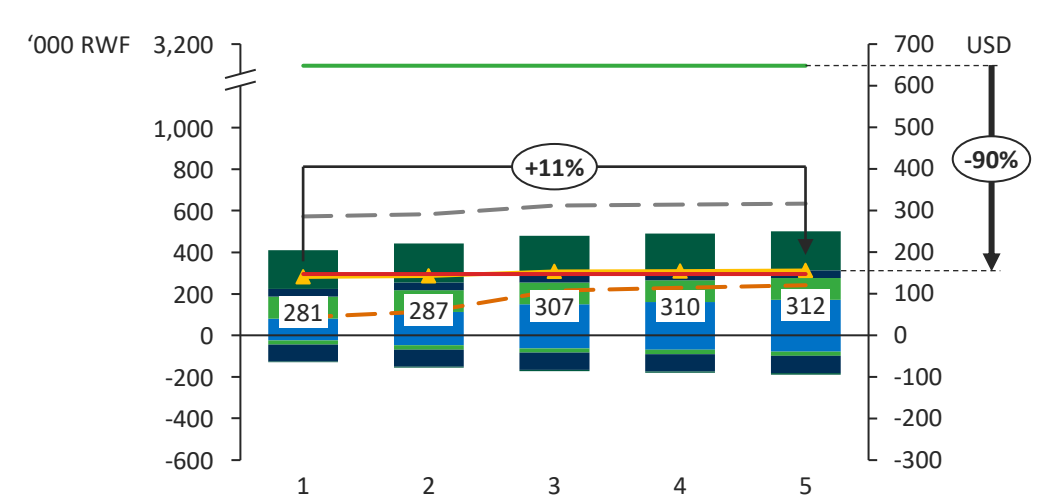


Farmer incomes will continue to be very low, but will increase

SDM farmers – East Rwanda (segment 1, 0.8 ha maize)
Annual net income split by revenue and expenses drivers



SDM farmers – South Rwanda (segment 2, 0.2 ha maize)
Annual net income split by revenue and expenses drivers



- Maize revenue
- Non-SDM crop income
- Livestock net income
- Off-farm net income
- Other expenses
- Equipment expenses
- Labour expenses
- Inputs expenses
- ▲ Net income
- Net income (per ha)
- Net income (USD)
- Baseline income
- Living income

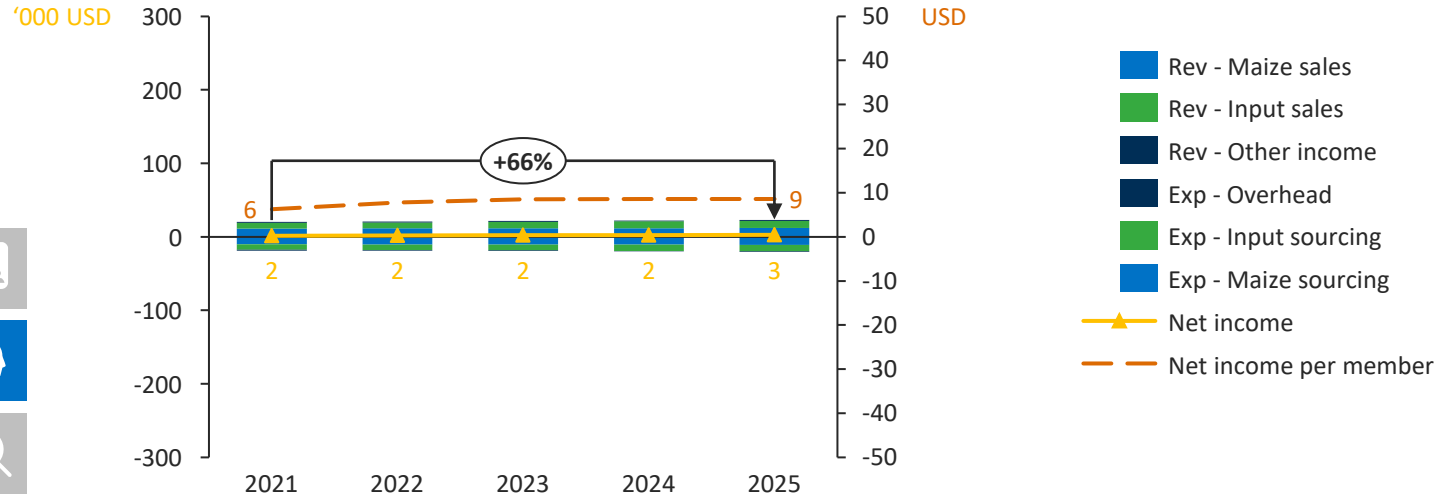
Farmer income drivers

- Farmers who are onboarded onto the Yield Improvement Project through their cooperative, are expected to increase their net incomes over the years. The main drivers for this increase are the **higher yields** and **higher quality**, as well as **lower aflatoxin-related rejections** that they can achieve through participation in the project.
- The Baseline farmer profiles that we modelled produce maize at a net cash loss, and the increase in income from maize through the SDM has leads to a [positive net result](#) for maize for farmers in the East, but not in the South. This is because a larger portion of East Rwandan farmers income comes from the production and sale of maize which is a consequence of larger pieces of land dedicated to the production of maize and higher yields in the East.
- The increase in maize revenues is dependent on and off-set by the increasing cost of inputs as a farmer is [assumed](#) to increase the quantities of high-quality inputs that are purchased over the years. Equipment and other expenses increase relative to the increase in volumes of maize produced and brought to market.
- In this analysis we have assumed that farmers will not achieve the full potential yield impact of applying high-quality inputs, as their current [cashflow](#) (without adequate financing) will not allow them to spend the cash required to purchase 100% of the recommended quantities of high-quality inputs.

Coops can grow revenues and net income tremendously through predictable and sustained growth in trade of maize and high-quality inputs, and benefit from higher member loyalty

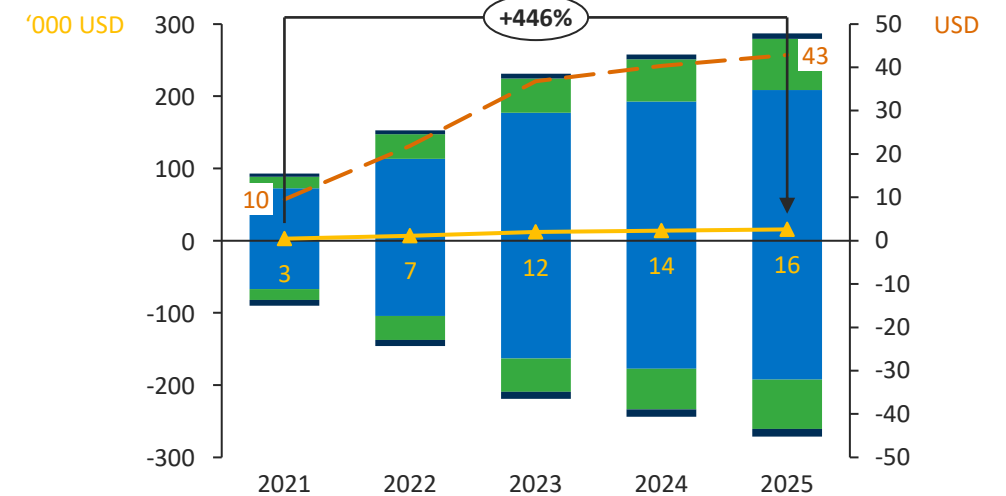
Baseline cooperative – East Rwanda

EBITDA split by revenue and expenses drivers, in '000 USD/year



SDM cooperative – East Rwanda

EBITDA split by revenue and expenses drivers, in '000 USD/year



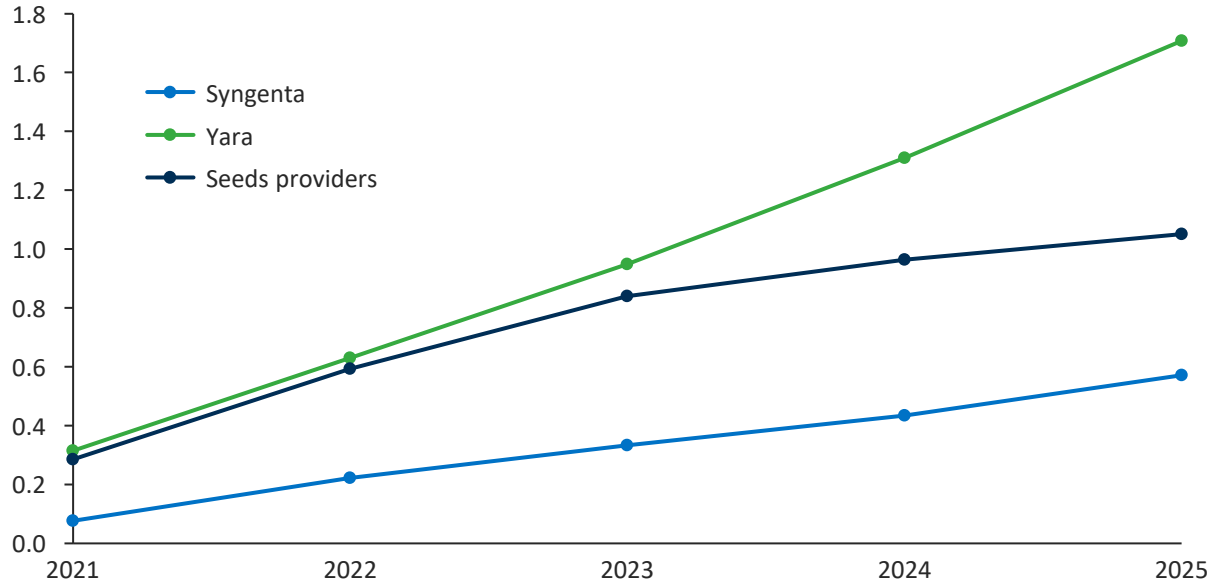
Cooperative income drivers

- Maize cooperatives in the East of Rwanda typically generate most revenues from the aggregation and sale of maize and the trade in inputs. Other income is generated from membership fees and from activities not related to maize. An overview of underlying assumptions can be found [here](#).
- We have projected the 5-year income development of two typical maize cooperatives in East Rwanda: one that is not onboarded onto the Yield Improvement Project (Baseline cooperative) and one that is (SDM cooperative, which typically has more members). Not only does the SDM cooperative trade much larger volumes, it also earns a much higher net profit and has a very steep growth curve, demonstrating the tremendous potential for cooperatives to grow. This growth will indirectly benefit the farmer members, but we recommend AIF to motivate cooperatives to use net income primarily to build internal capital as this is considered a critical step towards professionalizing cooperatives.
- As explained in the [previous section](#), the main drivers for the revenue increase in the SDM cooperative are (1) the higher volumes of grade 1 maize that become available due to improved use of high-quality inputs and increased training of Good Agricultural Practices and (2) higher levels of member loyalty to cooperatives. The slight growth in revenues of the Baseline cooperatives is due to an assumed organic increase in the number of farmer members over time.

The Yield Improvement Project provides Yara and Syngenta with sufficient market to establish operations locally

SDM revenues per input supplier over time¹

In M USD/year



SDM revenues

- This line graph reflects the modelled revenues from the [assumed sale](#) of crop protection products by Syngenta, fertilizers by Yara and high-quality seeds by local seeds providers:
 - at below 100% of recommended quantities (see table below for assumed increase in ability to purchase recommended quantities below)
 - within the scope of the 30,000 MT of maize to be processed by AIF
 - through the SDM cooperatives that are onboarded onto the Yield Improvement Project
- Only revenues are modelled, so returns for all three input providers will be lower than projected in this graph.
- On the other hand, the line graph does not consider any revenues from sales in Rwanda through other channels than the Yield Improvement Project with AIF, so total local revenues per player will likely be higher than projected here but provide a solid basis to establish operations in Rwanda

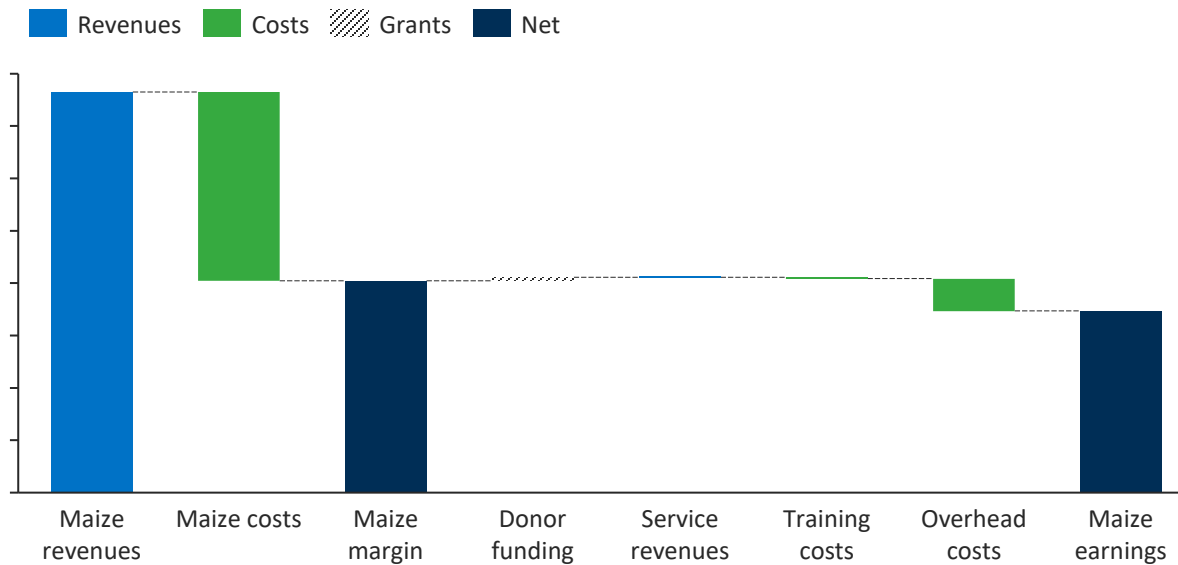
		Y1	Y2	Y3	Y4	Y5
% of recommended quantities of high-quality inputs purchased by SDM farmers	Seeds	50%	80%	100%	100%	100%
	Fertilizer - Planting	20%	30%	40%	50%	60%
	Fertilizer - Top dressing	15%	24%	36%	48%	60%
	Pesticide	3%	8%	10%	12%	15%

¹These charts do not reflect 100% of the potential size of the market, as we assume farmers will not be able to afford 100% of recommended quantities of inputs in the absence of adequate financing solutions

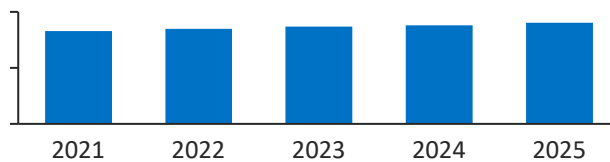
AIF can achieve its target of sourcing all maize from SDM cooperatives: in a financially sustainable way

AIF Maize earnings

Maize revenues and costs in USD, annual average 2021-25



AIF Maize gross earnings over time



Average gross profit margin 2021-25:

- AIF (maize, excl processing): █%
- SDM Coop: 8%
- Segment 1 Farmer: 26%

Financial sustainability

- The graphs on this page **do not represent the full income statement of AIF** and are to be interpreted with the following context in mind:
 - Revenues reflect those attributable to maize based on the average volume % of maize that goes into the final product
 - Costs reflect only costs related to the sourcing of maize and the processing costs attributable to maize based on that same average volume
 - The price/MT of maize as a raw material is kept constant over time, in reality prices are expected to fluctuate
- The slight growth of the maize gross earnings over time is influenced by several factors:
 - Revenues increase in line with inflation of prices
 - Cost of sourcing per MT increases slightly in the first years (2021-2023) as the cheaper volumes from the sourcing partnerships are phased out
 - This increase is off-set by efficiency gains from 2025 and more importantly by decreasing volumes and therefore cost of maize as the rejection rate decreases over time, leading to a reducing buffer of maize to be sourced to reach the required 30,000 MT for processing
 - Training costs fluctuate mainly due to the establishment of additional demo-plots (costs of establishment are higher than those of maintenance)
- The next page demonstrates the extent to which bottlenecks are expected in realizing this transition towards sourcing 100% through SDM cooperatives by 2025

AIF can achieve its target of sourcing all maize from SDM cooperatives: working capital requirement and silo storage capacity form potential bottlenecks

01

Working capital requirements could be prohibitive

Sourcing directly from cooperatives implies purchasing large volumes immediately after harvest rather than spread out over the year, and immediate payment rather than 30-day payment terms

ANALYSIS: Projected net working capital position¹

Net WC pos	2021	2022	2023	2024	2025
Bln RWF	■	■	■	■	■
Mln USD	■	■	■	■	■

¹As we did not have access to the full cash position of AIF, it was not possible to model a reliable working capital requirement. The net working capital position presented here will however be potentially heavily influenced by the cash and bank balance per year, and this makes it impossible for us to draw any conclusions from this net working capital position.

02

Drying and shelling capacity is sufficient

With the transition towards sourcing from local cooperatives comes the concentrated sourcing of maize on the cob and concentrated need for drying and shelling capacity. Looking at the year with the highest volumes sourced it becomes clear that there is sufficient monthly capacity for drying and shelling of maize on the cob

ANALYSIS: Projected drying and shelling need vs capacity per month in 2025

MT/month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Drying cap	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2	13.2
Drying req	■	■	■	■	■	■	■	■	■	■	■	■
Shelling cap	22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8	22.8
Shelling req	■	■	■	■	■	■	■	■	■	■	■	■

03

Grain silo storage capacity on site at AIF is not always sufficient

With concentrated sourcing comes the concentrated delivery of maize grain to AIF premises and a concentrated need to store maize grain in silos. Even though processing capacity lowers the volume of stored grain by enough in most months, storage capacity is not expected to be sufficient in peak months April, July and August.

ANALYSIS: Projected storage and processing need vs capacity per month in 2025

MT/month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Storage cap	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Process. cap	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Incoming vol	■	■	■	■	■	■	■	■	■	■	■	■
Storage req	■	■	■	■	■	■	■	■	■	■	■	■

We recommend AIF to strengthen the long-term sustainability of the local sourcing model

Recommendation 3:

We recommend AIF to strengthen the long-term sustainability of the local sourcing model

Pillar 3

3.A

Strategic investment in cooperative development is required to increase the resilience of cooperatives as business partners in a competitive local value chain

3.B

Adequate financing solutions will increase the likelihood of reaching the full potential of the local sourcing model

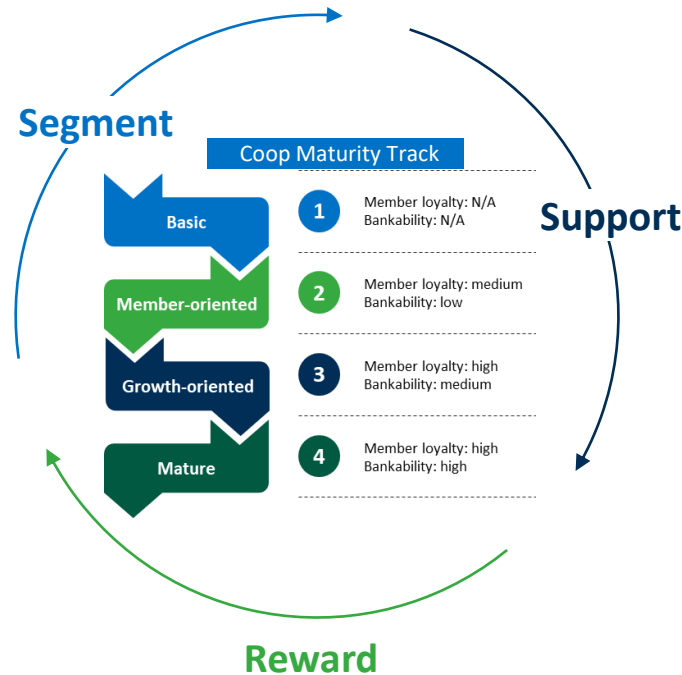


Strategic investment in cooperative development is required to increase the resilience of cooperatives as business partners in a competitive local value chain: we recommend the establishment of a Cooperative Development Program

A Cooperative Development Program would bring together traditional cooperative capacity building with increased 'security of demand' for cooperatives, allowing cooperatives to develop themselves into preferred suppliers to AIF. The blue-print for the program as set out in this section can be seen as the operationalization of AIF's ambition to bring cooperatives to higher levels of professionalism. The investment by AIF will initially consist primarily of human resources. As cooperatives mature, financial incentives are proposed.

Segment

We recommend AIF to define minimum criteria based on which a selection of cooperatives can be onboarded onto the Cooperative Development Program. At the start of each performance improvement cycle (annual or once every two years), cooperatives can be segmented by AIF, by assessing the level of member loyalty and coop bankability. Such segmentation allows AIF to plot cooperatives on the Coop Maturity Track and forms the starting point of the graduation path for each participating cooperative.







Support

Each graduation step on the path to maturity comes with additional support from AIF to the cooperative. The type of support is focussed on preparing the cooperative to make the next step on the maturity track towards the Mature segment.

Reward

We believe that the best way to reward for becoming a more effective business partner is financially and we propose several financial incentives for AIF to consider. This is to be complemented by symbolic reward in the form of recognition of performance.

Strategic investment in cooperative development is required to increase the resilience of cooperatives as business partners in a competitive local value chain: cooperatives develop along a Coop Maturity Track

Coop Maturity Track	Example thresholds per level	
	Member loyalty	Bankability
 <p>Basic</p>	<p>1 No thresholds applicable</p>	<p>No thresholds applicable</p>
 <p>Member-oriented</p>	<p>2</p> <ul style="list-style-type: none"> ✓ Off-take from farmers is structurally agreed in advance: >60% of projected volume to be traded¹, is agreed with individual farmers at the start of the season ✓ Farmer compliance is structurally administered: >50% of volume is traded according to agreements, and this is reported to coop management at the end of each season 	<p>No thresholds applicable</p>
 <p>Growth-oriented</p>	<p>3</p> <ul style="list-style-type: none"> ✓ Off-take from farmers is structurally agreed in advance: >80% of projected volume to be purchased from farmers¹, is agreed with farmers at the start of the season ✓ Farmer compliance is structurally administered: >60% of volume is traded according to agreements, and this is reported to coop management at the end of each season 	<ul style="list-style-type: none"> ✓ Farmers are structurally paid timely: <10% of accounts payable to farmers are outstanding 5 days after delivery ✓ Coop budgets and reports against budget annually: EBITDA vs budget is reported to coop management annually, Debt Service Coverage Ratio is captured
 <p>Mature</p>	<p>4</p> <ul style="list-style-type: none"> ✓ Off-take from farmers is structurally agreed in advance: >80% of projected volume to be traded¹, is agreed with individual farmers at the start of the season ✓ Farmer compliance is structurally administered: >60% of volume is traded according to agreements, and this is reported to coop management at the end of each season 	<ul style="list-style-type: none"> ✓ Farmers are structurally paid timely: >20% of off-take is pre-financed to farmers ✓ Coop budgets and reports against budget annually: EBITDA has been growing for 2 consecutive years, Debt Service Coverage Ratio is > 1.25

¹ Irrespective of whether maize is sold to AIF or to other off-takers

Strategic investment in cooperative development is required to increase the resilience of cooperatives as business partners in a competitive local value chain: a selection of coops enters the Program and enters a Segment, Support, Reward cycle

Based on this SDM analysis, we estimate that AIF will need to onboard a total of approximately 37 cooperatives onto the Service Delivery Model to reach the ambition of sourcing 30,000 MT of grade 1 maize from Rwandan farmers by 2025. To increase the long-term resilience and efficiency of the Rwandan maize cooperatives as a sourcing channel, we recommend AIF to increase the investment into the development of selected cooperatives into mature business partners.

To maximize the return on such an investment, we propose formulating minimum criteria to determine on which cooperatives to focus the investment. Below we present our suggestion for minimum criteria to select cooperatives who can participate in the Program, as well as the segmentation criteria that can be used to plot each participating cooperative on the Coop Maturity Track.



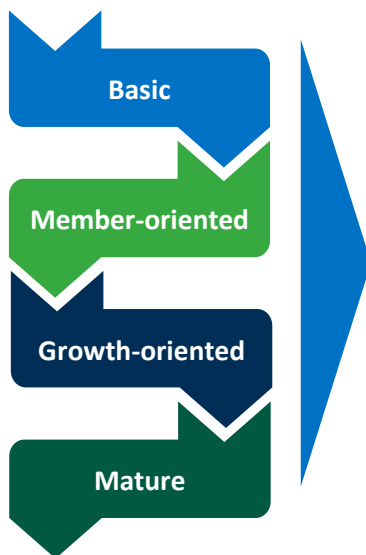
AIF COOP PORTFOLIO

Select

We recommend AIF to decide on a set of relevant and easy-to-assess minimum criteria to select which cooperatives are eligible for participation in the Cooperative Development Program, for example:

1. Min 350 hectares under management
2. Min 350 MT of maize traded in previous year
3. Max 75 kms from AIF processing factory

Segment



AIF COOP IMPROVEMENT PROGRAM

Support

- 1. Basic:**
 - Provide off-take guarantee to coop through timely contracting
 - Temporarily second project manager to support with setting up farmer management system to capture agreements and level of compliance
- 2. Member-oriented:**
 - Contractually guarantee timely payment to coop
 - Temporary second financial expert to support with setting up financial budgeting and reporting system
 - Support cooperative in rolling out mobile banking, crop insurance and farm-to-collection-centre pick-up service
- 3. Growth-oriented:**
 - Provide support in onboarding to [layer 1](#) of financing facility
 - Support coop with external assessment (SCOPEinsight, Agriterra or other) to identify remaining gaps to close
- 4. Mature:**
 - Provide support in onboarding to [layer 2](#) of financing facility

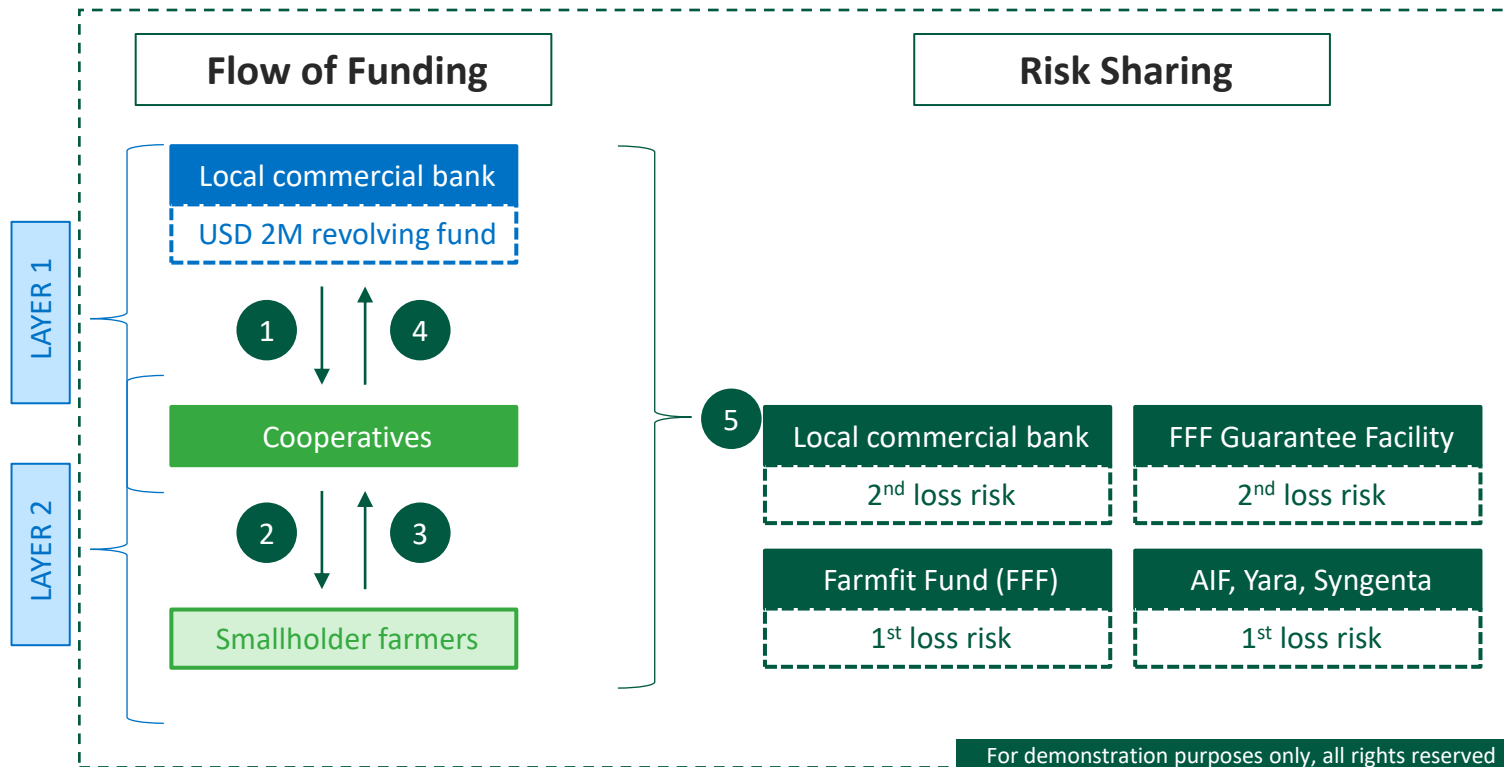
Reward

- 1. Basic:**
 - ❖ Insight into growth potential through customized cooperative P&L projection (using SDM analysis tooling)
- 2. Member-oriented:**
 - ❖ Bonus per MT for achieving overall compliance of farmers with off-take agreements of >50%
- 3. Growth-oriented:**
 - ❖ Additional bonus per MT for achieving overall compliance of farmers with off-take agreements of >80%
- 4. Mature:**
 - ❖ Provide option to buy AIF shares

All segments:

Organize annual Cooperative Academy in which assessment results are announced and graduations celebrated, with symbolic prize for best performing cooperatives

Adequate financing solutions will increase the likelihood of reaching the full potential of the local sourcing model: Growth-oriented coops are onboarded onto Layer 1, Mature coops are onboarded onto Layer 2



I. Explanation

1. Lenders provide loans to the cooperative;
2. Cooperative pre-pays 50% of value of off-take agreement to farmer, part of which is used to purchase recommended volumes of SDM inputs (Yara/Syngenta);
3. Farmers deliver maize to cooperative for as per off-take agreement; Layer 2: not necessary to implement layer 1
4. Cooperative repays lenders according to repayment schedule;
5. In case of side-selling by farmers, the risk is shared as per the risk sharing matrix¹.

II. Type of financial instrument that the Fund can use for this archetype:

- Guarantee (funded or unfunded)
- Subordinated loan

III. Maturity of Cooperatives

Cooperatives are only onboarded once they have been classified as Growth-oriented or Mature according to the [assessment criteria](#).



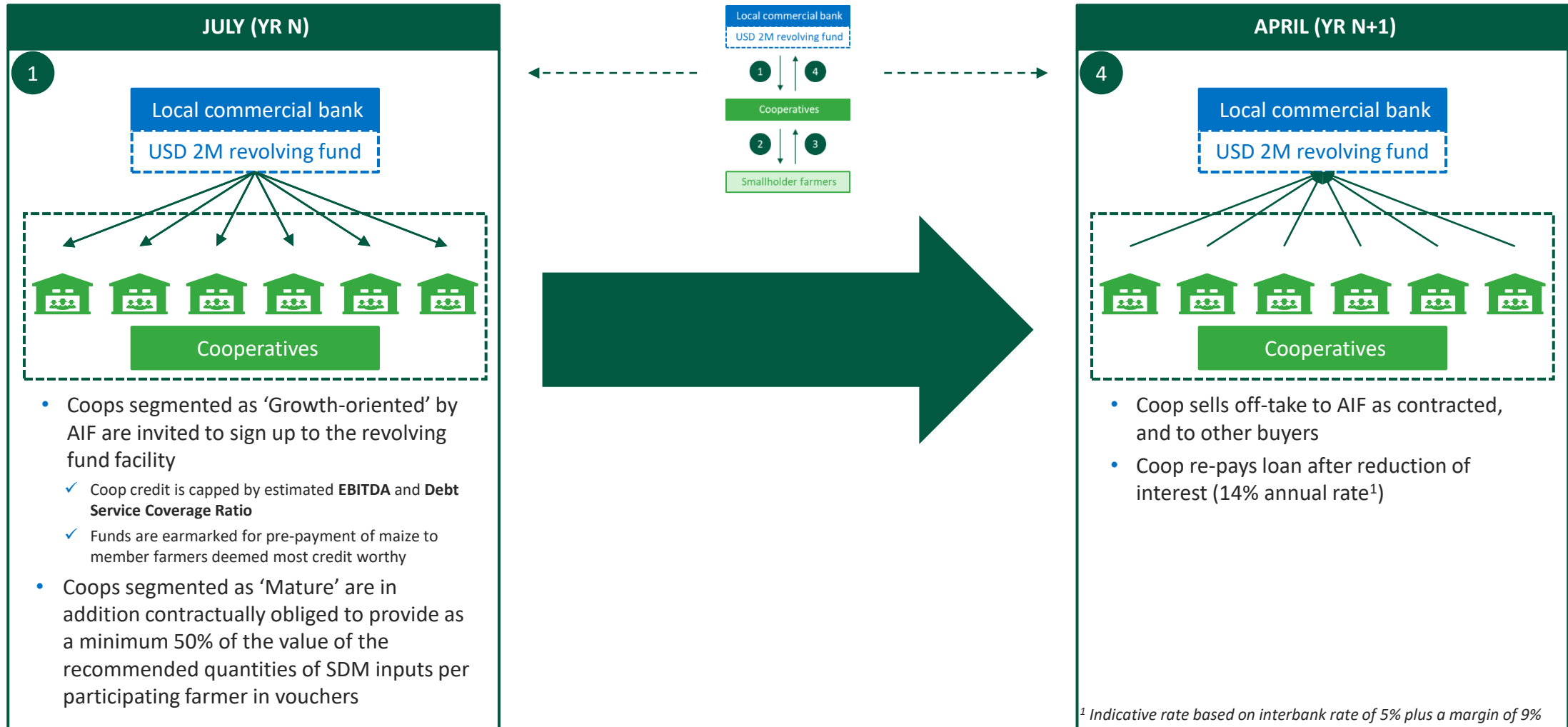
- Benefits and risks are shared across partners, increasing likelihood of success
- Facilitates cooperatives to further increase member loyalty
- Bank of Kigali potentially interested



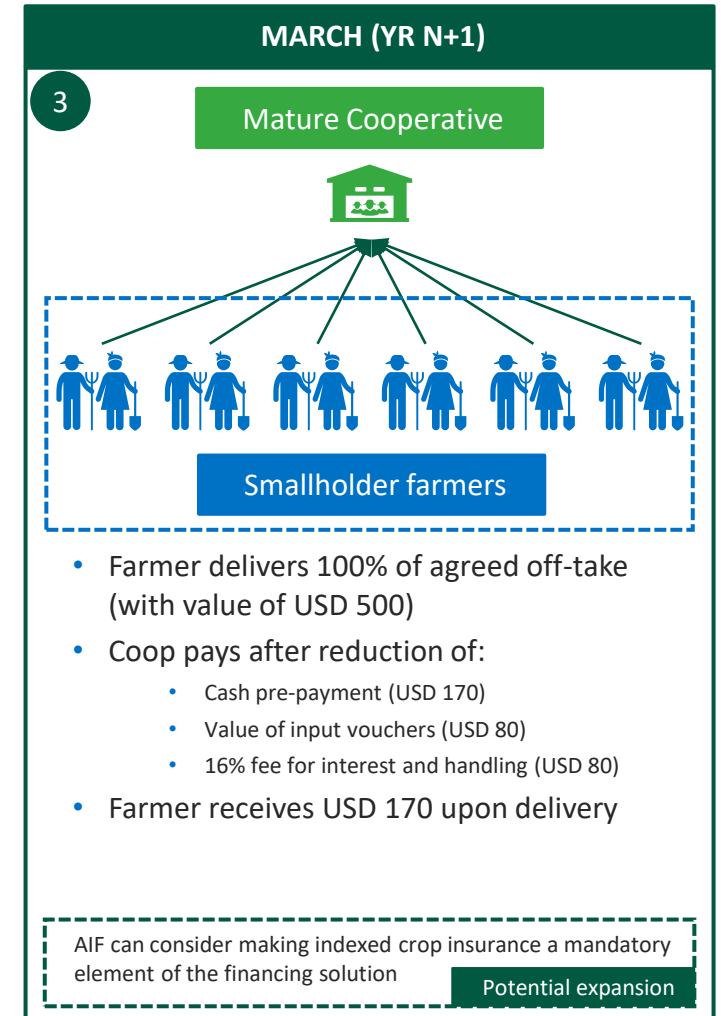
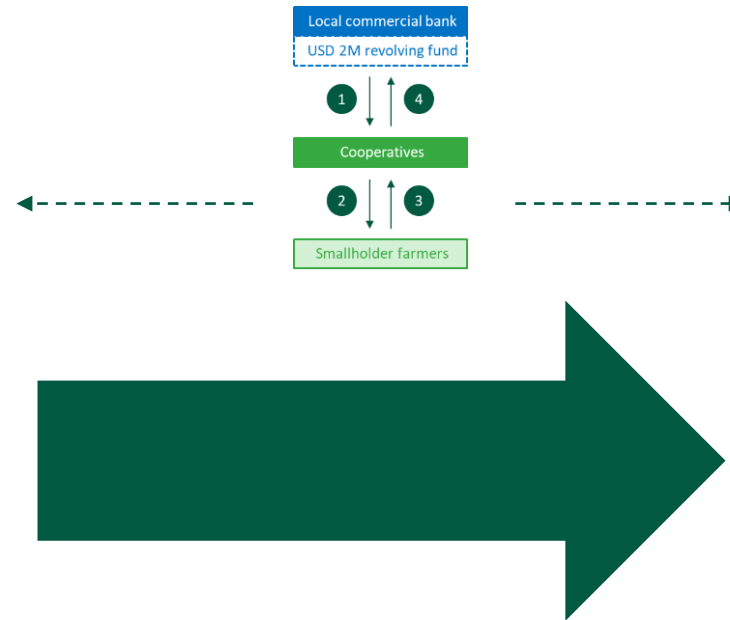
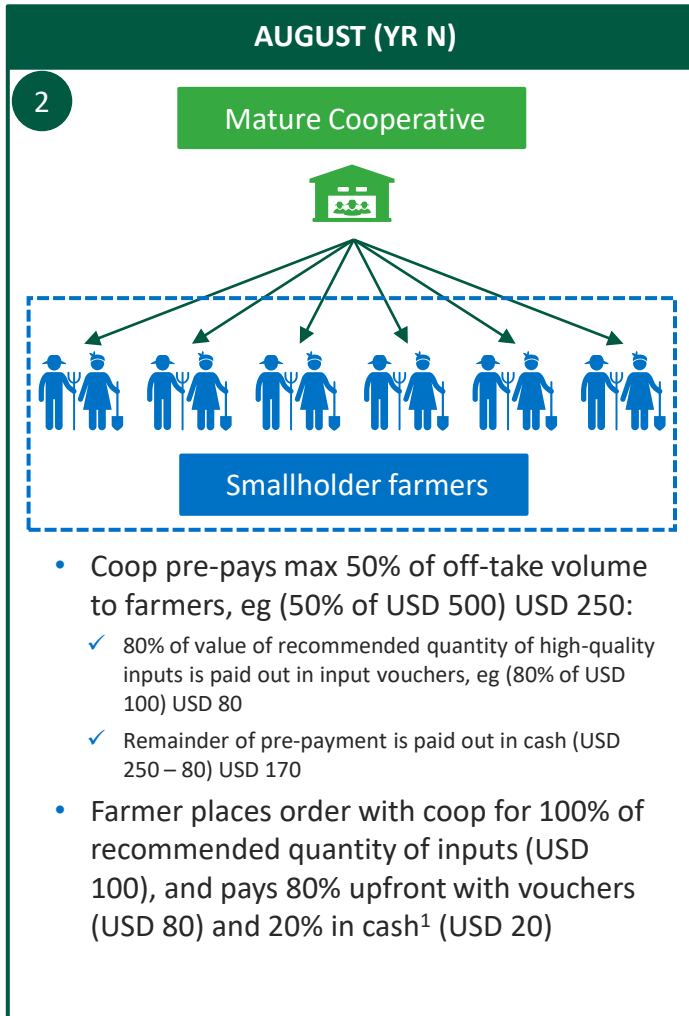
- High barrier to entry for cooperatives and therefore difficult to reach desired scale of 2M USD for the revolving fund (based on year 5 cooperative performance, 11 cooperatives would be required)
- Layer 2 is relatively complex and entails higher risks than only level 1

¹ The risk of default can be further reduced by incorporating a crop insurance product.

Adequate financing solutions will increase the likelihood of reaching the full potential of the local sourcing model: cooperatives with access to working capital in July can pre-finance farmers for season A harvest



Adequate financing solutions will increase the likelihood of reaching the full potential of the local sourcing model: farmers receiving pre-financing in August can purchase quality inputs at recommended quantities



¹ Incentives should be put in place to ensure that farmers don't end up purchasing only 80% of recommended quantities, for example: farmers that purchase full 100% of inputs have first option of supply to AIF



The below pyramid captures the summary of recommendations and supporting arguments

Audience: AIF Management
Situation: Africa Improved Foods (AIF) in Rwanda relies heavily on imported maize. However, they aim to improve farmer livelihoods and contribute to rural development by building a local supply chain to source **30,000MT** from Rwandan farmers.
Complication: Yields, quality and contract compliance of Rwandan maize farmers are currently too low for AIF to achieve its local sourcing ambition.
Question: How can AIF increase and sustain volumes of locally grown maize sourced for its Rwandan production facility?

By ① understanding the total cost of sourcing per MT sourced through different sourcing channels; ② understanding growth opportunities for AIF and partners; and ③ strengthening the long-term sustainability of the local sourcing model



Recommendation 1:
 We recommend AIF to assess the total cost of sourcing per MT for different sourcing channels

Pillar 1

1.A

In order to source all required maize directly from Rwandan cooperatives by 2025, we project that AIF will only need to onboard a total of 43 cooperatives onto the Yield Improvement Project

Recommendation 2:
 We recommend AIF to understand the growth opportunities for AIF, its partners and farmers

Pillar 2

2.A
2.B
2.C
2.D

- 2.A Farmer incomes will continue to be very low but will increase
- 2.B Coops can grow revenues and net income tremendously through predictable and sustained growth in trade of maize and high-quality inputs, and benefit from higher member loyalty
- 2.C The Yield Improvement Project provides Yara and Syngenta with sufficient market to establish operations locally
- 2.D AIF can achieve its target of sourcing all maize from SDM cooperatives in a financially sustainable way

Recommendation 3:
 We recommend AIF to strengthen the long-term sustainability of the local sourcing model

Pillar 3

3.A
3.B

- 3.A Strategic investment in cooperative development is required to increase the resilience of cooperatives as business partners in a competitive local value chain
- 3.B Adequate financing solutions will increase the likelihood of reaching the full potential of the local sourcing model

From these recommendations we have identified the required next steps, potential partners to involve, as well as the need for technical, financial or other support

Recommendation	Actions required to execute this recommendation	Type of actor best positioned to drive	Stakeholders to collaborate with	Support required?	Next step to be taken
High priority					
1. Onboard 11 additional cooperatives onto the Service Delivery Model established by the Yield Improvement Project to bring the total to 43 cooperatives and reach local sourcing ambition	<ol style="list-style-type: none"> 1. Confirm selection criteria for onboarding¹ 2. Select cooperatives 	AIF	Cooperatives	No, AIF has the resources in-house to execute this recommendation	Make the sourcing team responsible for selecting the best cooperatives
2. Operationalize the ambition to sharpen the cooperative engagement by establishing and piloting a Cooperative Development Program	<ol style="list-style-type: none"> 1. Confirm design of Cooperative Development Program 2. Select and onboard first round of cooperatives 	AIF	<ul style="list-style-type: none"> • Cooperatives • Cooperative experts (e.g., Agriterra) 	Yes, <ul style="list-style-type: none"> • Cooperative expert support to confirm design of Cooperative Development Program • Training of trainers for AIF staff 	Engage cooperative expert to support
3. Increase efforts to set up an adequate financing solution for cooperatives and farmers to achieve long-term sustainability of local sourcing model	<ol style="list-style-type: none"> 1. Secure AIF working capital required to transition to local sourcing 	AIF	<ul style="list-style-type: none"> • Yara • Syngenta • Impact funds • Local commercial banks 	Yes, <ul style="list-style-type: none"> • Liquidity provider • De-risking partners 	Continue conversations with Rabobank, Agri3 and Farmfit Fund

¹It is likely that the [selection criteria](#) suggested for the onboarding of cooperatives onto the Cooperative Development Program can be used as a starting point, as the cooperatives that are onboarded onto the SDM will also be the candidates to focus on in the Cooperative Development Program.

Our recommendations feed into the ambitions of IDH Value Chain Development and AIFs ambition to extend the Technical Assistance collaboration to establish a commercially viable value chain



TA Project Elements	
<p>Company project that requires TA</p>	<p>1. Increased commercialization of local sourcing from <u>cooperatives</u>:</p> <ul style="list-style-type: none"> - Increase yields + quality: improved practices, high-quality inputs; track changes in yield, returns to yield in project interventions. - Efficient sourcing. <p>2. Sharper cooperative engagement strategy:</p> <ul style="list-style-type: none"> - Transparent scoring; - sourcing against scoring; - <u>incentives</u> to move up scoring; - dedicated & tailored support to cooperatives. <p>3. Financing (working capital for AIF and input on credit for farmers)</p> <ul style="list-style-type: none"> - Potential payments platforms, evaluation criteria; how to structure & register farmers. Tied in with inputs credit facility. Indexed insurance? What would a good facility look like? - Different structure of credit with coops.
<p>Company ability to <u>implement</u> project</p>	<p>High: post-harvest handling, tracking of volumes and quality across supply chain.</p> <p>Med.: general agronomy support (inputs, etc.)</p> <p>Low: scaling broader support to farmers to meet sourcing targets, systematic and contextual approach (climatic projections?); tracking yield improvement & return to interventions.</p> <ul style="list-style-type: none"> - High: transparent scoring, sourcing against scoring; prioritizing cooperative engagements. - External support required: Train the trainer model for AIF staff (to provide direct support to cooperatives) <p>High: build awareness, farmer registration</p> <p>Med: roll-out solutions (train-the-trainer model, fin. Management).</p> <p>Low:</p> <ul style="list-style-type: none"> - actual working capital to support facility; - systematic approach to setting up solutions
<p>Company ability to <u>co-fund</u> project</p>	<p>AIF co-funding capacity will be assessed across the total project budget; not expected to be a constraint.</p>

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This report was developed using think-cell

3. Annex



This section includes the following subchapters:

3.1 About the context

3.2 About the strategy

3.3 Farmer impact details

3.4 Assumptions and methodology

3.1 About the context

Understanding the context of the SDM

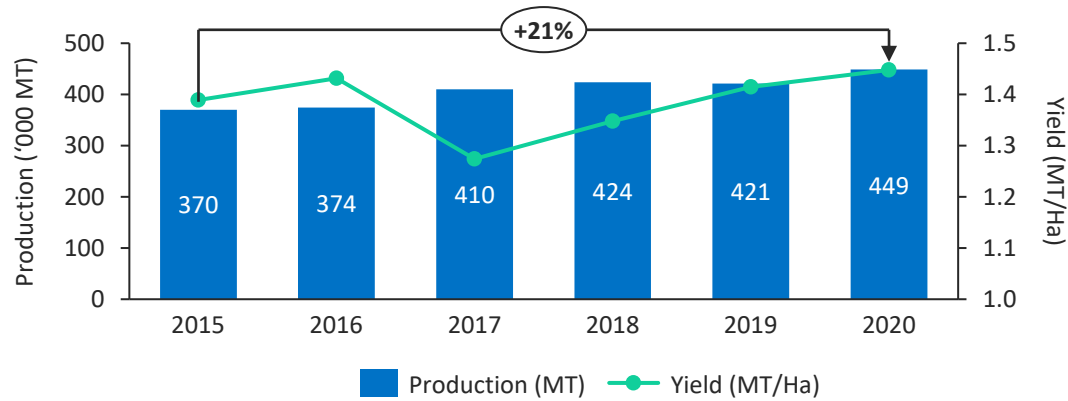
This section:

- *Describes the maize market and value chain in Rwanda*
- *Analyses the enabling environment and key sustainability risks*

Rwanda's maize production has grown four-fold since implementation of the crop intensification program by the Government in 2007

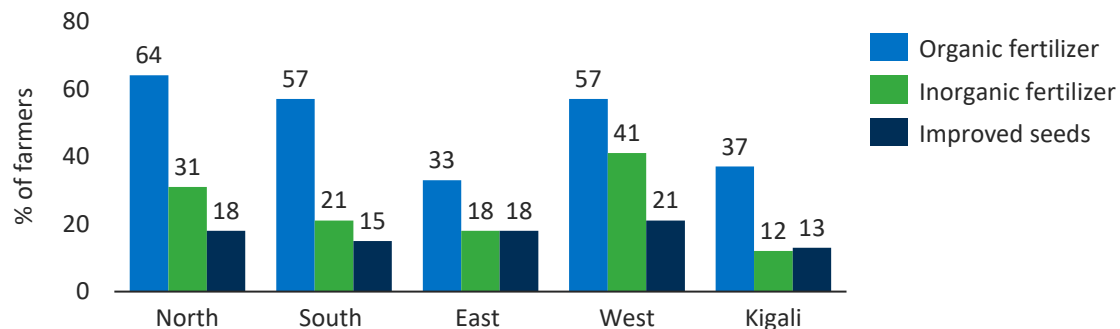
Rwanda's maize production and yield¹

Production ('000 MT) and yield ('000 MT/Ha)



Access to inputs by province⁴

% of farmers with access, 2019



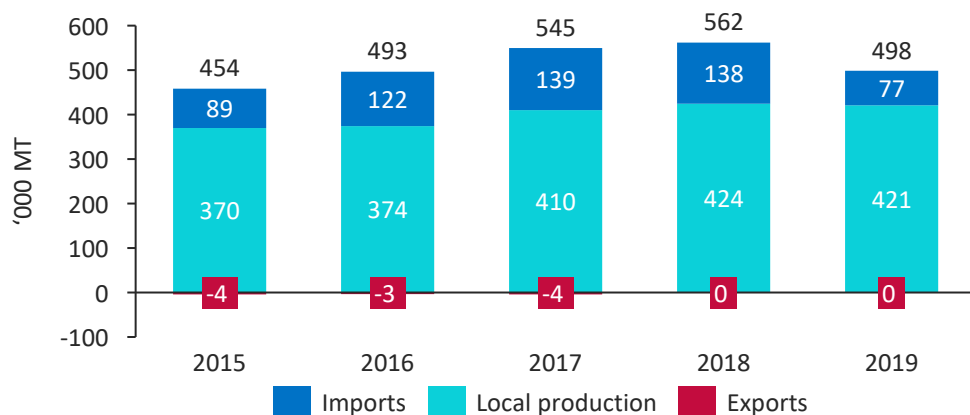
State of the sector – supply

- Maize is the third most important crop in Rwanda and the fastest growing in cultivated area and production volume terms².
- Production volume has been on an upward trajectory to meet increasing demand as consumption trends evolve from purely subsistence to commercial use².
- A key driver of this increasing production was the implementation of the Crop Intensification Program (CIP) - a flagship program aimed at increasing agricultural productivity³.
- As part of the CIP, new seed varieties have been introduced and a subsidized inputs program implemented³.
- Nevertheless, access to inputs and productivity rates still lag compared to the region⁴.
- There are two maize seasons in Rwanda. The bulk of the maize (c.79.2%) is produced in season A (September – February) with the remainder (c.20.8%) produced in season B (March – July)³.
- Commercial surplus is marketed through the cooperative network, whereby cooperatives sell to traders who in turn sell to maize millers³.
- The Rwandan Ministry of Trade and Industry is responsible for setting the price of maize each season. Price is set after considering the investment made by farmers⁵.
- Prices are set in consultation with stakeholders including the Ministry of Agriculture and Animal Resources, representatives of maize farmers processing factories, those of major maize buying firms, as well as districts that are big producers of the crop⁵.

Sources: ¹National Institute of Statistics of Rwanda – Upgraded Seasonal Agricultural Survey (2020, 2017 & 2016) ²UNIDO – Together for a sustainable future, ³USAID – Rwanda Cross Border Agricultural Trade Analysis, ⁴Africa Improved Foods and Farmer Coop Diagnostic Analysis, Dalberg (2020), ⁵Ministry of Agriculture – Rwanda

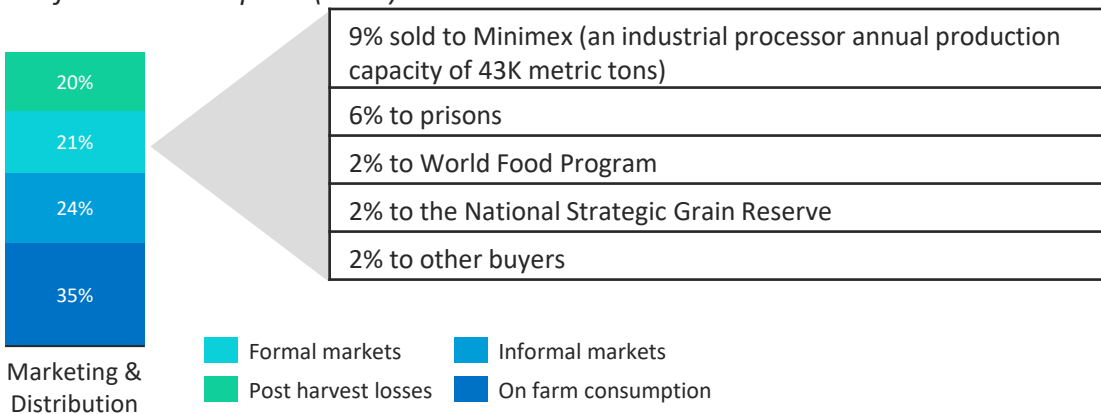
Despite this growing supply, Rwanda remains a net importer of maize grain. A sizeable proportion of the country's output does not meet the required phytosanitary standards required by off takers thus necessitating importation of maize grain.

Maize consumption* in Rwanda¹



Maize marketing and distribution in Rwanda²

% of local consumption (2017)



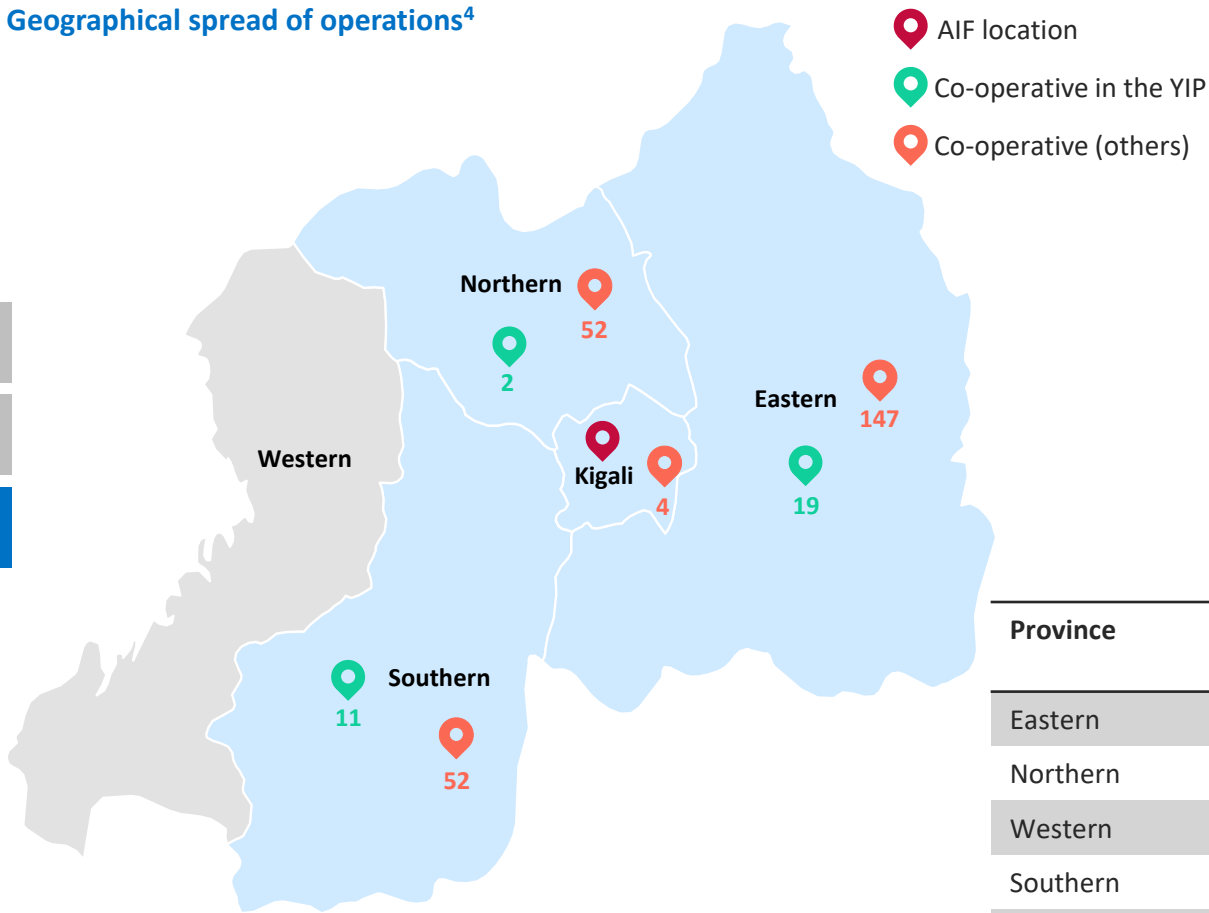
State of the sector – demand

- Rwanda has in the past relied on imports from Uganda. Following trade disputes with Uganda that resulted in cross-boarder trade disruptions, Rwanda turned to Tanzania to compensate for the reduced imports from Uganda³.
- Majority of the maize produced in the country is consumed on-farm as green maize⁴.
- Maize buyers include industrial processors, large scale grain trading companies, small and medium sized millers and middle-men⁵.
- Industrial processors source high quality maize via formal channels such as contract farming arrangements, farmer cooperatives and traders⁵.
- As middle-men purchase maize from farmers on cash basis, there is reduced commitment by farmers to sell produce to processors who would typically not pay upon delivery⁵.

Sources: ¹FAOSTAT and National Institute of Statistics of Rwanda – Upgraded Seasonal Agricultural Survey (2020, 2017 & 2016), ²International Growth Center – Policy Brief Feb 2017, ³WFP – East Africa Market and Trade Update, ⁴USAID – Rwanda Early Generation Seed Study, ⁵Africa Improved Foods and Farmer Coop Diagnostic Analysis, Dalberg (2020)
 *Local production does not consider proportion of grain lost in post harvest handling

Maize is grown throughout Rwanda. However, production is highest in the Eastern province where conditions are most favourable.

Geographical spread of operations⁴

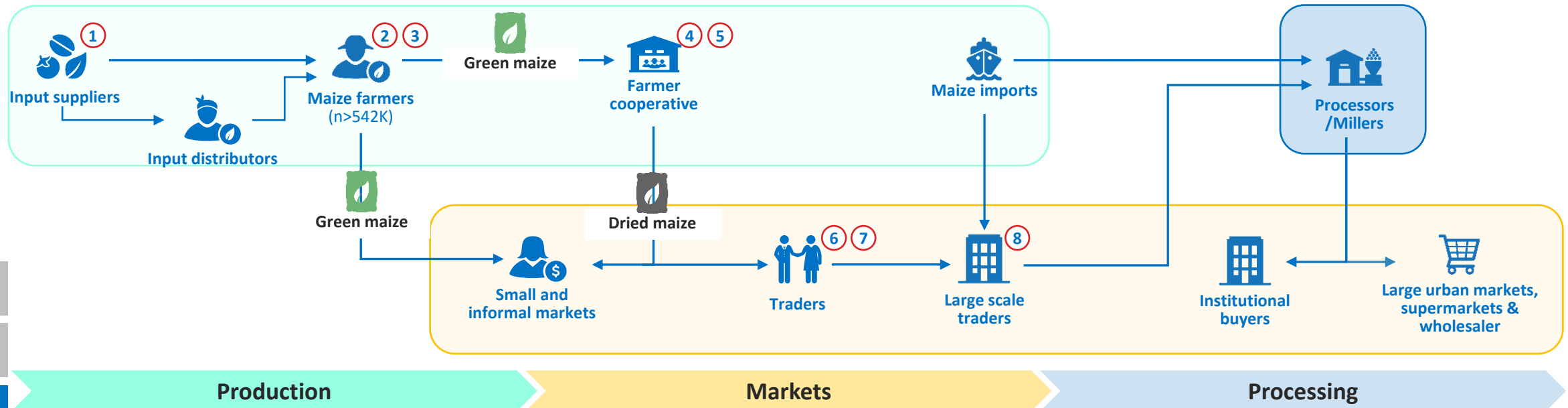


Province	Production (MT) – 2020 ⁵
Eastern	235,389
Northern	75,794
Western	69,209
Southern	60,269
Kigali	7,973
Total	448,634

- Smallholder farmers dominate maize production in Rwanda, with an average farm size of 0.6 Ha². There are over 542K maize farmers in Rwanda¹.
- The average farmer yield in 2020 was 1.45 MT/Ha compared to an optimal yield of 8 MT/Ha with irrigation and 5.5 MT/Ha without irrigation¹.
- c.50% of farmers are organized into cooperative farms through support from the Ministry of Agriculture².
- Maize producers include individual small scale farmers as well as farmer cooperatives.
- AIF operates across 21 (of 30) districts in Rwanda with the majority of target farmers being located in the Eastern province⁴.
- Each co-operative owns at least an aggregation point where farmers deliver their produce⁴.
- Generally, AIF does not source maize from the Western province as the bulk of the maize produced is exported to DR Congo. Further, the region produces low quality maize and AIF would incur high transport cost due to the distance between the region and their facilities⁴.

Sources: ¹Dalberg Study, ²International Growth Center – Policy Brief Feb 2017, ³UNIDO – Together for a sustainable future, ⁴AIF Management, ⁵Upgraded Seasonal Agricultural Survey 2020

The maize value chain in Rwanda is loosely organized. The value chain is characterized by high post harvest losses which limit supply.



1. Limited farmer access to quality inputs¹.

2. Maize is harvested during periods of relatively high humidity which can hamper drying thus reducing the storage life and commercial viability of the grain. Domestic drying facilities and storage capacities are both limited thus increasing potential of grain loss².

3. Limited access to credit and information to boost on farm investment³.

4. Limited management and handling capacity³.

5. Limited access to long-term credit³.

6. Fluctuating maize prices³. The government, through the Ministry of Trade and Industry sets the minimum maize price. Farmers are free to negotiate pricing for as long as this does not go below the minimum set price⁵.

7. Exploitation of farmers by traders who keep high margins thus lowering farmer incomes.

8. High transport costs⁴.

9. Traders purchasing from cooperatives do not ensure quality standard are met³.

10. Limited value addition due to limited product diversification³.

Sources: ¹Africa Improved Foods and Farmer Coop Diagnostic Analysis, Dalberg (2020), ²USAID – Rwanda Cross Border Agricultural Trade Analysis, ³UNIDO – Together for a sustainable future, ⁴USAID – Staple Food Value Chain Analysis, ⁵Ministry of Agriculture – Rwanda

Rwanda is a frontrunner in championing for gender equality and continues to record high rates of female employment

Current situation¹

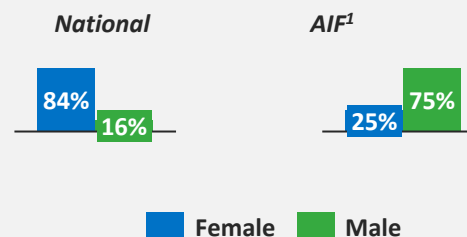
- AIF is **gender intentional**. The company has taken steps to at least understand the different needs and constraints of women and men in its internal process with the goal of ensuring both women and men have access to resources.
- Although AIF does not have a strategic focus on women as part of the maize value chain development project, **women are inherently involved in the project** owing to their role in agriculture.
- For the maize value chain development project, in place a specific strategy targeted at persons with disability and neither does the company tailor its services based on gender.
- AIF does, however, **collect data on co-operatives** and their gender distribution, have policies in place to make the **workplace more inclusive** and has adopted a model which allows women to have more independence and control over resources.

Best practices to implement¹

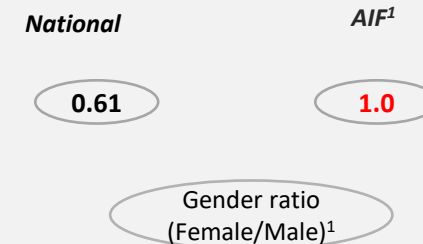
- **Write gender strategy** for clarity on goals and agenda. Establish KPIs (ex. targets on the number of male and female farmers you are aiming to reach), develop a roadmap to get there and allocate resources to monitor and measure gender goals.
- Foster a **robust monitoring and evaluation framework** that is flexible to adapt to change and capture learnings.

Gender dynamics within AIF

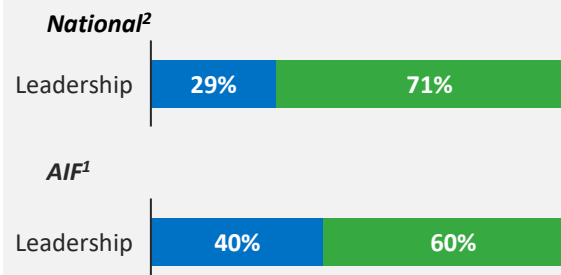
Employee ratio



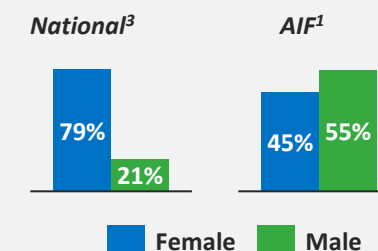
Income ratio*



Women in Leadership



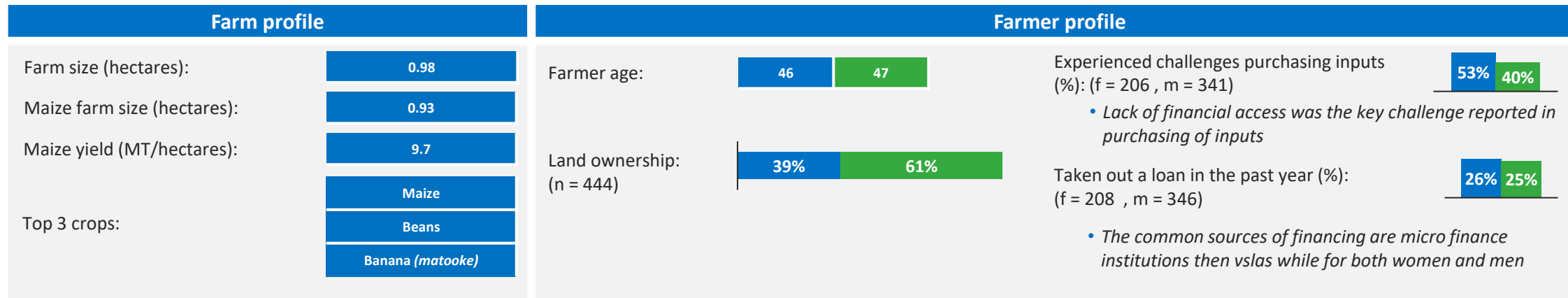
Farmer base



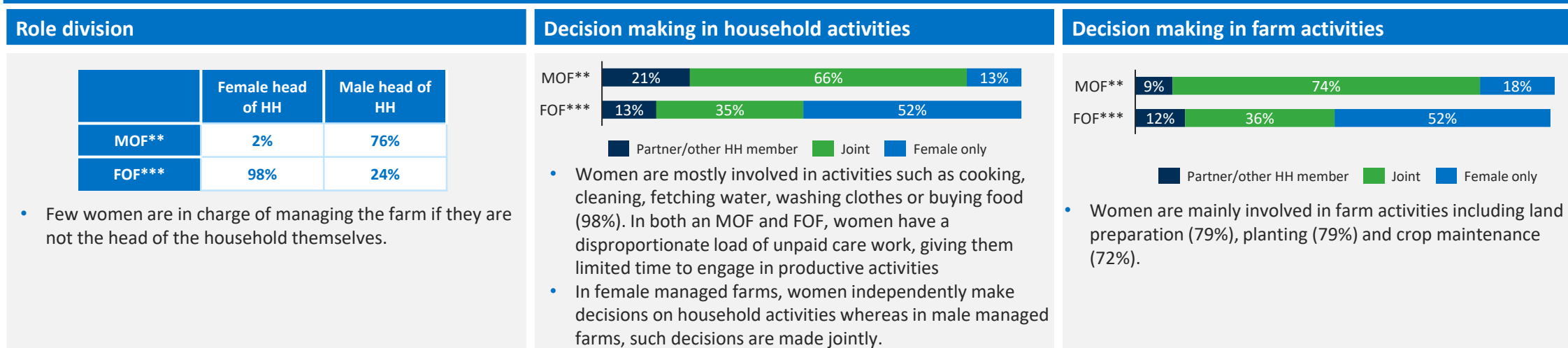
*Divide female indicator by male indicator to get ratio. A ratio of 1 indicates parity between the sexes; a ratio between 0 and 1 typically means a disparity in favor of males; whereas a ratio greater than 1 indicates a disparity in favor of females. **Own health care, major household purchases, and visits to family or relatives
Sources: ¹ AIF Management, ² World Economic Forum: Global Gender Gap report (2021), ³ GoR – Gender and Agriculture (2017),

Majority of the women are involved in making decisions relating to both farm and household activities

Female Male



Household profile



*Female **Male-operated farms ***Female-operated farms
Sources: All data comes from farmer PDC except specified otherwise.

It is estimated that 80% of Rwandan households are food secure⁴. Climate variability continues to pose significant threats to this security.

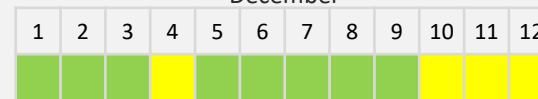
Current situation¹

- Food insecurity is perceived as a major risk to AIF and its farmers.
- Ensuring food security is a critical aspect underpinning the existence of AIF. The company seeks to provide scalable solutions to malnutrition through production of highly nutritious foods.
- In collaboration with partner organizations, AIF collects data to assess the food security of their farmers.
- In addition to sourcing high quality maize, AIF sources soybeans from farmers as this is an integral ingredient for AIF's variety of porridge blends.

Food Security (Access & Availability)²

FOOD SECURITY

Farmers are most food insecure between October and December



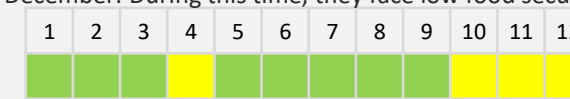
% of farmers the expressed that they face food shortages during this month of the year



Cashflow (availability)²

CASH FLOW

Farmers are most cash strapped between October and December. During this time, they face low food security.



% of farmers that expressed that they are cash-strapped during this month of the year

Assets (stability)²

- **Ownership:** 80% of the farmers own the land that they manage.
- **Other crops:** 80% of the farmers grow diversified crops, mainly beans (85%) and peas (5%).
- **Animals:** 66% of the farmers own livestock. Livestock reared is primarily goats (41%) cows (19%) and chicken (15%).

Market (Availability)

- **Per capita food production variability³:** 11.1
- **Export vs Import:** Almost all the maize produced is consumed locally.
- **Local market:** Yes, there is a local market for maize in Rwanda. However, quality of maize produced remains a challenge which has necessitated importation of high-quality maize into the country.

Health & Sanitation (Utilization)³

- **District level nutrition status:** On average, 4.4 million Rwandese are undernourished. The prevalence of stunting among children under five years if age is 36.9% nationally.
- **National average dietary energy supply adequacy:** 97%
- **Access to clean water:** Yes
- **Access to sanitation:** Yes

Sources: ¹AIF Management, ²PDC data, ³FAO, ⁴Food and Nutrition Security in East Africa (Rwanda, Burundi and South Sudan): Status, Challenges and Prospects,

Changing weather patterns remain a threat to the agricultural sector as majority of the agricultural households rely on rainfed agriculture

Current situation¹

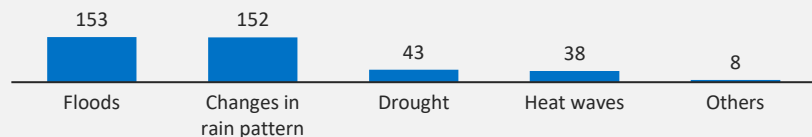
- Climate change is a major risk identified as facing AIF and farmers. The changing weather patterns have potential to affect farm productivity thus making it difficult to forecast production and local sourcing.
- AIF offers training and extension services to farmers. However, these trainings are not particularly focused on climate change.
- Generally, AIF tailors its services to farmers based on their access to infrastructure, such as drying sheds. If farmers are vulnerable to rains, AIF plans logistics around prioritizing farmers with less access to PHH facilities.

Opportunities¹

- Need to build farmer resilience in relation to climate changes. This can be achieved through better access to information on weather patterns and tools for farmers to prepare accordingly.
- AIF recognizes the value-add of irrigation schemes to farmers and it is a strategic long-term goal to be involved in such projects.

Climate issues faced²

- 61% of maize farmers reported to have experienced crop losses due to extreme weather events



Farmer sensitivity and exposure to

Changing temperatures³

Rwanda has been experiencing raising temperatures. The rising temperatures and increased duration of dry spells threaten high value crop production as agriculture zones shift to higher elevations and create additional pressure on water resources.

Changing rainfall patterns and soil conditions³

Rwanda has been experiencing raising variable rainfall. Heavy rainfall and flooding events increase the risk of diarrheal and other waterborne diseases, population displacement, and damage to infrastructure.

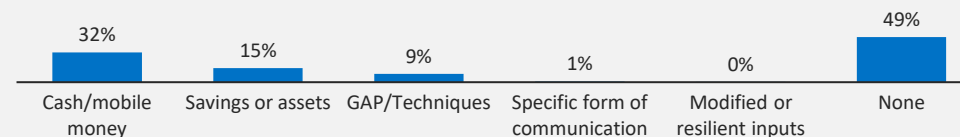
Frequent climate extremes³

Climate projections indicate that Rwanda will experience increased duration of heat waves (7 -22 days) and dry spells as well as an increase in the frequency (7 – 40%) and intensity of heavy rainfall (2 – 11%).

	Exposure	Sensitivity
Changing temperatures ³	High	High
Changing rainfall patterns and soil conditions ³	High	High
Frequent climate extremes ³	Medium	High

Coping mechanisms²

- 49% of the maize farmers reported as having no adaptation strategy to cope with crop loss as a result of extreme weather. None of the farmers reported as using insurance as a coping mechanism.



Sources: ¹AIF Management, ²PDC data, ³USAID – Climate risk profile: Rwanda

Limited access to input finance remains a challenge for farmers in Rwanda who have resulted to using low quality inputs

Definition	Situation	Impact on SDM
Technology <i>Technology availability, research & development, delivery and adoption</i>	<ul style="list-style-type: none"> With the current climate change and lack of adequate post harvest infrastructure, use of advanced technology in post harvest handling is important. 	<ul style="list-style-type: none"> AIF has resulted to purchasing unshelled and wet maize and processing it through existing post harvest technologies. This is done in order to grantee the required maize quality by AIF for processing.
Environment <i>Climate change, possibility of extreme weather, soil type, water supply and quality, pests and diseases. Potential environmental damages such as deforestation</i>	<ul style="list-style-type: none"> Due to climate change, Rwanda experiences heavy rainfall during the harvesting period that affects the quality of maize. Also, drought experienced in some regions affect farm production. 	<ul style="list-style-type: none"> Climatic changes continue to impact maize production within the country. Further, heavy rains destroy the roads thus making collection of maize from farmers challenging.
Infrastructure <i>Existence and state of roads, water and electricity networks as well as proximity to main trading / processing hubs (e.g., access to market)</i>	<ul style="list-style-type: none"> Poor road infrastructure has resulted in inaccessibility of farms and high transport costs. Consequently, farmers continue to face challenges in bringing their maize produce to the co-operatives buying centers. 	<ul style="list-style-type: none"> Lack of proper road systems and post harvest infrastructures at farmer or cooperative level affects the quality of maize particularly due to development of aflatoxin.
Labor <i>Cultural norms that restrict /promote people of certain ages, genders or social groups from farm labor. Availability and cost of labor</i>	<ul style="list-style-type: none"> Culturally, women and children are involved in post harvest activities including maize shelling, winnowing and drying. 	<ul style="list-style-type: none"> AIF’s unique model of purchasing maize on the cob relieves women from handling the post harvest activities and allows them to engage in more productive activities while children get enough time to focus on their studies.
Inputs & Financing <i>Availability of affordable, quality inputs and the necessary marketing and distribution mechanisms. Availability of credit. Enabling regulatory environment</i>	<ul style="list-style-type: none"> Due to lack of adequate financing, some farmers have limited access to the required quantities and/or quality of inputs. In some instances, farmers use low yielding seeds as high yielding seeds are not easily accessible. 	<ul style="list-style-type: none"> Use of low yielding seeds and delayed distribution of inputs affects not only the quality but quantity of input. This is turn impacts the incomes earned by the farmers and makes it more difficult for AIF to source the required quantities locally.

Sources: AIF Management – Enabling Environment survey

Lack of quality differentiation makes it challenging for AIF to source the required volumes locally.

Definition	Situation	Impact on SDM
Trading System <i>Organization of the system through which crops are traded from farmer to market, including the number and type of actors involved</i>	<ul style="list-style-type: none"> A sizeable share of the maize market in Rwanda is still informal with little differentiation of produce based on quality. Consequently, farmers do not appreciate the benefit of producing high quality maize. 	<ul style="list-style-type: none"> AIF is facing challenges in sourcing grade 1 maize locally due to lack of quality differentiation. Further, farmers do not benefit from better pricing offered by AIF for the grade 1 maize.
Pricing & Competition <i>Market dynamics of the main crop of the SDM, including competition between buyers and possible price-setting by the government or other parties</i>	<ul style="list-style-type: none"> Maize pricing in Rwanda is set by the government in consultation with key stakeholders. A floor price is set for each year, below which maize should not be traded. However, the floor price does not take into consideration the maize grade. 	<ul style="list-style-type: none"> AIF only purchases grade 1 maize and pays a premium for this maize. As such, they pay a higher price per kg of maize than other buyers.
Institutional Stability <i>Stable political environment, peace and security in farming areas</i>	<ul style="list-style-type: none"> There is political goodwill to support agriculture in the country. The Rwandan government instituted the CIP with a view to boost agricultural productivity through productive use of input and extension services. The country continues to enjoy a state of political stability. 	<ul style="list-style-type: none"> With the government support coupled with the state of relative peace and security within the country, farmers are encouraged to invest more in agriculture.
Land Tenure <i>Existence of land ownership rights / regulations and their enforcement. Ease of purchasing/ transferring land</i>	<ul style="list-style-type: none"> The Government of Rwanda adjudicated land claims across the country, legally registering all landholdings. There now exists a strong legal framework that ensures security for all landowners¹. 	<ul style="list-style-type: none"> With land tenure security, farmers have access to land for agricultural use.
Social Norms <i>Availability and quality of schooling / healthcare. Cultural factors. Potential social externalities like child labor, gender disparity</i>	<ul style="list-style-type: none"> Child education is encouraged, and child labour forbidden in Rwanda 	

Sources: AIF Management – Enabling Environment survey , 1African Centre for Technology Studies - Land reform, land scarcity and post conflict reconstruction a case study of Rwanda

3.2 About the strategy

Understanding the SDM's strategy and business model

This section:

- *Describes the current strategy of AIF Rwanda*
- *Details how the Service Delivery Model feeds into the company strategy*

By increasing the volume of maize sourced locally, AIF expects to have a positive impact on farmer livelihoods and to reduce the cost of maize sourcing. In order to succeed, several structural supply chain challenges need to be overcome.



Goals & Aspirations

- Africa Improved Foods vision is *“To be a trusted Africa-based producer of a range of high quality, nutritious and complementary foods that are proven to help prevent malnutrition”*¹
- AIF has a target to buy at least 50% of its maize and soy locally, which would collectively amount to an injection of more than USD 6 million per year into the Rwandan rural economy¹
- The initial focus is on increasing the volume of locally sourced maize with the expected benefit of reducing the cost of sourcing, and increasing the impact on Rwandan farmer livelihoods

Where to Play

- High Priority Areas**
- To achieve higher portions of locally sourced maize, it is critical to:
 - Strengthen cooperatives to increase farmer loyalty to the cooperatives that supply AIF
 - Increase farmer productivity through optimal use of high-quality inputs
 - Increase farmer access to financing options to ensure access to high-quality inputs
- Other Areas**
- Rwandan capacity for drying and shelling of maize needs to be increased (WIP with SDGP)
 - Efficiency through digitization of the sourcing process at AIF is required to increase access to real time data (WIP)

How to Win

- Points of Differentiation**
- AIF sources only grade 1 maize and pays a premium for that, whereas other players source unsorted maize at market price and sort and grade the maize after purchase
 - AIF has implemented the cob-sourcing model, allowing farmers to sell maize on the cob, reducing the risk of aflatoxin before selling their produce
 - AIF intends to partner rather than compete with local aggregators to access volumes of grade 1 maize from smallholder farmers
- Points of parity**
- All aggregators and buyers face the challenge of aflatoxin build up in maize, of transport from farm to aggregation point and of poor harvests

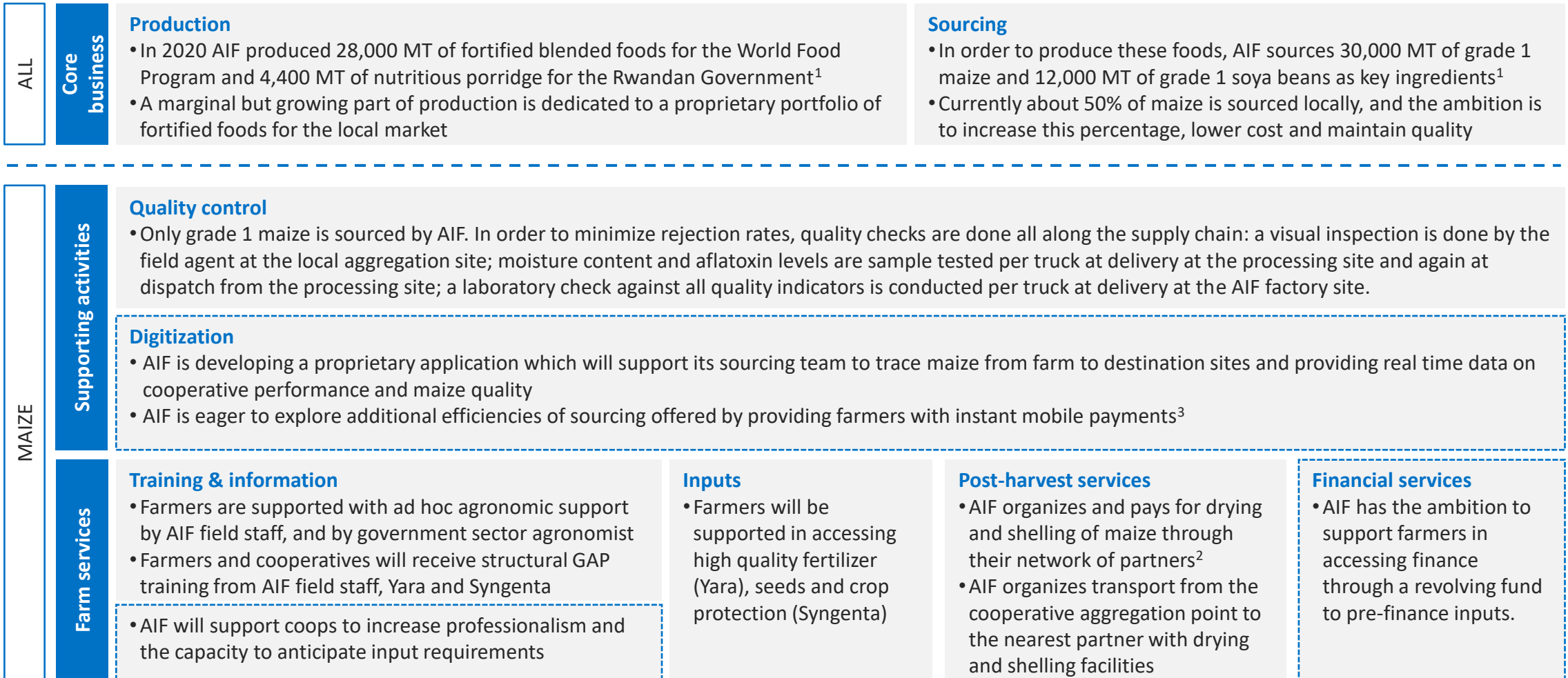
Capabilities Required

- Critical capabilities**
- Timely payment of farmers by cooperatives
 - Timely delivery of inputs to farmers
 - Adequate training of farmers on correctly applying inputs
 - Timely collection of maize from aggregation points
 - Relationship building between AIF and cooperatives and farmers
- Supporting capabilities**
- Through digital registration and data collection by farmers, enable the anticipation of volumes of inputs required per cooperative

Sources: ¹<http://www.africaimprovedfoods.com/>, visited April 2021

AIF service delivery is aimed at increasing the volume of aflatoxin-free, grade 1 maize sourced from Rwandan farmers






Overhead (management, HR, legal, utilities, etc.)



Margin

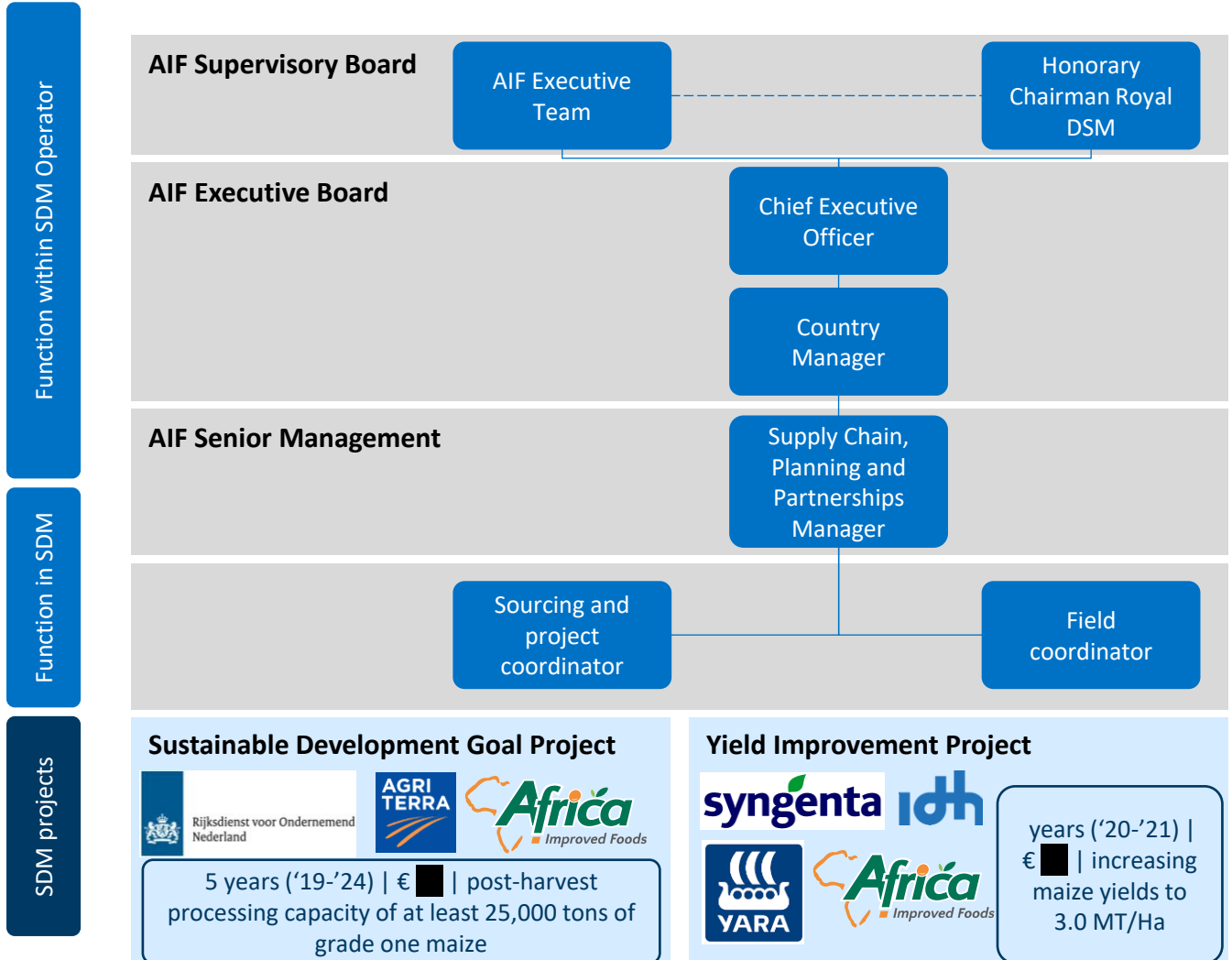
Sources: ¹Africa Improved Foods and Farmer Coop Diagnostic Analysis, Dalberg (2020); ²Vision Storage Facilities, ENAS, Spring Integrated, K/N, Kumwe (acquired by AIF in 2020), ³One Acre Fund model to be used as example

AIF works in collaboration with various partners in delivering services to farmers

Actor	Legal Status	Function (within this SDM)	Revenue model (within this SDM)	Incentive to participate (within this SDM)
 Input providers	Private limited companies	<ul style="list-style-type: none"> Sells fertilizers (Yara) Sells crop protection (Syngenta) Sells maize seeds 	<ul style="list-style-type: none"> Margin on product sales 	<ul style="list-style-type: none"> Increased sales volumes
 Ministry of Agriculture	Government institution	<ul style="list-style-type: none"> Subsidizing of farm inputs Providing extension services Regulating maize prices 	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> Catalyze the production of maize in Rwanda and drive the agenda of the CIP.
 Co-operatives	Co-operative society	<ul style="list-style-type: none"> Aggregate maize from members Sells farm inputs 	<ul style="list-style-type: none"> Margin of input sales and aggregation 	<ul style="list-style-type: none"> Increased sales volumes
 Post harvest handling partners	Private limited companies	<ul style="list-style-type: none"> Offer post harvest handling services including drying and shelling 	<ul style="list-style-type: none"> Fees for drying and shelling services 	<ul style="list-style-type: none"> Increased sales
 Logistics (Transport) companies	Private limited companies	<ul style="list-style-type: none"> Offer transportation services to AIF for maize sourced 	<ul style="list-style-type: none"> Transportation fees charged to AIF 	<ul style="list-style-type: none"> Increased sales

Sources: AIF Management

The SDM is fully integrated within the wider organization of the company



Organizational characteristics

- Africa Improved Foods Rwanda is a joint venture between Africa Improved Foods Holding (95% ownership) and the Government of Rwanda (5% ownership)
- AIF Rwanda and its Service Delivery Model have a strong link with Royal DSM through AIF Rwanda's Supervisory Board
- The Service Delivery Model is an integral part of AIF Rwanda's business model, it being a for-profit partnership aimed at improving nutrition in Rwanda and at the same time creating positive impact on the local economy through its operations and local sourcing
- With the view of strengthening the Service Delivery Model, AIF is involved in two projects:
 - The **Sustainable Development Goal Project**: a consortium of five partners led by AIF are currently implementing a five-year project (Euros []) co-funded by RVO (Dutch Government) and other consortium members (AIF, Agriterra and Sight & Life), which will invest in post-harvest handling equipment to ensure there is a capacity to handle at least 25,000 tons of grade one maize
 - The **Yield Improvement Project**: a partnership between four organizations aimed at increasing Rwandan maize farmers' yields by securing their access to high quality inputs.
- The current SDM analysis is focussed on modelling the impact of the Yield Improvement Project, and on exploring potential future interventions to further strengthen that impact

3.3 Farmer impact

Assessing farmer impact and opportunities for improvement

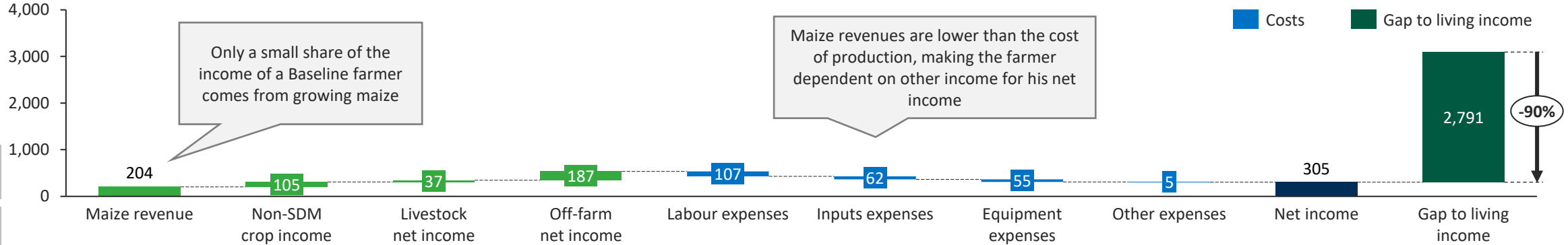
This section:

- *Explores farmer incomes in year 5 in more detail*
- *Sets out farmer monthly cash-flows for year 1*

Maize farming for Baseline farmers in the East is not profitable, but becomes profitable through participation in the SDM. By year 5 SDM farmers can afford significantly higher investments into production because of increased maize revenues

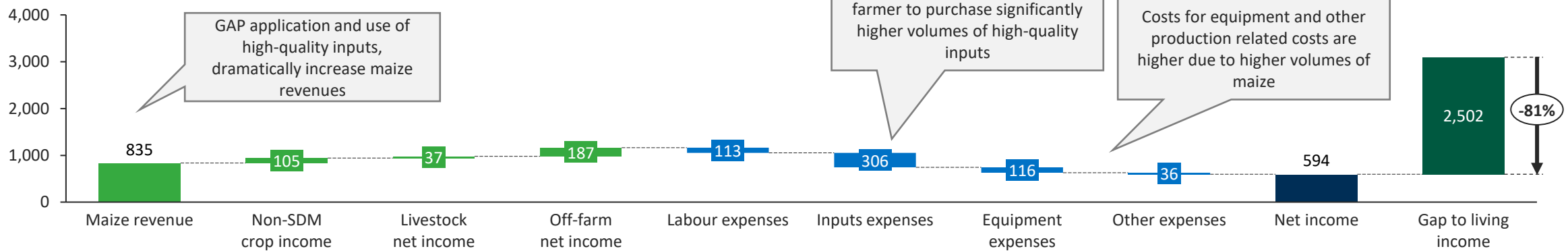
East Rwandan baseline farmer income in year 5

Split by revenue and expenses items, in '000 RWF/year



East Rwandan SDM farmer income in year 5

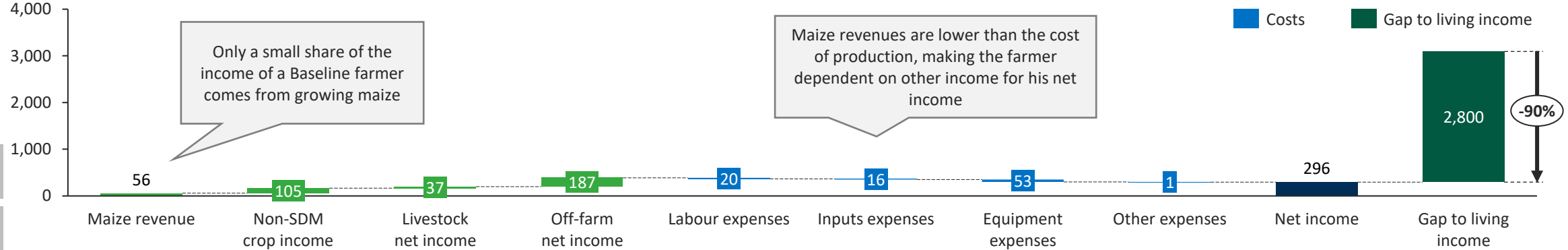
Split by revenue and expenses items, in '000/year



Maize farming for Baseline farmers in the South is even less profitable, and even by year 5 SDM farmers don't earn enough from maize to cover the production costs

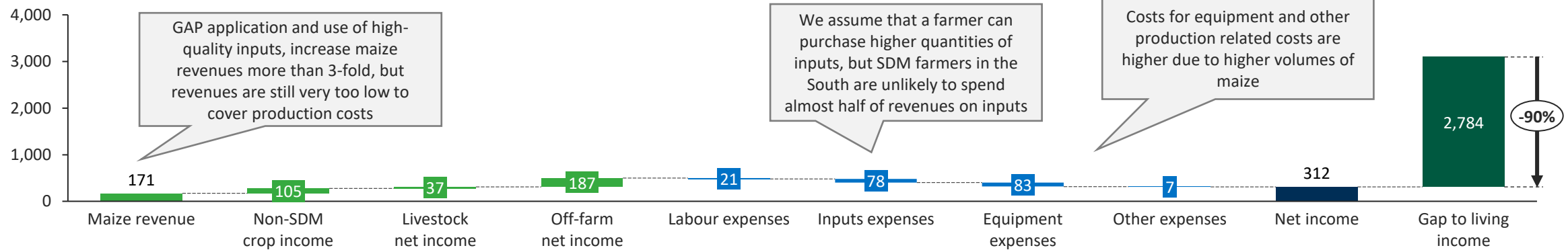
South Rwandan baseline farmer income in year 5

Split by revenue and expenses items, in '000 RWF/year



South Rwandan SDM farmer income in year 5

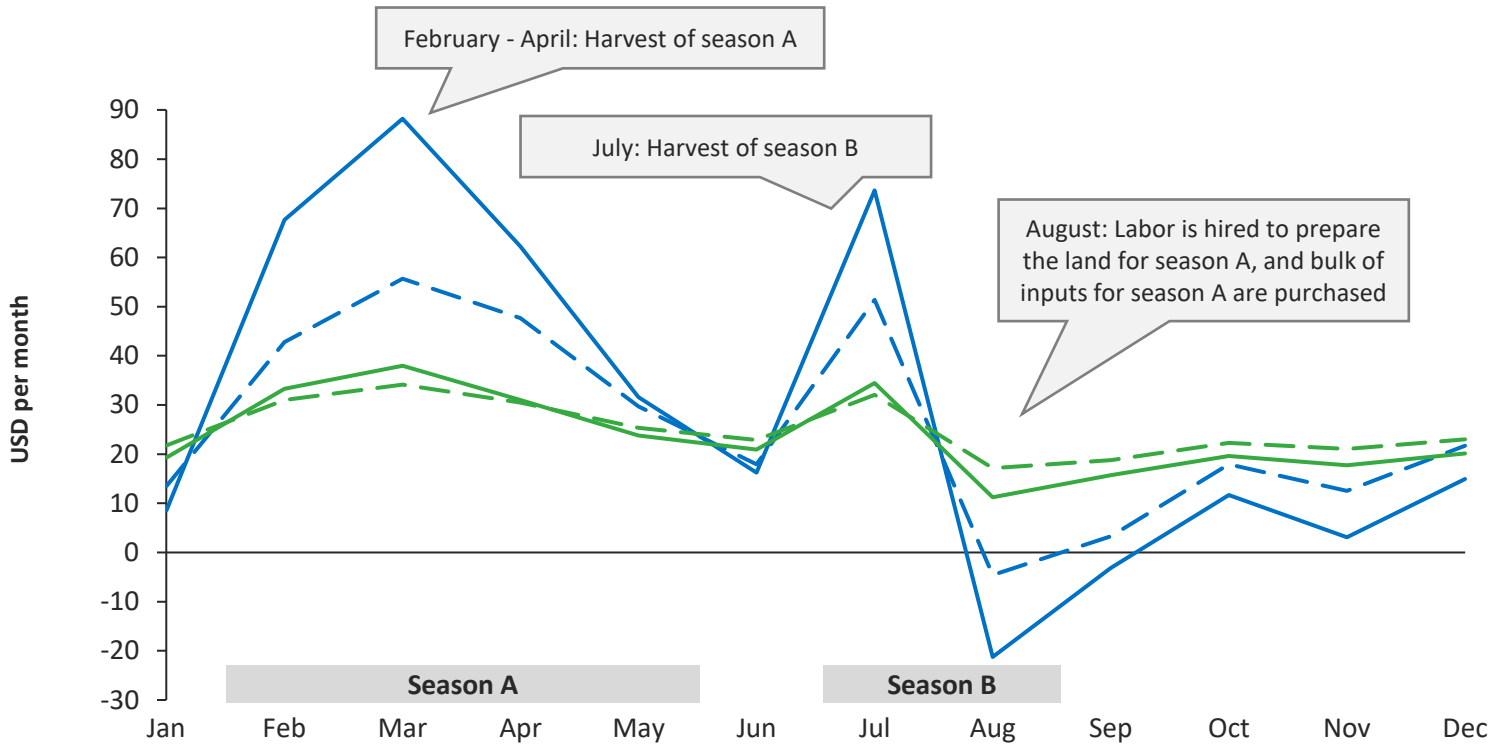
Split by revenue and expenses items, in '000 RWF/year



In line with findings from the Primary Data Collection, our monthly cash-flow projections for year 1 indicate that farmers do not typically find themselves with a negative cash-flow

Comparing cash flows of Baseline and year 1 SDM farmers

Cumulative in USD/month



Analysis

- Although farmers are not typically strapped for cash, almost half of farmers interviewed indicated that a lack of financial resources is the key challenge to purchasing inputs.
- This supports our recommendation to AIF to continue the efforts towards setting up a form of adequate financing for farmers, such that they can afford to purchase 100% of the recommended quantities of high-quality inputs at the right time of the year.
- Based on the negative cash position in August and the peak in cashflow in March, we recommend the [farmer financing](#) to be paid out to and collected from farmers in those months respectively

— East Baseline — South Baseline
 — East SDM — South SDM

For an SDM farmer in the East the most direct route to increasing annual income by USD 1,000, is through a 190% increase in productivity. For a South Rwandan farmer, it is increasing non-maize income by 299%

The year 1 pre-tax net income of a typical East Rwandan maize SDM farmer is **USD 267**, for one in south Rwanda it is **USD 284**. The table below shows **what change to each key variable would yield a +USD 1,000 cumulative farmer net income** in that same year:

Variable	East Rwandan SDM farmer			South Rwandan SDM farmer		
	Modelled assumption	Required assumption	Change required	Modelled assumption	Required assumption	Change required
Price (USD/kg)	0.22	0.87	286%	0.23	3.00	1217%
Productivity (MT/ha)	2,6	7,6	190%	2,3	24,3	948%
Farm size (ha)	0.8	2.5	211%	0.2	2.1	948%
Cost of production (USD)	331	-669	-302%	131	-868	-761%
Other income (USD)	334	1,334	299%	334	1,334	299%

Discussion

- This table does not intend to identify the most feasible route to increasing annual net income by USD 1,000, rather it sets out for the five main income drivers which gaps to close would be smallest, keeping all other things equal, which can be seen as a first step towards identifying the most feasible (combination of) drivers to focus on
- As we can see from our [income analysis](#), an addition of USD 1,000 would still not put these Rwandan maize farmers within range of a living income

3.4 Assumptions and methodology

Key assumptions and background information

This section:

- *Shows relevant assumptions used for the SDM operator income projections*
- *Shows relevant assumptions used for the cooperative income projections*
- *Shows relevant assumptions used for the different farmer segments and income projections*
- *Explains the methodology of the Primary Data collection*
- *Contains a list with all abbreviations used in the report*

Key assumptions used in modelling the business case for AIF

Variable	2021	2025
Sourcing		
Target volumes of grade 1 maize to source from SDM cooperatives	14,757 MT	32,630 MT
Price paid to cooperative for maize grain (grade 1)	■ RWF/kg of grain	
Price paid to cooperative for maize on the cob (grade 1)	■ RWF/kg of grain equivalent	
Form in which maize is sourced	Season A: 100% on the cob / Season B: 100% in maize grain	
Total quantity of maize assumed available for processing by AIF per year	~30,000 MT	
Average selling price	■ RWF/MT	■ RWF/MT
% of AIF revenues attributed to maize	■ %	
Financing		
Trade receivables days	25 days	
Inventory days	300 days	
Trade payables days	Cooperatives: 5 days Other suppliers: 30 days	
Cash conversion cycle	311 days	
Exchange rate	986 RWF/USD	

Key assumptions used in modelling the business case for Yara and Syngenta



Variable	Yara	Syngenta
Volumes of inputs sold	Planting fertilizer: 374 MT (yr 1) – 1,903 MT (yr 5) Top dressing fertilizer: 112 MT (yr 1) – 744 MT (yr 5)	1,498l (yr 1) – 11,261l (yr 5)
Price paid to input supplier	Planting fertilizer: 647 RWF/Kg Top dressing fertilizer: 607 RWF/Kg	50,000 RWF/l



Key assumptions used in modelling the business case for cooperatives

Variable	Baseline Cooperative	SDM Cooperative
General		
Number of farmer members	250 (yr 1) – 304 (yr 5)	300 (yr 1) – 365 (yr 5)
Organic growth membership	5% per year	5% per year
Farmer loyalty	60% (yr 1) – 60% (yr 5)	60% (yr 1) – 75% (yr 5)
Price paid to farmer for maize grain: grade 1 / non-grade 1	250 RWF/kg / 210 RWF/kg	
Price paid to farmer for maize on the cob: grade 1 / non-grade 1	220 RWF/kg / 180 RWF/kg	
Form in which maize is sourced	Season A: 100% on the cob / Season B: 100% in maize grain	
Margin made on seeds and fertilizers	Local: 38 RWF/kg	Local & High-quality: 38 RWF/kg
Margin made on crop protection	Local: 3,000 RWF/l	Local: 3,000 RWF/l High-quality: 0 RWF/l
Other		
Other income	55,391 RWF/yr (fixed)	1,998,521 RWF/yr (fixed)
Conversion rate cob to grain	0.77	

Key assumptions used in modelling the business case for farmers

Segmentation approach <i>Based on whether farmers are in the East or South of Rwanda</i>		 East Rwanda		 South Rwanda		
		Baseline	SDM	Baseline	SDM	
Minimum criteria: <i>Farmers should meet this criteria in order to be eligible for service provision</i>	Organization	SDM Farmers must be a member of a cooperative that is included in the Yield Improvement Project				
	Segments: <i>Distinct groups of SDM farmers that differ on farm characteristics</i>	Characteristics	# seasons	2		2
Season A – yield			1.8 MT/ha	Yr 1: 2.2 MT/ha Yr 5: 4.8 MT/ha	1.5 MT/ha	Yr 1: 1.7 MT/ha Yr 5: 3.4 MT/ha
Season B – yield			0.8 MT/ha	Yr 1: 1.0 MT/ha Yr 5: 2.3 MT/ha	1.0 MT/ha	Yr 1: 1.2 MT/ha Yr 5: 2.6 MT/ha
Season A – maize plot			0.8 ha		0.2 ha	
Season B – maize plot			0.4 ha		0.1 ha	
Season A – HH consumption			10%		8%	
Season B – HH consumption			22%		20%	
% of GAP adopted and % of recommended quantities of high-quality inputs purchased by SDM farmers			Good Agricultural Practices	Y1	Y2	Y3
	Seeds	50%	75%	100%	100%	100%
	Fertilizer - Planting	50%	80%	100%	100%	100%
	Fertilizer - Top dressing	20%	30%	40%	50%	60%
	Pesticide	15%	24%	36%	48%	60%
		3%	8%	10%	12%	15%



Living income assumptions for farmers in Rwanda

- To determine the living income benchmark, IDH has taken as the starting point the minimum monthly living expenses (excluding discretionary income contributing to a 'decent' living) for a typical, 6-person household as captured by the WageIndicator Foundation
- This is translated into an annual expenditure and was adjusted for inflation up until December '19, and then converted to USD based on the exchange rate of 16 June 2020

Monthly family living expenses in Rwanda¹

THE LIVING WAGE IS BASED ON THE CONCEPT THAT WORK SHOULD PROVIDE AN ADEQUATE INCOME TO COVER THE NECESSARY LIVING COSTS OF A FAMILY. WAGEINDICATOR USES PRICES FROM THE COST OF LIVING SURVEY TO CALCULATE LIVING WAGE IN MORE THAN 60 COUNTRIES. THE LIVING WAGE IS AN APPROXIMATE INCOME NEEDED TO MEET A FAMILY'S BASIC NEEDS INCLUDING FOOD, HOUSING, TRANSPORT, HEALTH, EDUCATION, TAX DEDUCTIONS AND OTHER NECESSITIES.

The following table summarises the varying expenditure and income needs for the three commonly occurring family household compositions.

EXPENDITURE AND LIVING WAGE CALCULATION (MONTHLY RATES IN RWANDA FRANC)

	Typical family from-to	Standard family from-to	Single-adult from-to
Food	144400-170100	96200-113400	24100-28400
Housing	35000-40000	35000-40000	20000-25000
Transport	20000-20000	20000-20000	10000-10000
Health	30000-30000	30000-30000	7500-7500
Education	9100-190000	9100-190000	0
Other costs	11900-22500	9520-19700	3080-3550
Total Expenditure	250400-472600	199820-413100	64680-74450
Net Living Wage	131789-248737	111011-229500	64680-74450
Gross Living Wage	185800-350700	156500-323600	91200-105000

Annualized & updated

Annualized	Adjusted for inflation Jan '18 – Dec '19	Converted to USD ²
3,004,800 RWF/yr	3,095,948 RWF/yr	3,288 USD/yr³

¹<https://wageindicator.org/salary/living-wage/archive-no-index/rwanda-living-wage-series-january-2018>; ²Exchange rate of 16-6-2020; ³IDH Income Driver Analysis – available upon request

A representative group of farmers has been interviewed, and the outcomes of those interviews have been used to strengthen this SDM analysis

- **Description:** IDH uses the primary data collection to get an understanding of the farmers involved in the SDM and support with the farmer modeling. It is also meant to capture data related to gender, climate resilience and food security. It can also serve as baseline to measure the future impact of an SDM.
- **Sample size:** 554
- **Sample location:** Kirehe and Nyagatare, Eastern Rwanda
- **Target population:** Members of maize co-operatives within the age rang of 18 and above, both male and female farmers.
- **Sampling methodology:** AIF provided a list of maize co-operatives from their database, from which Akvo randomly selected a sample of farmers. On these selected outgrower farms several people were interviewed.
- **Data cleaning:** Farmers are either only removed if they refuse to participate in the survey or their farm size is outside of certain parameters. To determine outliers for numerical questions of the survey, a cut off of three standard deviations from the corresponding mean is set.

List of abbreviations

Abbreviation	Meaning
DSCR	Debt Service Coverage Ratio
EBIT	Earnings Before Interest and Taxes
EBITDA	Earnings Before Interest, Taxes, Depreciation and Amortization
FTE	Full-time equivalent
GAP	Good Agricultural Practices
GDP	Gross Domestic Product
MT	Metric Ton (1,000 kg)
NGO	Non-governmental organization
P&L	Profit and Loss statement
SDM	Service Delivery Model
SHF	Smallholder farmer
SWOT	Strengths, Weaknesses, Opportunities & Threats
USD	United States Dollar (currency)
YIP	Yield Improvement Project

