

Sustainable production and marketing of rice in Ghana

Rujo Agri-Trade Limited (Agri-Trade)
Ghana

Service Delivery Model Analysis – Public report

June 2023



Introduction

Smallholder livelihoods

Agriculture 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 and is affected by 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

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 analyzes these models to create a solid understanding of the relation between impact on the farmer and impact on the service provider's business.

Insights & Innovations

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 aims to inform the agricultural sector and catalyze innovations and investment in service delivery that positively impact people, planet, and profit.



IDH Grown Sustainably in Africa (GSA) Program

1 Ghana's grain markets can contribute greatly to local food security and improvement of rural livelihoods

Global development organizations like the World Bank have identified agriculture as one of Ghana's engines for economic growth and job creation due its ability to catalyze the manufacturing sector. A commercialized agricultural sector would support Ghana diversify its economy as agricultural produce could be used to grow an agro-processing sector. Despite this potential, the country's agricultural sector is underperforming

2 However, these markets function far from optimally with producers, aggregators and processing facing a range of challenges

Smallholder farmers (SHF) face challenges such as low productivity, low market prices, lack of technical expertise and experience in the consistent production of high-quality crops, and limited access to (affordable) financing. Additionally, local small and medium enterprises (SMEs) are not able to meet the requirements to supply to these large-scale off-takers for premium markets. They typically lack the managerial, technical and operational capabilities and the market development support to become commercially viable and to scale operationally

3 IDH's GSA seeks to accelerate sustainable development by strengthening the capacity of 12 SMEs in key grain value chains

Without intervention, farmers and SMEs may remain confined to producing for smaller markets that offer lower returns on agricultural activities. This proposed project, which is part of IDH's GSA partnership with the Mastercard Foundation, aims to promote sustainable economic growth in the agriculture sector through the development of inclusive value chains of maize, millet, and rice, contributing to improved livelihoods.

For the SMEs to provide these services to farmers, they should be supported in improving their managerial, technical and operational capacity, and be enabled to access high-quality inputs, services, mechanization and required technology to increase aggregation, processing and storage capacity. This will help the SMEs to increase their scale, profitability, bankability, and sustainability

4 This SDMA assesses the business and impact case of Agric Trade to inform the design of effective support packages

It aims to answer the question "how can Agri Trade optimize its sourcing and service delivery model in a commercially viable and smallholder inclusive manner?"



Abbreviations

CC	Community champion
EBIT	Earnings before interest and taxes
FEA	Farm enterprise advisor
GAP	Good agricultural practices
GHS	Ghanaian Cedis
GoG	Government of Ghana
ICS	Internal control systems
ICT	Information & communication technologies
KPI	Key performance indicator
LI	Living income
M&E	Monitoring & Evaluation
MoFA	Ministry of Food & Agriculture
MT	Metric ton (1,000 kg)
ND-GAIN	Notre Dame Global Adaptation Initiative

OECD	Organization for Economic Cooperation and Development
P&L	Profit & Loss
PFJ	Planting for Food and Jobs
PHM	Post-harvest management
PPP	Purchasing power parity
SDM	Service delivery model
SHF	Smallholder farmer
SOP	Standard operating procedures
SWOT	Strengths, weaknesses, opportunities and threats
TA	Technical assistance
ToT	Training of Trainers
VSLA	Village savings and loan association
WC	Working capital
Y-o-y	Year on year

Report outline

To navigate between the different chapters, simply click on the corresponding name in the reading guide on the right of each page, and you will be taken to the first page of that chapter

1 Executive summary

2 The Service Delivery Model

3 Business case

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1

Executive summary



Introduction | Rujo Agri-Trade Ltd and the Grains (Rice, Soybean) sector in Ghana



Rujo Agri-Trade Ltd (Agri-Trade)

- Agri-Trade, established in 2014 in Tamale, is a commercial agribusiness specialized in the production and marketing of rice, soybean, seeds, and maize
- The company sources paddy rice from ingrowers (100), as well as outgrowers (+2,500) located in the Northern region. It also sources from commercial farms in addition to producing in their own farm
- Agri-Trade clients are mainly local offtakers, i.e., other millers, school feeding programs, and Ghanaian international traders. The company also has their own brand for long grain rice under the subsidiary *Maraba Foods*
- It currently undertakes milling through 3rd parties (mostly Tamanaa). It seeks to venture into in-house milling going forward. In line with this, they intend to increase inhouse harvesting capacity in order to ensure greater quality control and higher loyalty levels
- Farm Enterprise Advisors (FEAs) and Community Champions (CCs), are leveraged to facilitate delivery of services to farmers. Services provided are seeds, mineral/organic fertilizer, ploughing and harvesting. The company is also venturing into community-based seed multiplication. The cost of services are recovered through in-kind payment



Rice and soybean value chains

- Ghana ranks 41st globally in rice production¹. Between 2008 and 2020, production averaged 302,000 MT and 987,000 MT. In terms of productivity, Ghana ranks 59th out of 83 rice producing countries with 3MT/ha on average⁶
- The low productivity is attributed to low quality inputs, limited irrigation, market- and credit access⁷ as well as lack of processing infrastructure and adequate milling machinery²
- Total national rice consumption amounts to 1.45Mn MT, equivalent to per capita consumption of 45kg per annum. Ghana's rice self sufficiency ratio was about 43% in 2020. The country still relies on import from countries such as Thailand. In 2020, Ghana was the 20th largest importer in the world valued at \$391M. It was also ranked the 107th largest exporter in the world⁴
- Soybean is a non-staple crop in Ghana predominantly used for livestock production. About 90% is produced in the Northern parts of the country and processed in the Southern parts¹
- The country has witnessed an increase in exportation of soybean from Ghana leading to high competition. This resulted in the government enacting the Export and Import –restriction of soybean regulation in 2020

Sources: 1) [FAOSTAT \(2021\)](#); 2) [MoFA \(2021\)](#); 3) [AGRA \(2020\)](#); 4) [OEC \(2020\)](#); 5) [IFPRI \(2020\)](#); 6) [Index Mundi \(2022\)](#) & [Our World in Data](#); 7) [AGRA \(2020\)](#); [Ministry of Food and Agriculture](#)



Summary | Opportunities pathways to scale (1/5)

While Agri-Trade's model demonstrates a clear business case for both farmers and the company, there are possible pathways to enhance performance, sustainability and expand impact for the farmers. We have evaluated five pathways to drive shared value.

Pathway	Rationale	Observations
Build internal capacity in line with envisioned growth	Enhanced internal capacity results in efficient sourcing and service delivery to farmers, especially with the projected scale	<i>This information is only available in the private version of the report</i>



Summary | Opportunities pathways to scale (2/5)

While Agri-Trade's model demonstrates a clear business case for both farmers and the company, there are possible pathways to enhance performance, sustainability and expand impact for the farmers. We have evaluated five pathways to drive shared value

Pathway	Rationale	Observations
<p>Design effective service package and delivery mechanisms that benefit both the farmer and Agri-Trade</p>	<p>Well designed service packages can lead to increased productivity and sustainability at farm level, resulting in higher farmer incomes and higher volumes sourced (per farmer). Exploring different delivery mechanisms that facilitate access to the inputs (e.g., working with other providers) is critical to reduce working capital pressure for Agri-Trade in the coming years</p>	<ul style="list-style-type: none"> • Currently, Agri-Trade has not segmented the farmers they work with, making it hard to customize service provision and track performance. This analysis adopted <u>four farmer segments</u> based on farming practices, crop combination, and type of scheme. All the SDM farmer segments proposed are projected to perform better than the baseline farmer as a result of the service package provided by Agri-Trade, which leads to improved yields • Access to irrigation is particularly a key income driver as it results in a <u>substantial income uplift (on average 1.8 times higher)</u> compared to farming only on rainfed land. The irrigation infrastructure is, however, costly and underdeveloped in the region limiting the number of farmers with access • Shifting to organic fertilizer is also increasingly profitable for farmers, as chemical fertilizer leads to <u>declining yields in the long-term</u>. For Agri-Trade, use of organic fertilizers <u>can reduce working capital requirements by 67%</u> • Community-based seed multiplication presents significant benefits for both the farmers and Agri-Trade. Seed multiplication <u>generates higher incomes for farmers compared to paddy</u>. By scaling the community-based seed multiplication, Agri-Trade is also able to diversify risk while ensuring consistent supply of high-quality seeds

This information is only available in the private version of the report



Summary | Opportunities pathways to scale (3/5)

While Agri-Trade’s model demonstrates a clear business case for both farmers and the company, there are possible pathways to enhance performance, sustainability and expand impact for the farmers. We have evaluated five pathways to drive shared value.

Pathway	Rationale	Observations
<p>Diversify into new high value markets</p>	<p>Agri-Trade faces a high market risk given the reliance on two main crops. The current market for soybeans also generate low margins. It is thus critical to explore other markets. Further, with a growing global market for premium organic rice, particularly in Japan, Europe and North America, Agri-Trade can also explore the requirements to enter these high value markets. Such markets would unlock higher prices, and thus higher incomes for the farmers, and higher margins for Agri-Trade</p>	<p><i>This information is only available in the private version of the report</i></p>



Summary | Opportunities pathways to scale (4/5)

While Agri-Trade's model demonstrates a clear business case for both farmers and the company, there are possible pathways to enhance performance, sustainability and expand impact for the farmers. We have evaluated five pathways to drive shared value.

Pathway	Rationale	Observations
Address wet paddy harvesting capacity constraints	With an increasing number of acres to be supported and increasing targets for wet rice to be sourced over the years, Agri-Trade needs to address the shortage in mechanized harvesting capacity. Providing the required harvesting support (own or hired) can be a major competitive advantage in increasing farmer loyalty (currently at 80%). Further, given the volatile fuel prices as well as high emissions, Agri-Trade can explore the purchase of innovative renewable energy/solar powered combines harvesters	<ul style="list-style-type: none"> While Agri-Trade envisions growing the harvesting capacity in the next 5 years to 6 harvesters, <u>it is still insufficient to meet the demand for wet rice harvesting, for which at least 10 harvesters are needed</u>. Harvesting services from 3rd party providers is also scarce, with 3rd parties only able to fulfil 7.5% of Agri-Trade's total requirement <p><i>This information is only available in the private version of the report</i></p>
		<ul style="list-style-type: none"> However, at current yields of 1,400 kg/acre and in-kind payment for mechanized harvesting of 200 kg, it is more profitable for farmers to sell their rice dry than wet, which means mechanized harvesting (mainly done for wet rice) is not beneficial for farmers in the early years. However, as the yields <u>increase to +1,667 kg/acre farmers start making more profit from the wet rice</u> <p><i>This information is only available in the private version of the report</i></p> <ul style="list-style-type: none"> Agri-Trade could consider lowering the price of this service or link it to farmers' yields so that it is profitable for farmers from the beginning, since yield improvements are not guaranteed. This will also lead to a higher uptake of the service, and therefore higher volumes of wet rice for Agri-Trade



Summary | Opportunities pathways to scale (5/5)

While Agri-Trade’s model demonstrates a clear business case for both farmers and the company, there are possible pathways to enhance performance, sustainability and expand impact for the farmers. We have evaluated five pathways to drive shared value.

Pathway	Rationale	Observations
<p>Explore building internal rice storage and milling capacity as a longer-term intervention</p>	<p>A mill requires significant investments which take longer to recoup if milling is not done at full capacity. To reap financial gains most efficiently, Agri-Trade should first focus on</p> <p>1) improving yields at farm level, 2) increasing the volume of wet paddy by increasing the harvesting capacity through investment in combine harvesters, and 3) investing in the mill.</p> <p>Additionally, it is worth exploring the benefits of first investing in the silos, as they allow for flexibility in planning when using a 3rd party mill, mitigating the challenge of unavailability of the 3rd party mill</p>	<p><i>This information is only available in the private version of the report</i></p>



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The Service Delivery Model

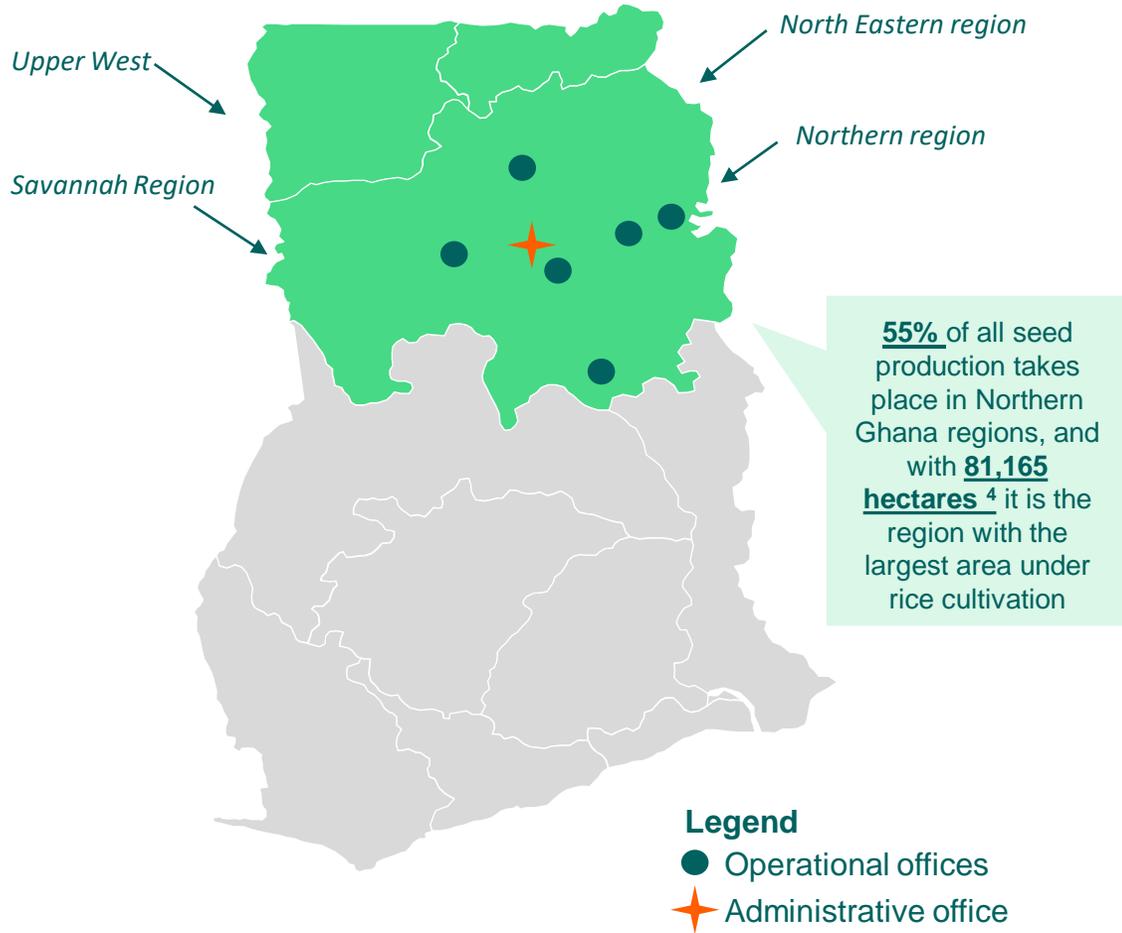


Objectives | Agri-Trade aims to enhance their sourcing and service delivery model by venturing into value adding activities, that sustainably benefit their business as well as the farmers

	Objective	Envisioned outcomes per stakeholder		
		Farmers	Agri-Trade	IDH
Core objective	The main goal for the company is to increase incomes of producer groups whilst remaining financially and operationally sustainable	<ul style="list-style-type: none"> Higher incomes, financial and food security, and improved long-term business case 	<ul style="list-style-type: none"> Contribute to smallholder impact Strengthen commercially viable markets 	<ul style="list-style-type: none"> Scale learnings within the industry in favor of the grain sector in Ghana
Secondary objectives	Provide mechanization services, production input bundles, training and extension to sustainably increase productivity of farmers	<ul style="list-style-type: none"> Higher rice yields Better quality produce 	<ul style="list-style-type: none"> Grow customer base Higher income from added value to produce More volumes sourced 	<ul style="list-style-type: none"> Improve long-term market sustainability Contribute to smallholder impact – food and income security
	Set up community seed multiplication by women farmer groups	<ul style="list-style-type: none"> Lower financial risks Sustainable supply of quality, affordable seeds Alternative source of income 	<ul style="list-style-type: none"> Improve business case of supply chain actors Additional volumes of seed to the market 	<ul style="list-style-type: none"> Contribute to smallholder impact – food and income security
	Build farmer loyalty to stabilize supply of paddy from at least 2,500 farmers	<ul style="list-style-type: none"> Market access Long term off take agreements 	<ul style="list-style-type: none"> Meet capacity requirements Quality & quantity control 	<ul style="list-style-type: none"> Contribute to smallholder impact – food and income security
	Improve business systems to manage extension support and produce aggregation from farmers	<ul style="list-style-type: none"> Access to (weather) information 	<ul style="list-style-type: none"> Optimization of staff employment, machinery/warehousing 	<ul style="list-style-type: none"> Improve long term business sustainability through TA



Location | Agri-Trade's farm and their outgrower farmers are in the Northern regions of Ghana. Their administrative and operating offices are strategically positioned around key activities



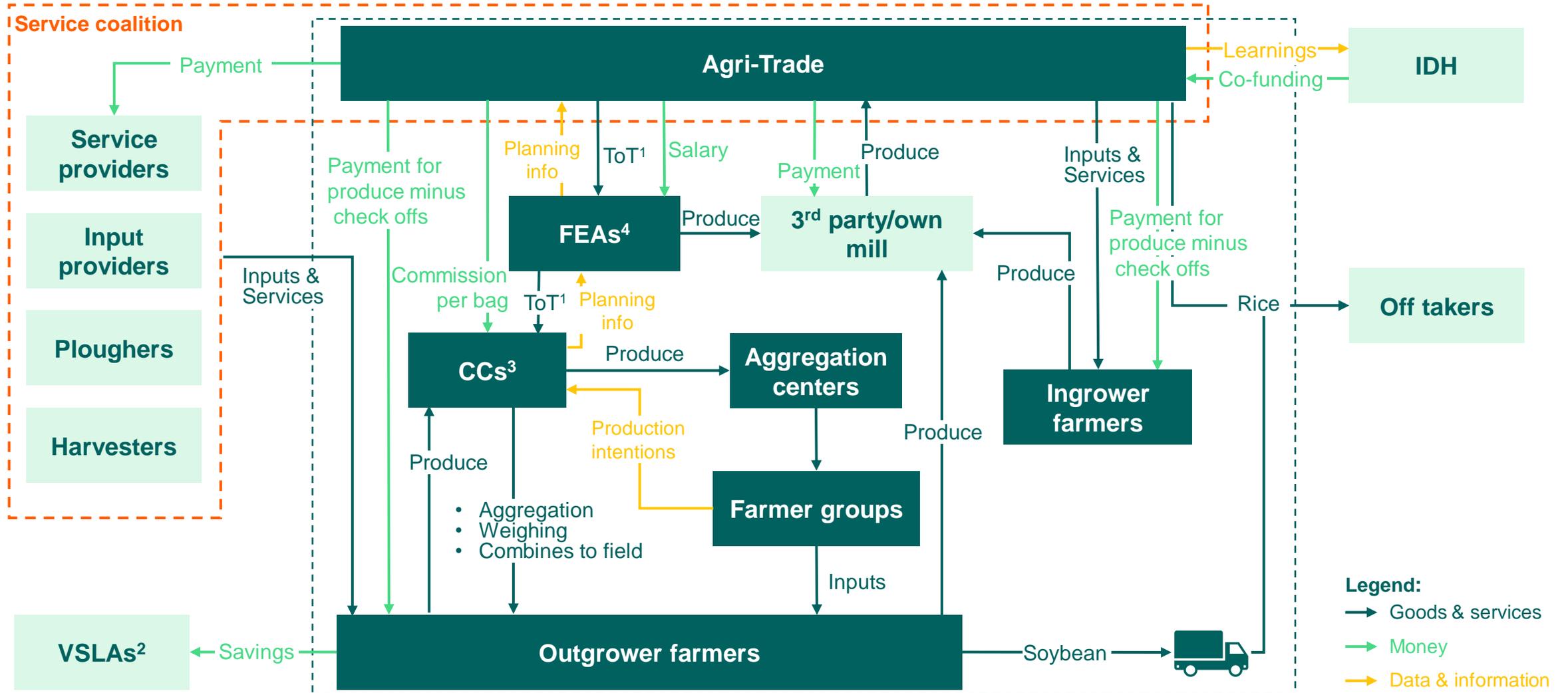
Production areas and systems

- Outgrowers:** Currently, Agri-Trade operations are within the four Northern Regions (indicated in green) with operational districts in Walewale, Yendi, Busunu, Salaga, and Botango, where they work with +/- 2,500 farmers¹. These outgrowers grow soybean, paddy, rice seed, or a combination of these. They have 6 aggregation centers scattered over the districts. These serve as operational offices, storage space and training location
- Ingrowers:** Agri-Trade operates an own farm of 2,500 acres, which they aim to expand to 3,000. These acres are located in Walewale, Nasia, Gushiegu, and Salaga². On the farm, they manage an ingrower scheme where +/-100 SHFs farm paddy on +/- 1 acre each
- Climate:** Ghana's sub equatorial tropical climate is strongly influenced by the West-Africa monsoon winds. The North has one rainy season³ and the majority of farmland is rainfed. Only 1.7% of farmland in Ghana is irrigated⁴, most of which is as part of a government irrigation scheme close to a dam. Access to such schemes is limited, due to a limited number of dams, limited scale of the scheme, and the fact that many farmers are not located in proximity

1) Company documents (2023); 2) Strategy call (2023); 3) Worldbank (2020); 4) AGRA (2020)



SDM Overview | In order to effectively meet the growing needs of their farmers, Agri-Trade intends to establish a service coalition composed of different service providers



1) Training of Trainers; 2) Village Savings and Loans Association; 3) Community Champions – function as agents; 4) Farm Enterprise Advisors Scope of analysis



Stakeholders| Lack of 3rd party biofertilizer and mechanization service providers challenges Agri-Trade's strategy. GoG¹ policy execution must be considered in strategic decision-making

Actor	Legal status	Function (within this SDM)	Revenue model (within this SDM)	Incentive to participate (Within this SDM)
Smallholder farmers	Individuals	Receive services, training and input and supply produce	Sale of paddy and seed	Improve income and thereby livelihoods
Ministry of Food & Agriculture (MoFA)	Governmental entity	Supposed to pay subsidies on seeds as part of PFJ ² program	N/A	Promotes local rice Meet PFJ ² program objectives
IDH	Non-profit	Knowledge/technical assistance, diagnostics, co-funding	N/A	Improve SHF livelihood and facilitate industrywide learning
Ghana Seed Inspection Division Directorate	Governmental entity	Certification seeds Supplies foundation seeds	Service fee- storage, certification, cleaning Sale of foundation seed	Quality seed provision to farmers
3 rd party millers	Limited companies	Mills Agri-Trade's paddy	Margin per milled bag, and sale of bran	Financial business incentive
Off-takers	Limited companies /government	Demand for Agri-Trade's produce and sales to end consumers	Sales of produce	Improved quality and quantity of produce
3 rd party service providers	Limited companies/ individuals	Provide farmers with inputs/ mechanization services. Often not readily available	Sales of inputs and service provision	Demand for offering

1) GoG: Government of Ghana; 2) PFJ: Planting for Food and Jobs



Sourcing channels | Total volumes of rice paddy sourced by Agri-Trade flow from four channels with different characteristics and needs



	 Own farm <i>Paddy, soybean, seed</i>	 Ingrowers <i>Paddy</i>	 Outgrowers <i>Paddy, soybean, seed</i>	 Commercial farms <i>Paddy, soybean</i>
General	Rainfed farm operated by Agri-Trade’s staff. Has priority for mechanized services. 2,300 acres for rice and 200 acres are for soybean	Rainfed land, where farmers cultivate paddy and receive inputs and mechanization services from Agri-Trade	Rainfed (and irrigated) land. Receive inputs and mechanization services from Agri-Trade depending on availability	Large commercial farms that do not receive any services from Agri-Trade
Performance	Yield: 5.4 MT/hectare (paddy) 1 MT/hectare (soybean) 6 MT/hectare (seed) Quality: High-moisture paddy	Yield: 5.4 MT/hectare Quality: High-moisture	Yield: 3.5 MT/hectare (paddy) 1.75 MT/hectare (soybean) 7 MT/hectare (seed) Quality: Depends on availability of mechanization	Yield: 3.7 MT/hectare (paddy) Quality: High-moisture content
Challenges/ benefits	<ul style="list-style-type: none"> + High control - No irrigation - Growth is limited due to management 	<ul style="list-style-type: none"> + High control over quality + High adoption rates of training and information - Limited growth potential 	<ul style="list-style-type: none"> + Large producer base - Scattered farms - Require services that are not readily available 	<ul style="list-style-type: none"> + Possibility to pay later - Lower quality of seeds resulting in 10% higher processing losses
Scale	<i>This information is only available in the private version of the report</i>			



Farmer relationships | Agri-Trade builds continuous engagement with the farmers through the CCs and FEAs. This can further be improved with adoption of a farmer management system



Outreach

- Farmers can reach out to CCs and FEAs directly. During the season, the FEAs are around the fields daily
- With the implementation of a digital decentralized communication system, Agri-Trade hopes to soon be able to reach out to the farmers with weather information and associated practices



Selection

- Agri-Trade wants to move from working with individual farmers with only a few farmer groups, to only working with farmer groups and nucleus farmers
- They prefer to work with farmers with smaller land sizes as guarantee for more dedicated farming. For seed production, farmers must have irrigated acres and additional land of their own to hedge risk



Contracting

Contracts are on a group basis, resulting in group liability. Whenever a farmer defaults repayment of the service package, the whole group can be phased out from the scheme in the next year



Segmentation

- So far, Agri-Trade does not segment the farmers they work with. However, farmers do already receive different service packages based on their activities (seed multiplication, paddy and/or soybean)
- Additionally, the company divides their sourcing/serving area into 6 clusters.



Graduation

A graduation approach encourages farmers to achieve certain performance criteria, making them eligible for a more elaborate service package². Agri-Trade wants to learn how to implement a graduation strategy since farmers have requested for rewards and acknowledgement



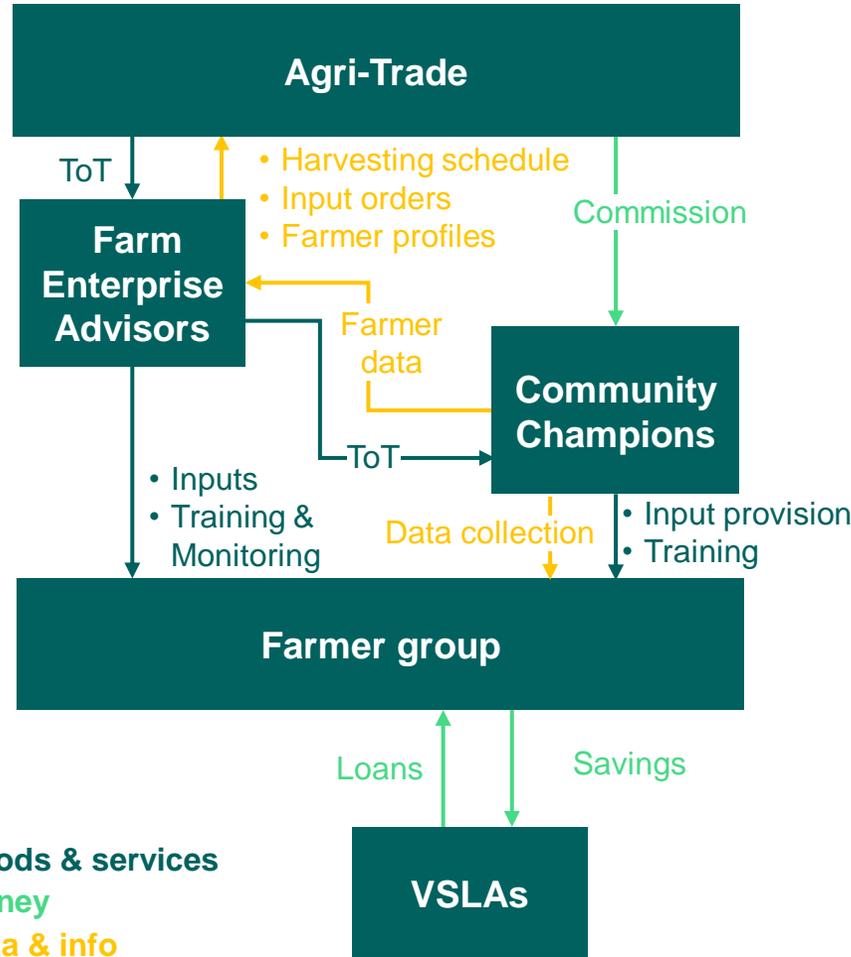
Data collection

Agri-Trade is in the process of developing an application that FEAs can install on their phones to facilitate digitized data collection. So far, bio data (district, region, aggregation, yield, gender, age) has been gathered by means of a paper form, brought back to the office and then entered into an Excel based system

Sources: 1) Company interviews (2023); 2) [Insight Report \(2022\)](#)



Farmer groups and VSLAs | Organizing farmers into groups is conditional to facilitate effective sourcing and service, impose group liabilities, and establish a savings culture



Legend:
 → Goods & services
 → Money
 → Data & info

Relationship between Agri-Trade, FEAs and CCs

- **Establishment:** FEAs support in mobilization of farmers to form farmer groups. The groups have 15-30 members. In total, Agri-Trade works with 60 groups.
- **Capacity building:** Both CCs and FEAs provide group trainings. The 4 topics of focus are planting, weed control, harvesting, and nutrition.
- **Input and credit facilitation:** farmers pay services and inputs they received after harvesting, in-kind by paying in bags of produce. Whenever a farmer defaults, together the CC and FEA try to solve the situation with the individual or group.
- **Commercial relationship:** Agric Trade assigns contracts to the groups giving an indication of prices. However, these prices are subject to the market.

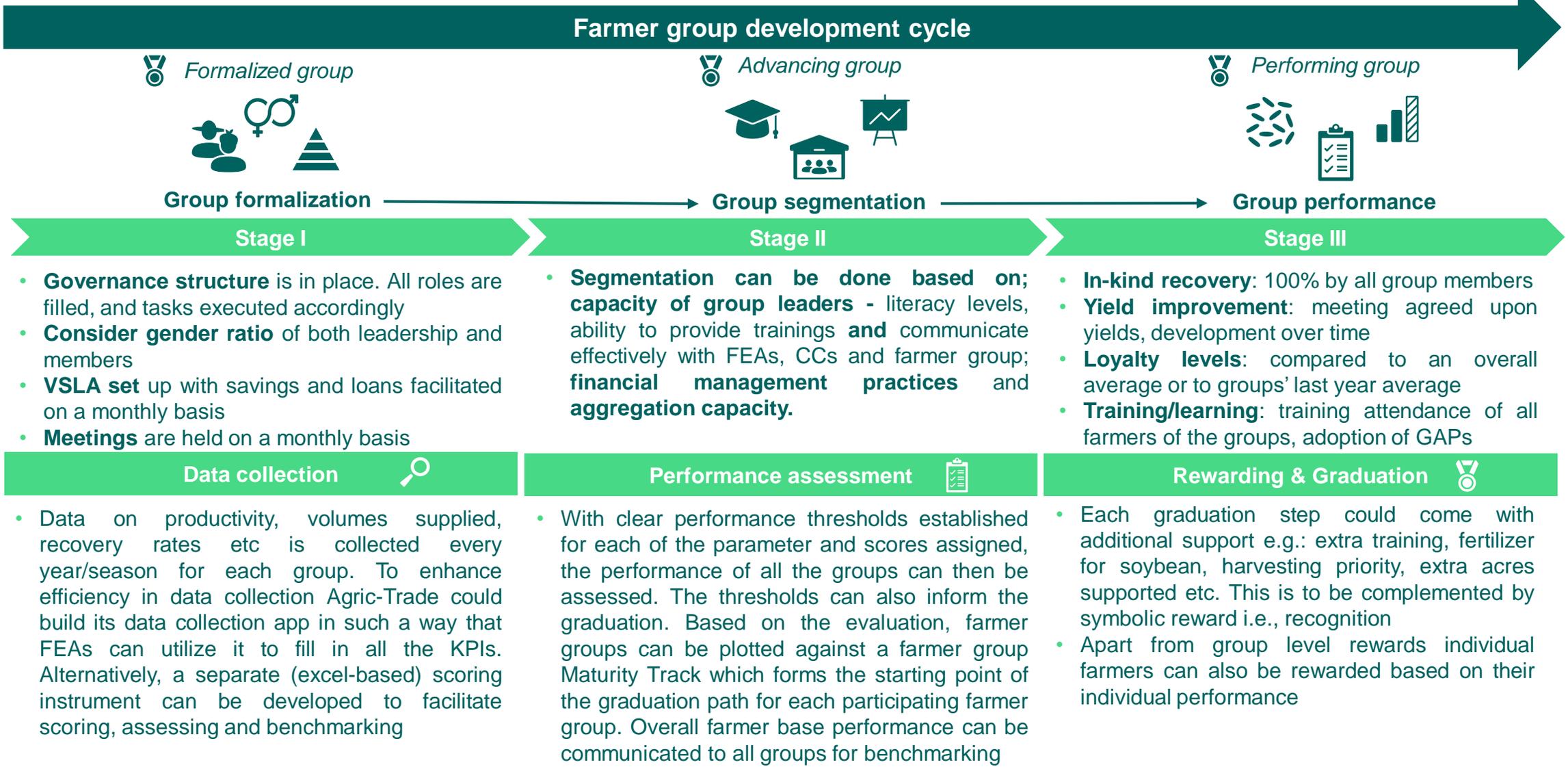
Relationship between FEAs and CCs and farmer groups:

- **Group governance:** groups have 3 to 4 formal positions: secretary, chairman, assistant chair and organizer. Some groups are completely governed by women.
- **Meeting frequency:** Farmer groups meet on a weekly basis.
- **Service provision:** Farmer group chairmen serve as the main interface between Agri-Trade and farmers. They communicate needs to CCs and FEAs. FEAs place orders and connect with the administrative office. CCs help facilitate provision.
- **VSLAs:** All groups operate VSLA¹ model, which is required by Agri-Trade. Contributing and saving is required to join the VSLA. However, groups are not always able to meet the financing needs of their members.

1) Village Savings and Loans Association



Graduation | A farmer group development cycle with graduation and rewards can facilitate farm-level performance improvement and incentives can be aligned with Agri-Trade long-term goals





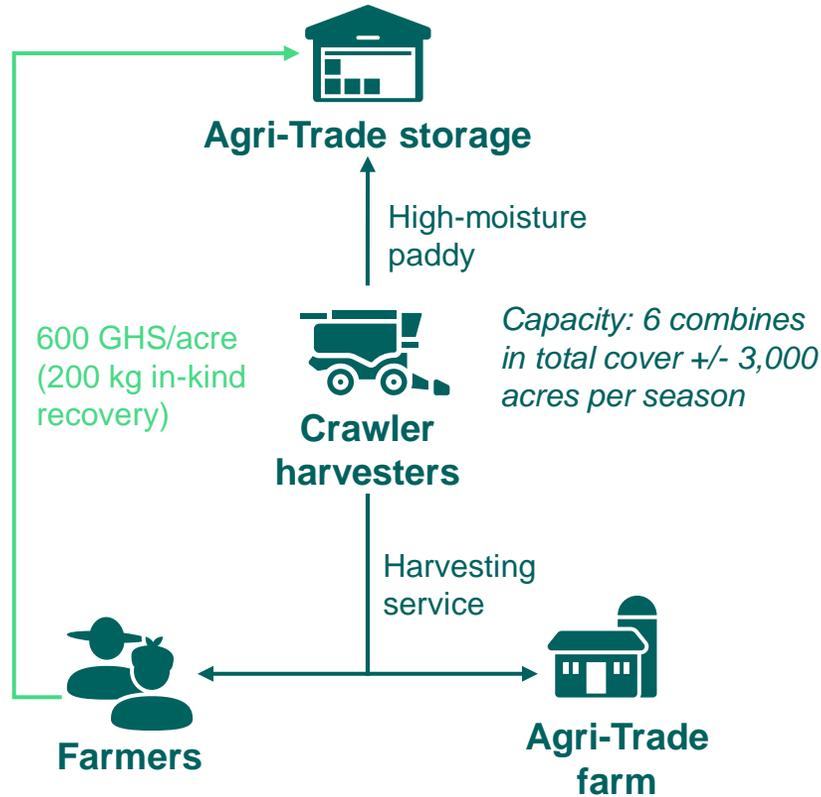
Services | Agri-Trade is offering a wide range of services in-house, and is looking to build a strong service coalition with third parties to meet the remaining needs of the farmers

Category	Service	Impact	Implementation	Financial model	Status
Training & information	GAP, PHM, Farming as a Business training	<ul style="list-style-type: none"> Higher quantity Higher quality 	Trainings are given at the aggregation centers in the 5 districts	<ul style="list-style-type: none"> Indirect revenue by sourcing more, and higher quality of the crop 	● ●
Inputs	(Organic/foliar) fertilizer, (foundation-) seeds	<ul style="list-style-type: none"> Higher quantity Higher quality 	Inputs are distributed by CCs and FEAs. They are available on credit	<ul style="list-style-type: none"> Indirect revenue by sourcing more, and higher quality of the crop Subsidy from seed 	● ●
Financial services	Crop insurance	<ul style="list-style-type: none"> Risk mitigation 	Agric Trade has been piloting insurance index-based on rain-patterns, with selected communities	<ul style="list-style-type: none"> Insurance proceeds in case of loss 	●
Equipment & Labor	Ploughing services	<ul style="list-style-type: none"> Higher quantity Higher quality 	Agritrade has 4 tractors. Each can do 300 acres a season	<ul style="list-style-type: none"> Revenue from sourcing more and higher quality of the crop Margin on the service provision 	●
	Harvesting	<ul style="list-style-type: none"> Higher quality produce harvested Improved operations & loyalty 	Agritrade has 3 crawler combine harvesters that can access wet land, and 2 for dry land. For the remaining land to be harvested FEAs search for combines	<ul style="list-style-type: none"> Revenue from sourcing more and higher quality of the crop Margin on the service provision 	● ●
Post-harvest services	Aggregation	<ul style="list-style-type: none"> Improved operations Reduced side selling 	CCs aggregate and weigh. They receive a commission per bag	<ul style="list-style-type: none"> Costs in the form of commissions 	●

● Ongoing ● Under development



Mechanized harvesting | It is key for Agri-Trade to invest in this service, as it drives both the quality of sourcing volumes, the profitability of their business, and farmer incomes



Beneficiaries: Currently this service is delivered in the first place to Agri-Trade’s own farm and then to the ingrower farmers. Afterwards, the combines are sent out to the outgrowers. In case of lacking capacity, female farmers are prioritized

Mechanization as a service

- **Description:** Harvesting paddy manually is tedious work which combine harvesters help to optimize. However, combines are heavy, expensive machines that are not easily accessible/obtainable in Northern parts of Ghana.
- **Impact:** Timely harvesting is crucial for the quality of the paddy in terms of moisture content. Dry rice leads to more broken grain after milling. Increasing mechanized harvesting capacity has a significant positive impact on farmer income, since the farm gate price for high moisture (4 GHS/kg) is higher than for low moisture (3 GHS/kg).
- **Strategic importance:** With Agri-Trade’s plan to sell more rice under its own brand, (control over) consistent quality is key. It is a logical step to scale up harvesting capacity instead of other services (e.g. ploughing which can be outsourced). Harvesting is highly demanded among SHFs and increases loyalty.
- **Risk:** Heavy machinery compacts the soil leading to higher fertilizer needs. The machines also require a lot of fuel, while fuel prices are highly volatile.

Service profitability (for service provider)

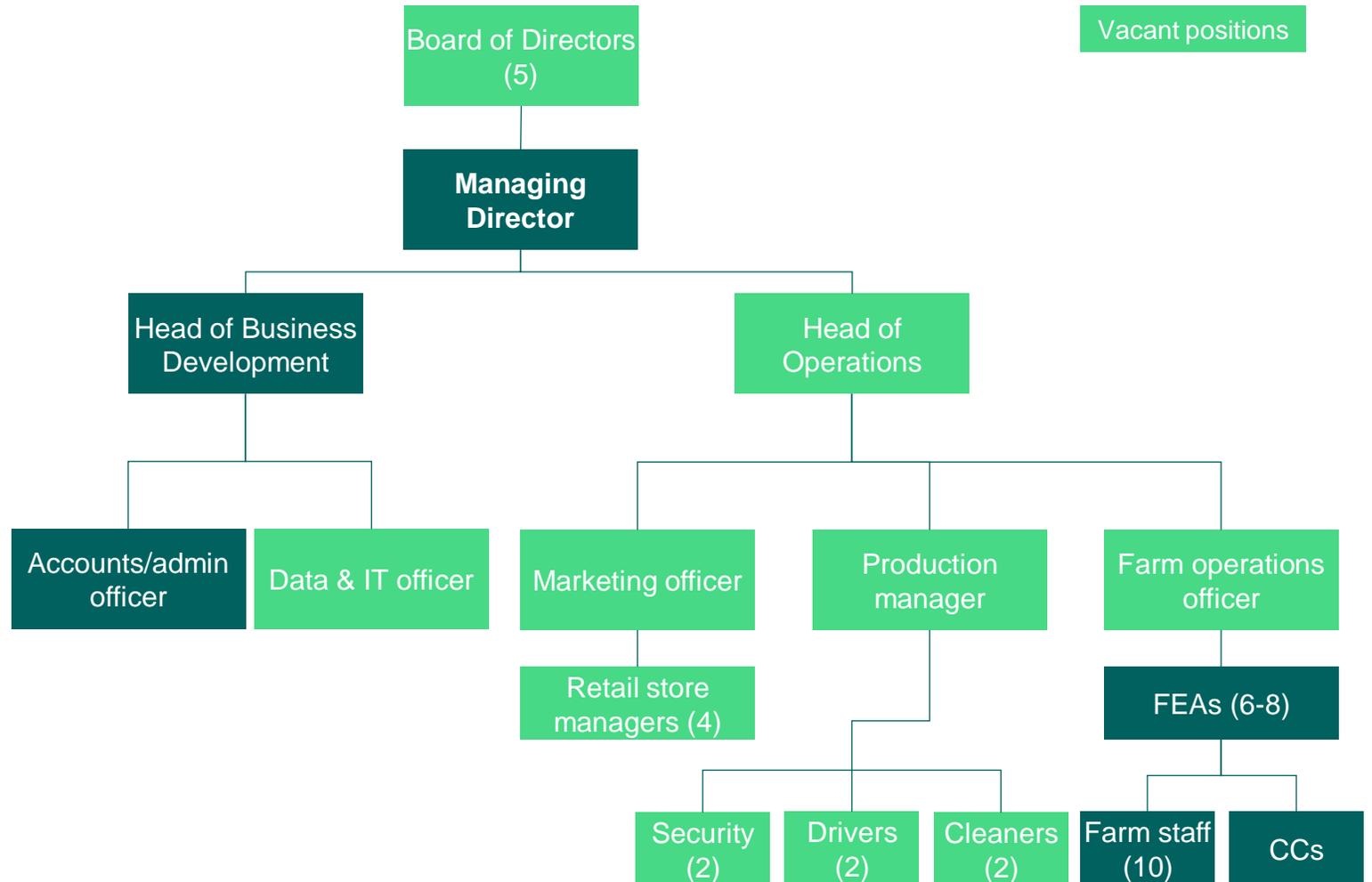
- **Investment & operational expenses:** A new crawler harvester that can operate on wet fields costs 33,000 USD. Operational cost are quite low, but there is a significant exposure to the risk of fluctuating fuel prices

This information is only available in the private version of the report



Organizational structure | With Agri-Trade's expansion ambitions, many vacant positions need to be filled

- **Vacant:** Currently, all FEAs report to the managing director or deputy. A farm operations officer is to be hired, where all FEAs would report to. With installation of the mill and retail stores, 12 new positions will be created.
- **Gender ratio:** There are only 2 (out of 21) women, who perform FEA and accounts/admin roles. Considerations on gender will be made in filling the positions in line with the Agri-Trade targets and strategy. There are no women in leadership positions
- **Casuals:** Including seasonal workers, Agri-Trade employs 56 people. These are not depicted in this overview





Organizational capacity | Anticipating scaling, organizational capacity gaps need to be bridged regarding the staffing plan, SOPs, leadership, communication and farmer base management

		Summary of observations*	Score
Vision and mission	50%	Governance Agric Trade lacks a clearly articulated strategic plan and up-to-date by-laws. The organogram is also outdated, and multiple positions and the Advisory Board are vacant. There is a lack of women in leadership positions. A gender specialist and succession person are on board	Medium
Legal status	50%		
Organizational structure	50%		
Board composition	25%		
Leadership	50%		
Succession and key person risk	75%		
Adequacy of staffing	50%	HR High stability in personnel retention. There are policies covering health, safety, leave, and codes of conduct. However, these policies and staff roles change and not consistently updated.	Medium
Recruitment, retention, and performance	67%		
Personnel policies	60%		
Planning and budgeting	50%	ICS** Management communicates and meets informally, ad-hoc. Tally system is used for accounting and audited financial statements for the last 3 years are in place	Medium
Accounting and financial systems	50%		
Auditing	75%		
Communications		Management There is no clear M&E framework or KPIs. Management dedicates 70% of time to SDM. Farmer data collection app is being implemented. This will also be used for communication. Quality management SOPs are lacking, making it difficult to track paddy quality and reward accordingly. No dedicated IT officer despite digitization efforts	Low
Monitoring and evaluation	50%		
Farmer base management	25%		
Standard operating procedures			
Infrastructure and processes	75%		
ICT systems	33%		

* Find the detailed organizational capacity assessment in the [annex](#); ** Internal control and financial management systems



Gender assessment | Even though Agri-Trade has taken many measures towards becoming *gender transformative*, high gender inequality among staff makes them *gender intentional*

Questions	Answer	Explanation
Gender strategy: Is gender equality a strategic goal for Agri-Trade which is communicated in documents?	Yes	For the outgrower scheme, the company specifically indicated 55% of farmers sourced from, must be female to achieve gender equality in the supply chain. 55% of service provision funds is allocated by a woman to female farmers. The company is making conscious effort to employ more women
Data collection: Does Agri-Trade collect data on staff or customers/farmers disaggregated by gender?	Yes	Data collection is disaggregated at staff- and farm level. Agri-Trade tracks KPIs by gender i.e., # women targeted, yields, recovery rate. After insight on higher recovery rates by women, credit scheme is serving more women
Inclusive workplace: Does Agri-Trade have policies or practices to make the workplace inclusive for both women and men?	Partly	Agri-Trade indicates they ensure equal pay and growth opportunities for both men and women. Nevertheless, only 2/21 FTEs is currently female. Agri-Trade has a gender specialist where employees can turn to if need be. HR policies are developed to make sure all employees are aware of their rights and protocols
Inclusive consultation: Does Agri-Trade speak to or consult both male and female customers (farmers) to learn about their different needs and preferences when designing a product	Partly	At farmer group level, Agri-Trade encourages women to take leadership positions to ensure direct communication from a female farmer perspective with CCs/FEAs. Still, most FEAs are male (5/6)
Inclusive tailoring: Does Agri-Trade tailor services based on how needs may be different for men and women?	Yes	Agri-Trade considers the input weights that women can handle and easily apply on their farms. Trainings are in local language and use audio visual aids to cater for illiterate women. When there are floods, Agric Trade prioritizes the harvest of women produce
Independence and control over resources: Do services enable women to improve their independence, control over resources and/or value capture?	Yes	Agri-Trade does not give its input credit bundle to households/couples. Instead, they serve individuals (women are a priority), to allow for independent decision making and direct digital payments to individuals



Gender best practices | If Agri-Trade maintains its continuous efforts to employ more women and reach the 55% female farmer ratio, climbing the ladder to gender transformative is feasible

JOURNEY ON GENDER INTENTION LADDER

Gender unintentional

Gender intentional

Gender transformative

Agri-Trade is gender intentional:

- The SME has taken steps to at least understand the different needs and constraints of women and men in its internal process, strategy or service design with the goal of ensuring both women and men have access to resources
- The [IDH Gender Tool](#) seeks to conduct in-house integrated gender analysis at different touchpoints

BEST PRACTICES TO IMPLEMENT

<p>Establish Key Performance Indicators (KPIs) e.g., targets on the number of male and female farmers they are aiming to reach, develop a roadmap to get there and allocate resources to monitor and measure gender goals.</p>	<p>Use sex disaggregated data collected to inform service delivery to farmers e.g., track sex disaggregated farm level metrics such as yield and income to understand gaps and need for services and skills.</p>	<p>Incorporate both men and women farmers in the design process of key services to ensure the different needs are considered.</p>
<p>Intentionally advocate for women to serve as leaders in the groups and to take active roles in recruitment and training of farmers. Build capacity of FEAs on gender by training them</p>	<p>Continue and expand the use of mobile money transfer to women. This ensures autonomy, control of their income, and bolsters financial resilience.</p>	

BENEFITS TO Agric Trade

<p>Adapting training to women's capacities, literacy rates, time schedules and location leads to improved yields and quality of produce¹, leading to higher supply.</p>	<p>Recruitment of women's groups is more likely to foster higher loyalty levels² and increased bankability of the farmers/groups.</p>	<p>Using existing women leaders and female FEAs to attract more women is an effective farmer recruitment strategy.</p>
<p>Women's financial resilience is beneficial in household and community resilience and fosters stable market and constant supply chains.³</p>	<p>Agri-Trade gains reputation as a gender inclusive company increasing chances of attracting funding and other support.</p>	

Sources: 1) [Suri, T., Jack, W., \(2016\)](#); 2) [IFC \(2017\)](#); 3) [Davies, M. Baars, M., \(2017\)](#)



Enabling environment (1/2) | Accessing adequate inputs, mechanization, and irrigation (some of the main drivers to increase yields), remain challenging in Northern Ghana

Category	Situation	Impact on SDM
Technology	<ul style="list-style-type: none"> On average, mobile penetration in rural Northern Ghana regions ranges from 36 to 41%¹ Internet penetration stands at 69%² Technical innovations have been crucial in optimizing seed variety breeding for rice production that is more resistant to pests and has higher yields For heavy mechanization machinery, Ghana relies on import 	<ul style="list-style-type: none"> Agri-Trade is implementing a digital app to send out weather information to their farmers, which can significantly impact yields Agri-Trade has leveraged the innovative varieties S-Baika and AGRA that are resistant to rice blast (most common pest) Acquiring combine harvesters is financially challenging. Renting does not pose a relevant alternative since combines are scarce
Natural environment	<ul style="list-style-type: none"> <i>ND-GAIN index</i> shows Ghana is the 64th most vulnerable country to climate change out of 188³ Yields are expected to decline due to droughts and lacking capacity to provide irrigation and inputs³ 	<ul style="list-style-type: none"> Agri-Trade aims to provide all their outgrowers with yield-based or weather-based insurance A part of the farmers Agri-Trade works with, benefit from an irrigation scheme by the GoG
Infrastructure	<ul style="list-style-type: none"> At times, farms can not be accessed due to muddy roads. Outdated infrastructure forms a bottleneck in sourcing/serving rural areas in Northern regions of Ghana⁴ 	<ul style="list-style-type: none"> Inaccessibility of farms can delay harvesting, which poses a risk to Agri-Trade since time of harvest is crucial for rice quality
Labor & workforce	<ul style="list-style-type: none"> Increasing number of youth seek education and move away from agriculture⁵ Farmer age ranges from 45-55⁶ 	<ul style="list-style-type: none"> Seed multipliers main cost is (manual) labor, which is scarce requiring Agri-Trade to facilitate access to more machinert Aging farmers tend to adopt less of Agri-Trade's GAP training requiring more behavior change interventions
Inputs & financing	<ul style="list-style-type: none"> Fertilizer prices have increased significantly due to the war between Ukraine and Russia⁷ GoG partially subsidizes certain inputs as part of the Planting for Food & Jobs (PFJ) campaign⁸ 	<ul style="list-style-type: none"> Agri-Trade investigates organic fertilizers. Yet, the immaturity of the industry means inconsistent quality and supply GoG has been defaulting on subsidy contracts for 4 years

Opportunity

Neutral

Risk

Sources: 1) [Household Survey \(2020\)](#); 2) [World Bank \(2021\)](#); 3) [ND-GAIN Index \(2020\)](#); 4) [D+C \(2020\)](#); 5) [Journal of Rural Studies \(2022\)](#) 6) [FAO](#); 7) [World Bank \(2022\)](#); 8) [MoFA \(2019\)](#)



Enabling environment (2/2) | Government of Ghana (GoG) is taking measures to facilitate a favorable agricultural industry policies, implementation however remains a challenge

Category	Situation	Impact on SDM
Trading system	<ul style="list-style-type: none"> Imported rice is often preferred over local rice, due to quality and price benefits. The GoG has, however, introduced an initiative that require importers of rice to source a quantity of locally produced rice in addition to what is imported¹ Ghana's annual inflation rate stands at 52.8%² 	<ul style="list-style-type: none"> Despite this preference, Agri-Trade experiences high demand for its own white milled polished rice brand: Maraba Dependency on fuel exposes Agri-Trade to risk. Additionally, inflation leads to an unattractive investment climate for foreign organizations, making it hard for Agri-Trade to obtain financing
Pricing & competition	<ul style="list-style-type: none"> Ghana has a free pricing system for paddy GoG determines the maximum price for seeds if you are a supplier that is part of the subsidy scheme³ 	<ul style="list-style-type: none"> Free pricing offers a unique opportunity to factor in cost of inputs, expected revenue and prices offered by competitors in the market Agri-Trade will get out of the subsidy scheme for seed, as the GoG is defaulting, and Agri-Trade can then set competitive prices
Institutional stability	<ul style="list-style-type: none"> Over the past years, Ghana enjoyed political and economic stability making it favourable for business. The PFJ program demonstrates the government support for the rice industry. At times, proper execution of plans is lacking 	<ul style="list-style-type: none"> Agri-Trade operational areas are peaceful, and the people live in harmony. There is no risk in investing in these communities Agri-Trade has been experiencing balance sheet risk due to the government defaulting on the seed subsidy
Land tenure	<ul style="list-style-type: none"> Traditional authorities and men are generally custodians of land. Women are mostly given depleted lands for cultivation of grains on subsistence basis, and available lands require further development which is costly¹ 	<ul style="list-style-type: none"> Agri-Trade leverages their position to buy land and prioritize women in granting permission to farm this land
Social norms	<ul style="list-style-type: none"> Ghana has lower levels of adult literacy compared to other lower/middle income and sub-Saharan African countries⁵ In cases that women do have farmlands, they are still expected to execute all the work around the household⁶ 	<ul style="list-style-type: none"> Agri-Trade aims to include at least 50% of women in their outgrower scheme. For seed multiplication, solely women are trained. It will be crucial to get buy-in from the male heads of the household given their role in decision making

Opportunity

Neutral

Risk

Sources: 1) [IDH \(2023\)](#); 2) [Bloomberg \(2023\)](#); 3) [USDA \(2022\)](#); 4) [European Commission \(2021\)](#); 5) [PHC General Report \(2021\)](#); 6) [IFPRI \(2020\)](#)



3

Business Case

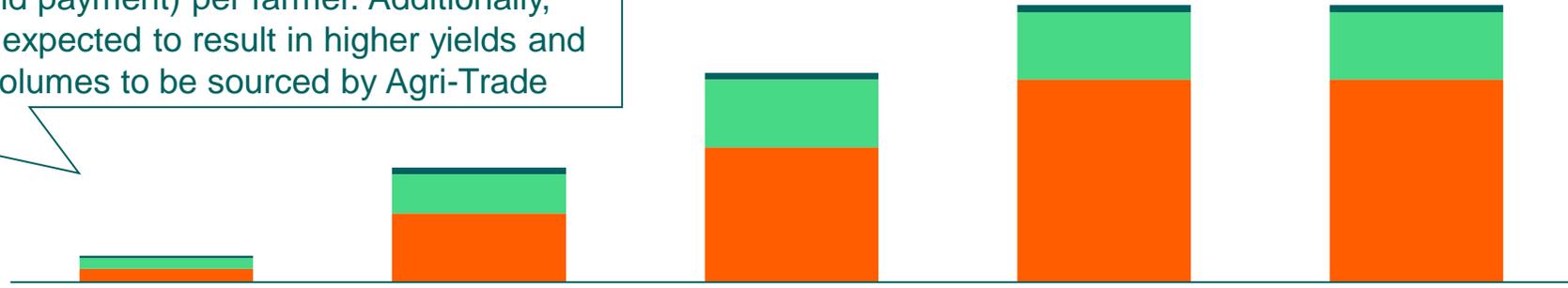


Scale | Agri-Trade seeks to grow total volumes sourced tenfold, mainly driven by increasing the proportion of land supported and improving yields, leading to higher recovery and more volumes

Total sourcing volumes (MT) per crop

By increasing the acres, they support per farmer (from 1 to 3 for paddy and 1 to 2 for soybean), Agri-Trade increases the recovery volumes (in-kind payment) per farmer. Additionally, the extended support is expected to result in higher yields and thereby higher excess volumes to be sourced by Agri-Trade

- Seed
- Soybean
- Paddy



	2022	2023	2024	2025	2026
# of farmers	1,500	2,600	2,650	2,700	2,700
Acres supported	4,150	7,250	10,165	10,250	10,250
Yield development* (kg/acre)					
Paddy	1,858	2,106	2,464	2,463	2,463
Soybean	381	547	714	714	714
Seed	2,604	2,610	2,807	2,807	2,807

* Yield developments are based on the projected yield increase for all farmers as well as Agri-Trade's own farm, and is not related to the increase in volume sourced from commercial farms

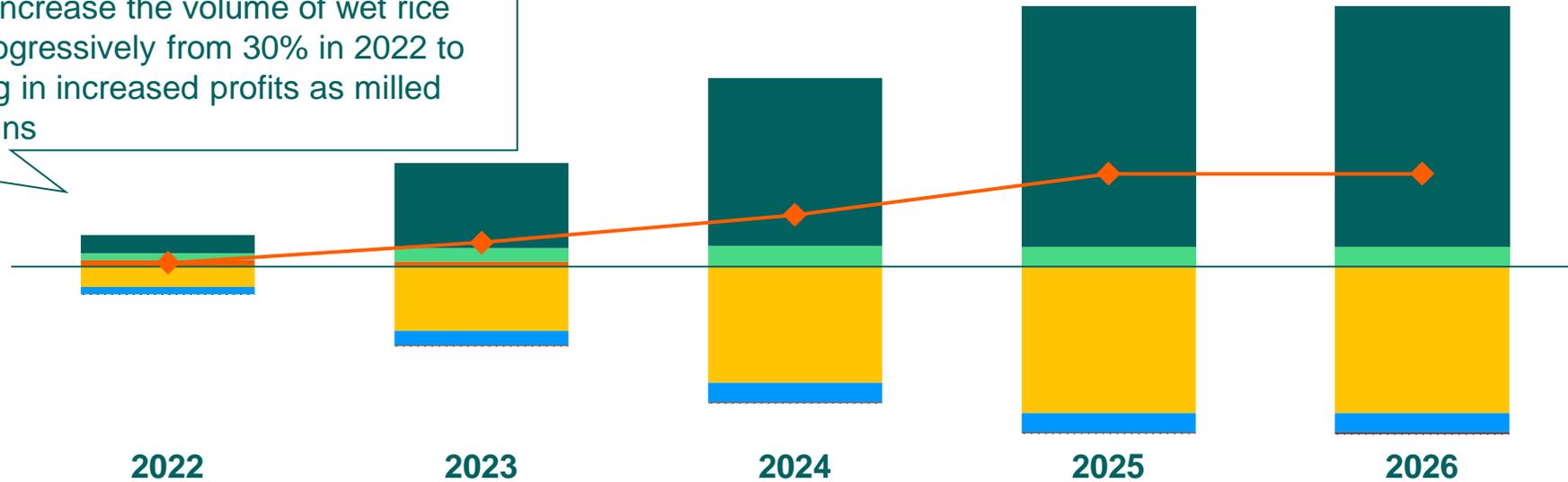


P&L over time

Profit and loss for 2022-2026 (USD)



Agri-Trade intends to increase the volume of wet rice sourced and milled progressively from 30% in 2022 to 70% by 2025, resulting in increased profits as milled rice fetch higher margins



EBIT margin	<i>This information is only available in the private version of the report</i>				
Share of wet rice	30%	43%	57%	70%	70%

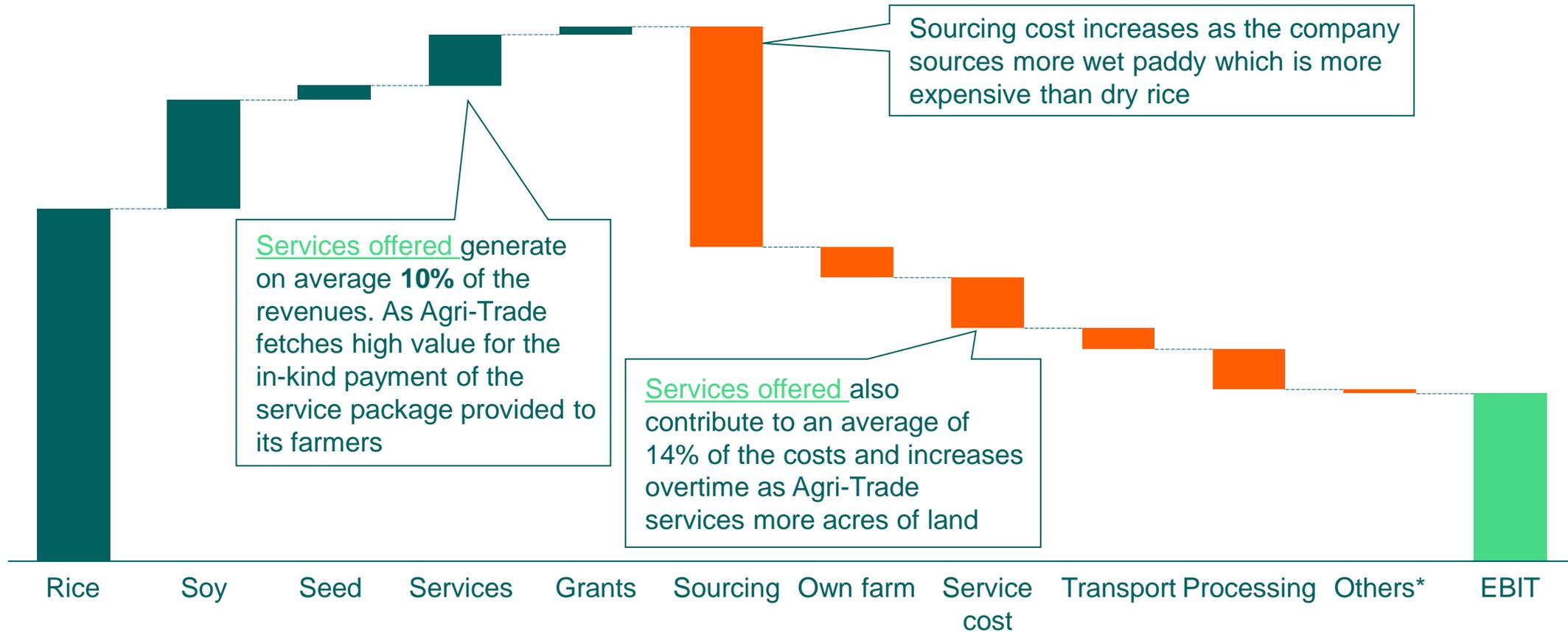
* Commercial revenue is sales from rice (milled, unmilled and broken), soybean and rice seed



P&L build-up | Service revenues and costs contribute significantly to the business performance accounting for 10% of total revenues and 14% of total costs

Profit and loss drivers, 5-year average 2022-2026 (USD)

Net Expense Revenue

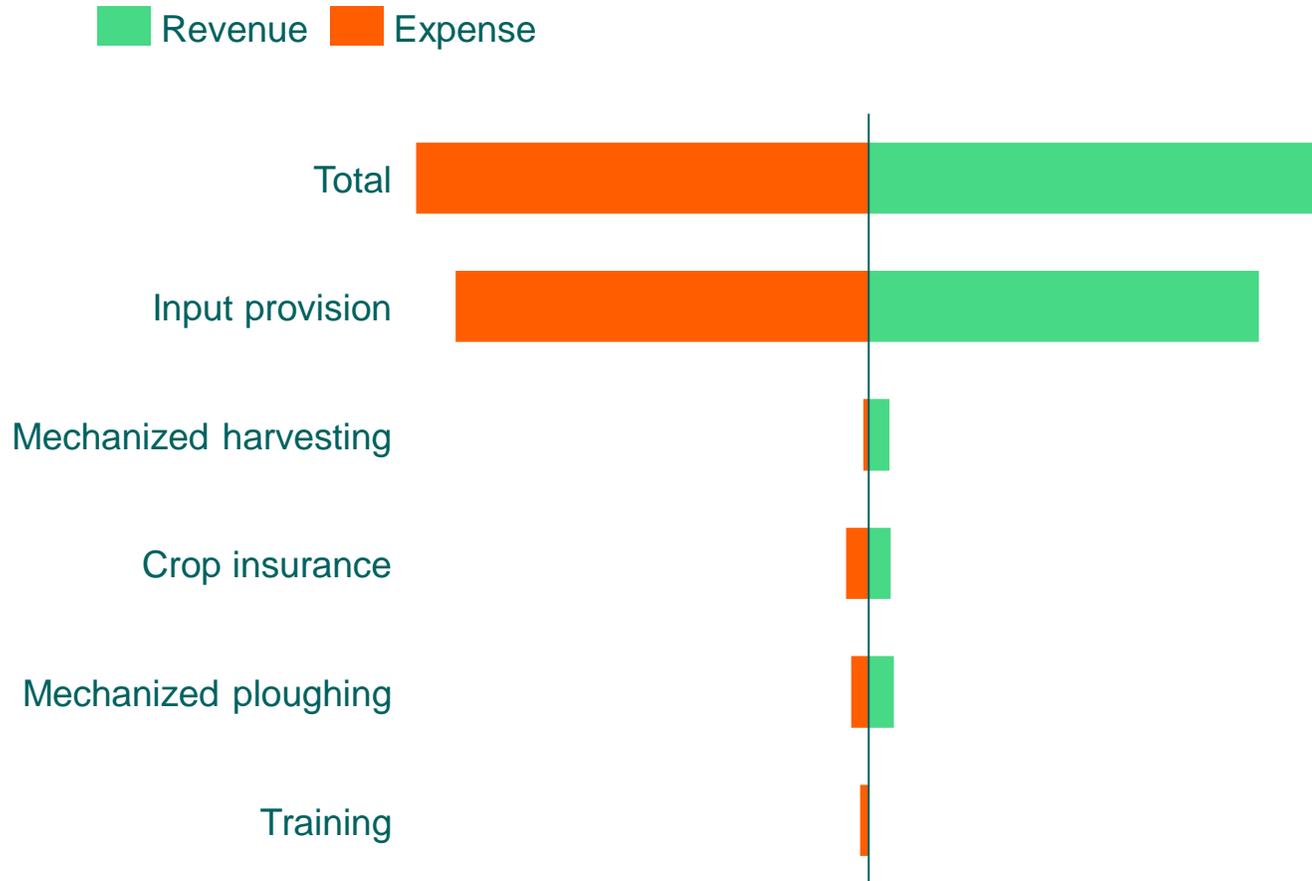


* Others include overhead and depreciation



P&L by service | Agri-Trade fully recovers the cost of services provided as the value of the in-kind payment outweigh the cost of the input package

Profit and loss per service*, 5-year average 2022-2026 (USD)



- Agri-Trade currently supports only **1 acre** of paddy and **1 acre** of soybean per farmer with plans to increase this to **3 acres** of paddy and **2 acres** of soybean by 2024
- The largest service cost is the input cost which includes seed, fertilisers and weedicides. An input package averages **\$150** for in/out grower rice seed and paddy farmers and **\$20** for soybean (this includes only ploughing and weedicides)
- Given the current limited tractor capacity, only ingrower farmers fully receive ploughing, harrowing and mechanised harvesting services. These services costs on average **\$70** per farmer. Ingrower paddy farmers also receive harrowing
- All services are recovered through in-kind payment equivalent to **650kgs/acre** for paddy, **500kgs/acre** for seed and **50kgs/acre** for soybean
- Training is provided by the FEAs with an average training facilitation budget of **\$500**

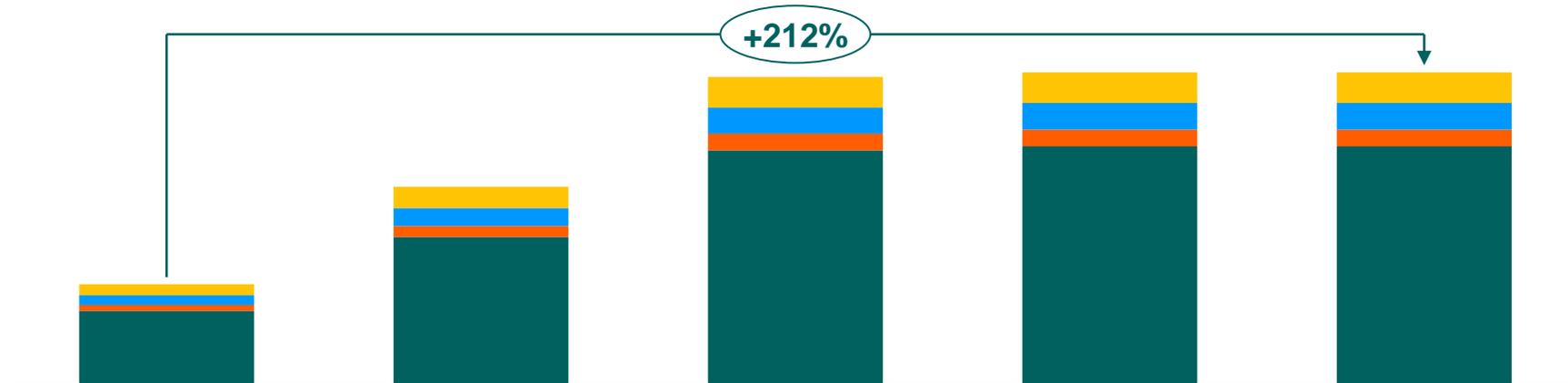
* Service P&Ls assume a 5% default rate on inputs on credit. Input provision expenses include procurement, staff/FEA distribution and transport costs



Cost to serve | Increasing acres serviced with inputs will increase working capital needs. With chemical fertilizer making up 76% of input costs, it is worth exploring cheaper organic alternatives

Working capital needs - Cost to serve per input over time (USD)

Seeds Weedicides Crop insurance Chemical fertilizer



Acres served	2022	2023	2024	2025	2026
Paddy	1,900	3,775	5,415	5,400	5,400
Soybean	2,000	3,075	4,200	4,200	4,200
Seed	50	100	150	150	150
Ingrower	200	300	400	500	500
Total	4,150	7,250	10,165	10,250	10,250

* Assuming an organic fertilizer input price of 14 USD per acre



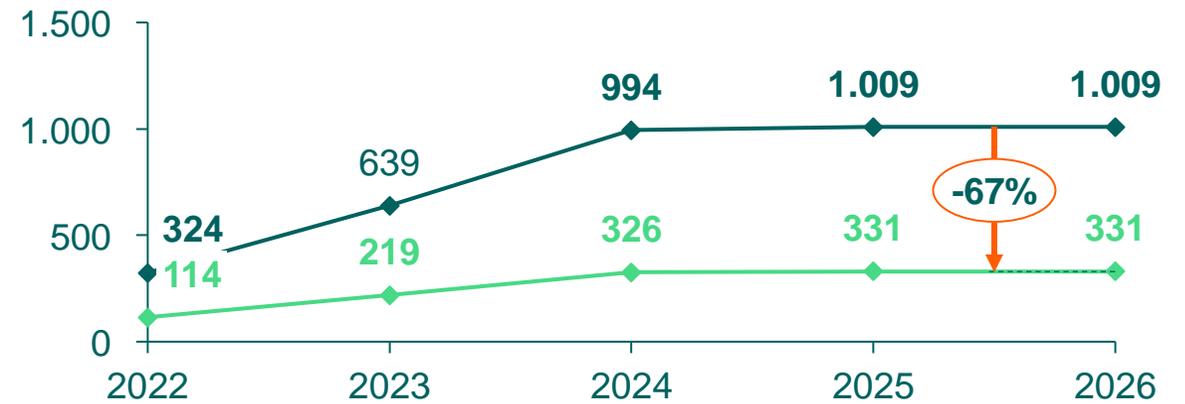
Fertilizer | Shifting to organic fertilizer is increasingly profitable for farmers, as chemical fertilizer leads to declining yields in the long-term. For Agri-Trade, it can reduce WC* requirements by 67%

Farmer income: chemical vs. organic fertilizer (USD/acre)**



Over time, the difference in net income increases, with chemical fertilizer users experiencing declining yields ([see annex](#)). This means break-even yields also decrease over time. In year 1 organic users would earn the same income as chemical users at a yield of 2.1 MT/acre, but in year 5 this is only 1.3 MT/acre. The cost difference per acre between chemical fertilizer (\$135) and organic fertilizer (\$14) is significant

WC needs: chemical vs. organic fertilizer (USD)



Apart from the long-term business case for farmers to switch to organic fertilizer, Agri-Trade can significantly reduce its working capital needs, that are expected to grow by 200%. Chemical fertilizer would eventually make up +/-75% of the required WC, with organic this would reduce with 58% (steady state)

* Working Capital

** This analysis assumes consistent quality and availability of organic fertilizers, which is not always the case. Only includes input and application cost; other costs are assumed to be constant



Milling (1/3)

Cost of milling (USD/MT)*

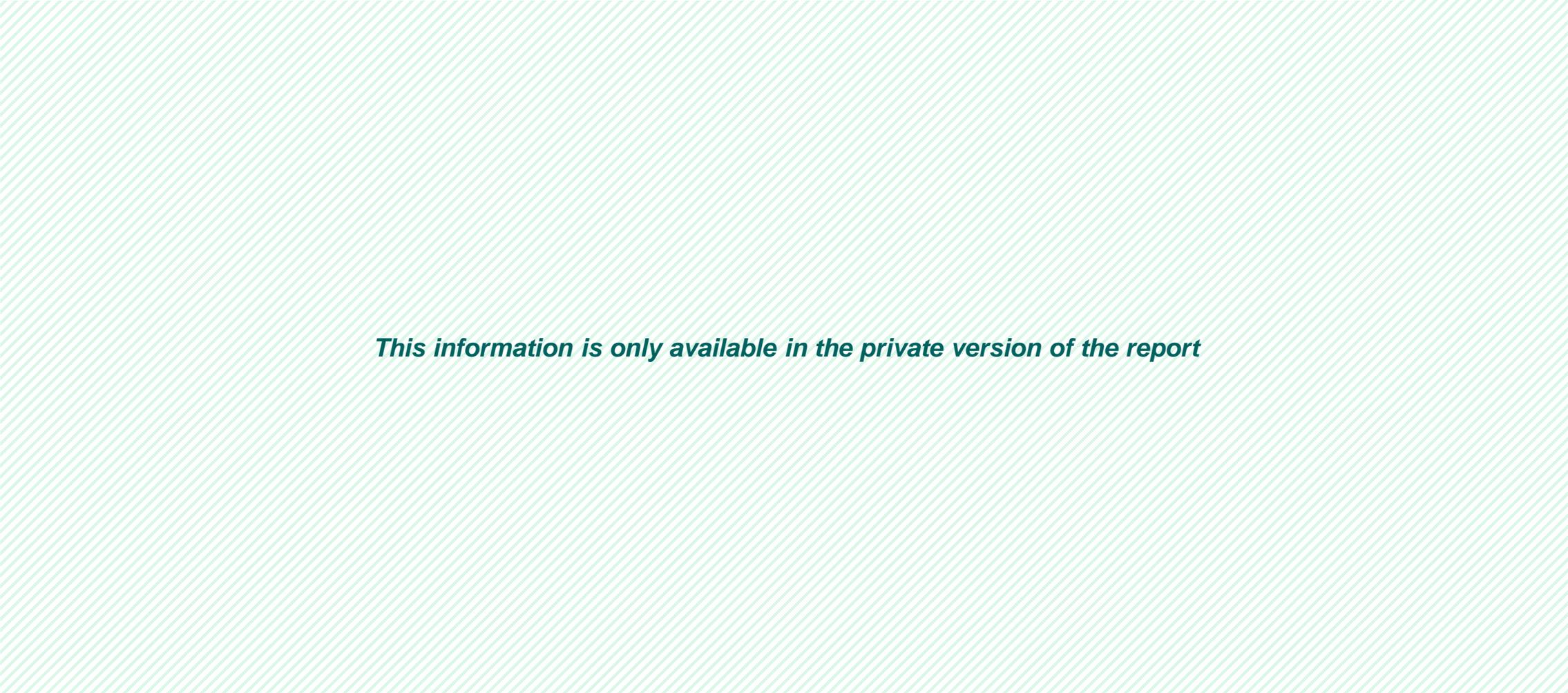
Profitability (USD/MT) based on (un)availability of mill

This information is only available in the private version of the report



Milling (2/3)

Annual performance of in-house milling (USD)



This information is only available in the private version of the report



Milling (3/3) | Multiple large investment in the mill require strategic thinking to prioritize which sequence of investment makes most financial sense

Sequence of investment / prioritization

The mill requires significant investments which are only recouped at fully mill capacity. To reap financial gains most efficiently Agri-Trade should first focus on improving yields at farm level, increasing (wet paddy) harvesting capacity by investing in combine harvesters and after investing in the mill. Additionally, it is worth exploring the benefits of first investing in the silos and as they allow for flexibility in planning when using a 3rd party mill, mitigating the challenge of unavailability of the mill.

Benefits

- **Visibility:** Mill creates brand recognition
- **Employment:** Ability to create more jobs
- **Collateral:** Mill can cover as collateral to obtain additional investments
- **Quality insurance:** Control over final product
- **Planning:** Silos can help smooth out milling over the whole year
- **Independence:** Reduces the exposure to risk of untimely milling by 3rd party millers
- **Milling services:** Can be provided to other parties in case sourced volumes are not enough to operate at full capacity

Challenges

- **Financing:** Exposure to bridging a finance gap throughout the year
- **Recouping investment:**  per year is the break-even volume for Agri-Trade to recover its operational cost. Every additional MT will contribute to recouping the investment. If Agri-Trade is willing to invest in the mill without first bridging the current capacity gap, financial gains from other activities are required to offset the loss.
- **Learning curve:** Time to achieve maximal efficiency in operating the mill
- **Value chain lock-in:** Less flexibility in shifting to other business activities

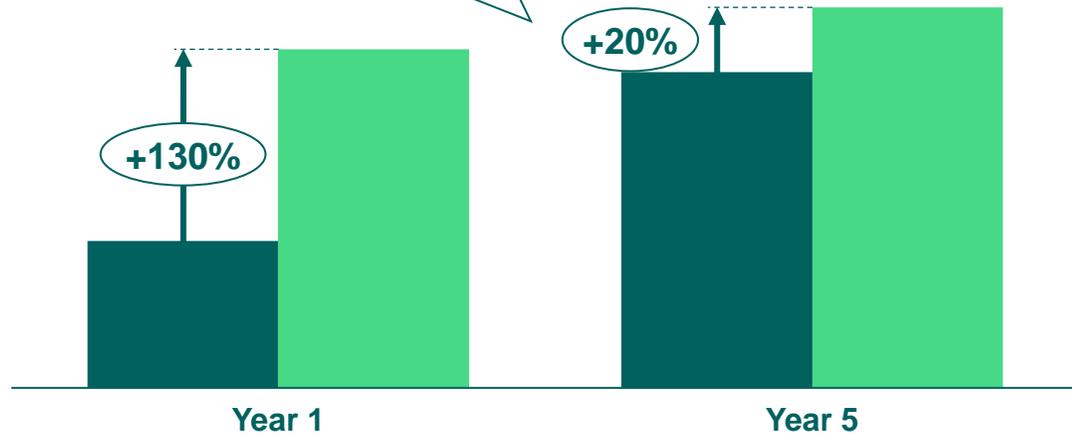


Seed multiplication | Seed multiplication at the community level and at Agri-Trade's own farm both have their benefits. A mix of both is preferred to share these benefits and to diversify risks

Farmer net income per crop, year 1 and year 5 (USD/acre)*

■ Paddy ■ Seed

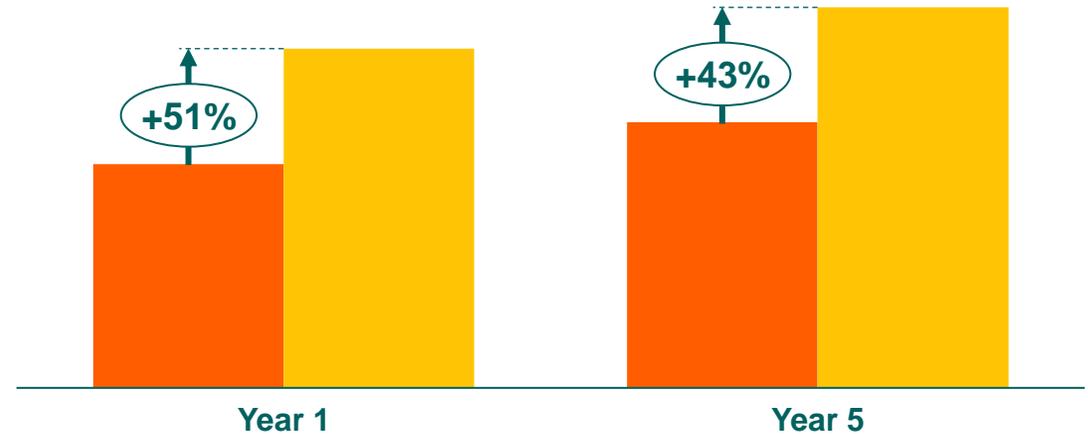
Seed multiplication increases farmer incomes compared to paddy (although the difference decreases over time), but it does require higher investments, new skills and more (family) labor. Other benefits of seed production at farm level are improved community relations, building local knowledge, and diversifying risks



Potential savings for Agri-Trade (USD/acre)**

■ Savings for paddy ■ Savings for seed

Both seed and paddy are more profitable when grown on the own farm compared to sourcing from outgrowers, but savings are significantly larger for seed. Other benefits of seed production at their own farm include more control, less need for field staff and capacity building at farm level, and diversifying risks



* More assumptions can be found [in the annex](#)

** Savings when Agri-Trade produces paddy on their own farm instead of buying it from farmers, and savings when Agri-Trade produces seed on their own farm instead of buying it from farmers

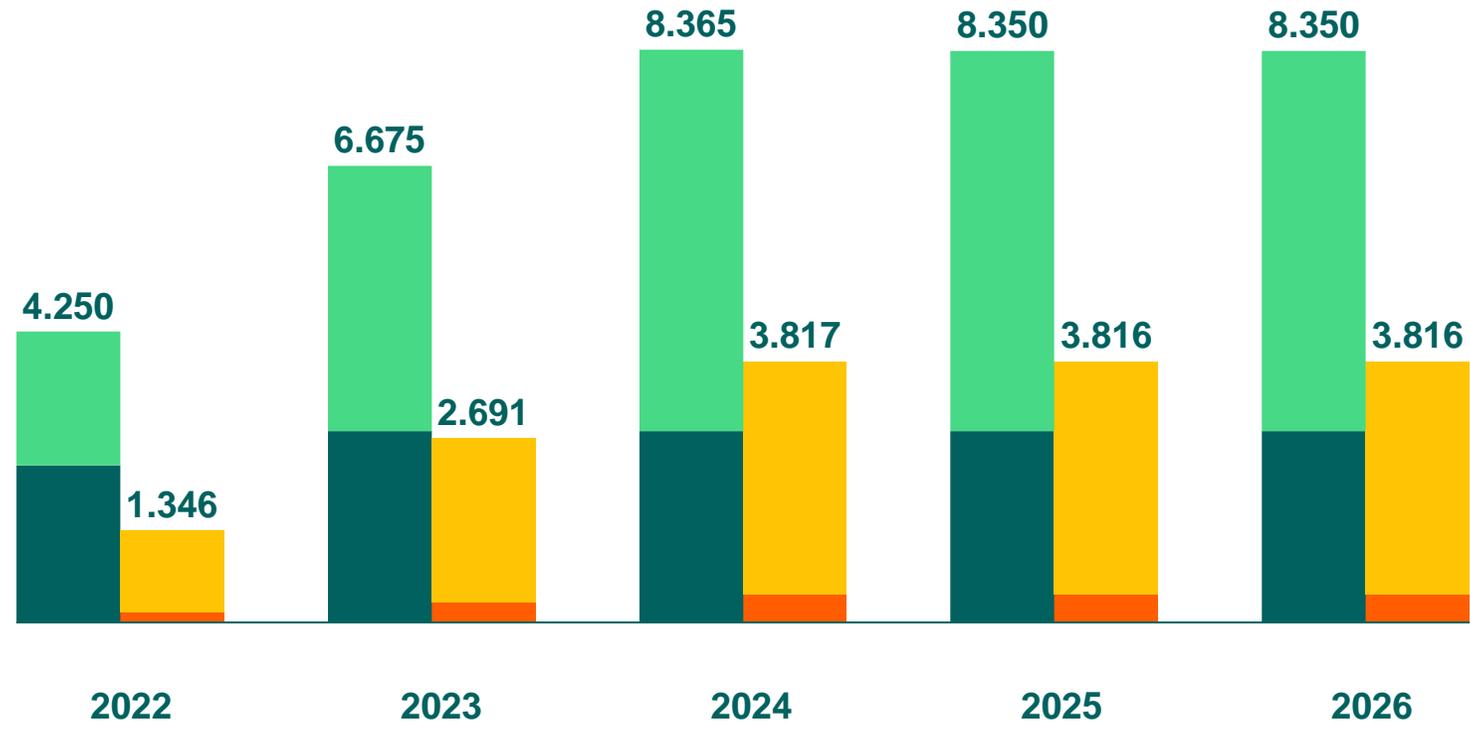


Mechanized harvesting (1/4) | Although Agri-Trade envisions growing their harvesting capacity significantly in the coming years, it is still insufficient to meet demand of paddy to be harvested

Capacity of mechanized harvesting service provision (acres/year)

Own farm demand Outgrower demand 3rd party capacity Agri-Trade capacity

While planning to increase their harvesting capacity over the years, Agri-Trade is still not able to meet the needs of both its own farm and their outgrowers. Timely harvesting services from 3rd party providers are scarce, since demand far exceeds supply. 3rd parties can only fulfil 7.5% of Agri-Trade's total requirement



Projected number of harvesters	<i>This information is only available in the private version of the report</i>
Required number of harvesters	



Mechanized harvesting (2/4) | There is a clear business case for Agri-Trade to invest in harvesters, since the benefits are twofold through service revenues and higher sourcing profitability

A combine harvester costs \$33,000 and has a lifetime of 5 years. While this is a significant investment (especially since financing for these machines is difficult to secure), it is beneficial for Agri-Trade in two ways. Firstly, Agri-Trade can provide mechanized harvesting as a service on which it makes a profit. Secondly, timely mechanized harvesting leads to higher volumes of wet rice which is [more profitable](#).

Profitability of mechanized harvesting service (USD/acre)

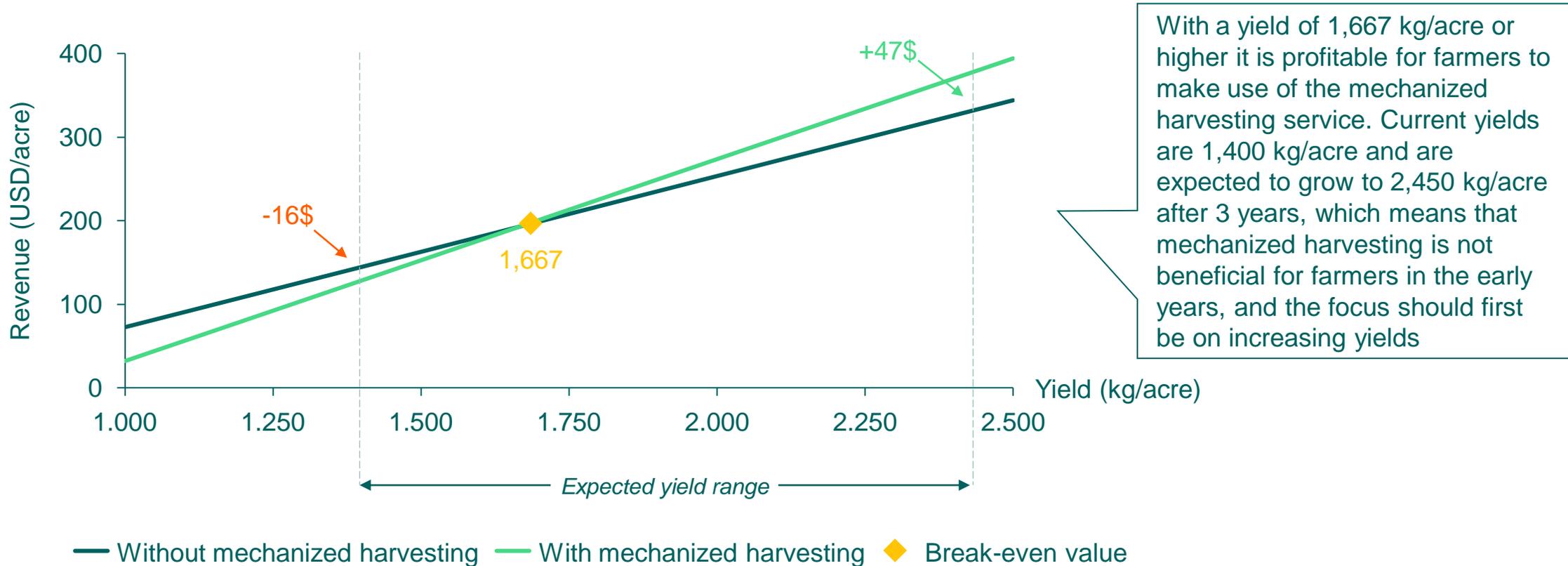
Profitability of dry and wet rice (USD/MT sourced)

This information is only available in the private version of the report



Mechanized harvesting (3/4) | The business case for farmers to offtake the mechanized harvesting service only exists when their yields are above the break-even value of 1,667 kg/acre

Farmers' in-kind payment for the mechanized harvesting services amounts to 200 kg of paddy, but the price they get for the remainder of their rice is \$0.08 higher (3 GHS vs. 4 GHS). This means that only above a certain yield (after deduction of post-harvest losses and in-kind payment for other inputs), this service becomes profitable for farmers.



Mechanized harvesting (4/4)



This information is only available in the private version of the report



4

Impact Case



Farmer segments | Farmer segments have been determined based on farming practices, crop combination and type of scheme. Majority of the farmers grow rainfed paddy and soybean



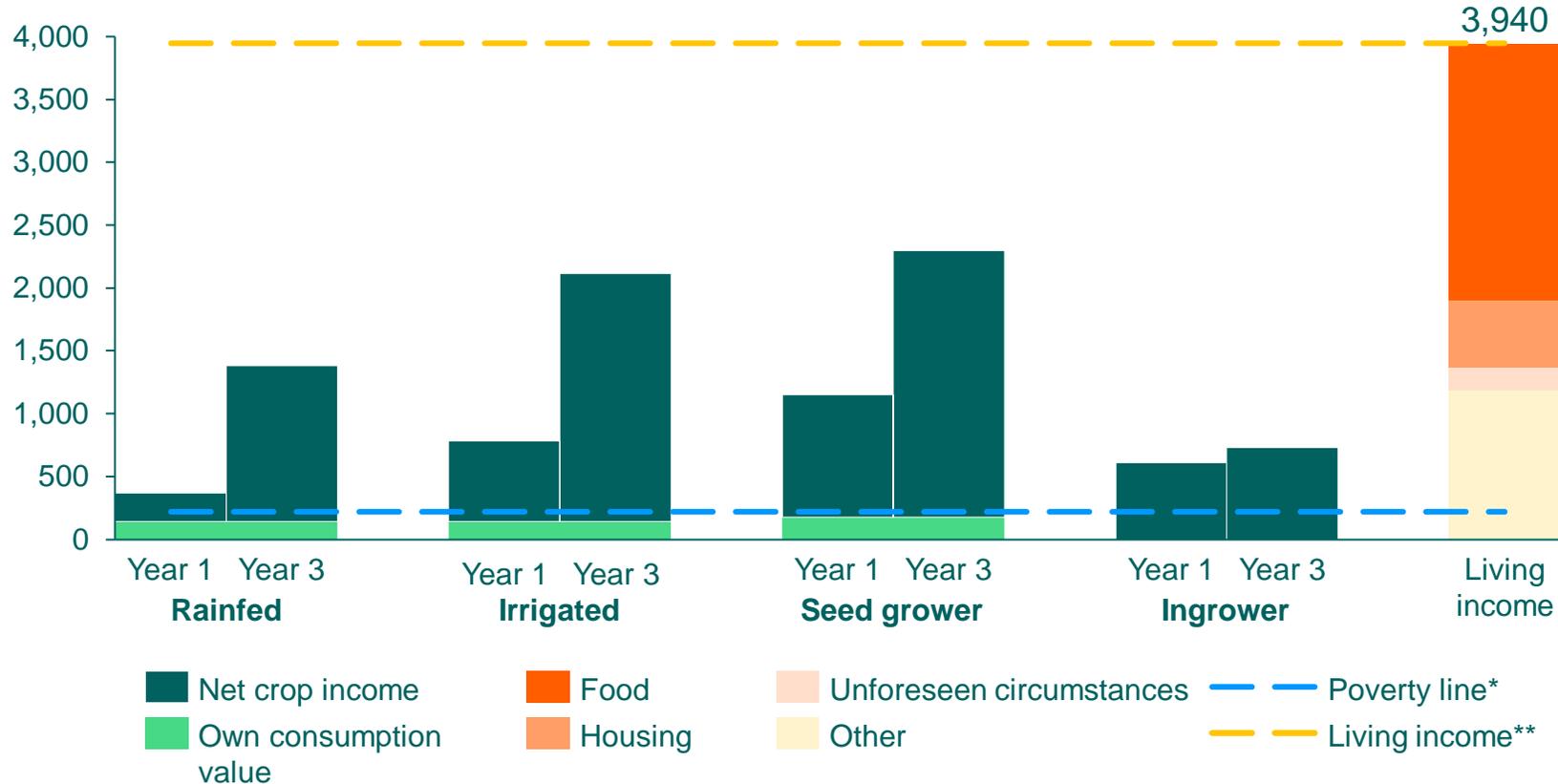
Characteristics	Baseline	Rainfed	Irrigated	Seed grower	Ingrower
Farm composition	Paddy: 3 acres Soybean: 2 acres	Paddy: 3 acres Soybean: 2 acres	Paddy: 2 acres rainfed, 1 acre irrigated Soybean: 2 acres	Paddy: 2 acres rainfed Seed: 1 acre Soybean: 2 acres	Paddy: 2 acres rainfed
Second season	N/A	N/A	1 acre (paddy only)	1 acre (paddy only)	N/A
Current yield (kg/acre)	<i>This information is only available in the private version of the report</i>				
Optimal yield	Paddy: 750 Soybean: 300	Paddy: 2,450 Soybean: 700	Paddy: 3,000 Soybean: 700	Seed: 2,500	Paddy: 2,450
Farm-gate price	3 GHS/kg	4 GHS/kg	4 GHS/kg	5 GHS/kg	4 GHS/kg

Services	
Training	Training on planting, weed control, harvesting, & nutrition
Inputs	Seeds and fertilizer for paddy & weedicides for both paddy & soybean
Equipment & Labor	Harrowing or ploughing, harvesting, threshing
Financial services	Crop insurance
Post-harvest services	Aggregation



Living income | Despite projected increase in income from year 1 to 3 due to higher productivity, none of the farmer segments achieve the living income benchmark

Household income, living income, poverty line (USD/year)



- From year 3 onwards, net crop income will be constant for all segments. (See slides on farm P&Ls). This stability is achieved due to arriving at the max of the learning curve. From year 3 onwards farmers do not become more productive. They are already applying all inputs and receive all services as desired
- By farming on the ingrower acres alone, farmers surpass the poverty line in year 3. These farmers are expected to have additional acres outside of the scheme that are not considered here in their net crop income, which decrease their living income gap

* The World Bank poverty line was adjusted to a household of 4 members and a PPP conversion factor of 12.3 GHS per USD. Further assumptions can be found [in the annex](#)

** The living income benchmark is based on a family composition of 2 adults and 2 children. Further assumptions can be found [in the annex](#). Note that the **current** living income is presented in this graph. It might be higher in year 3.

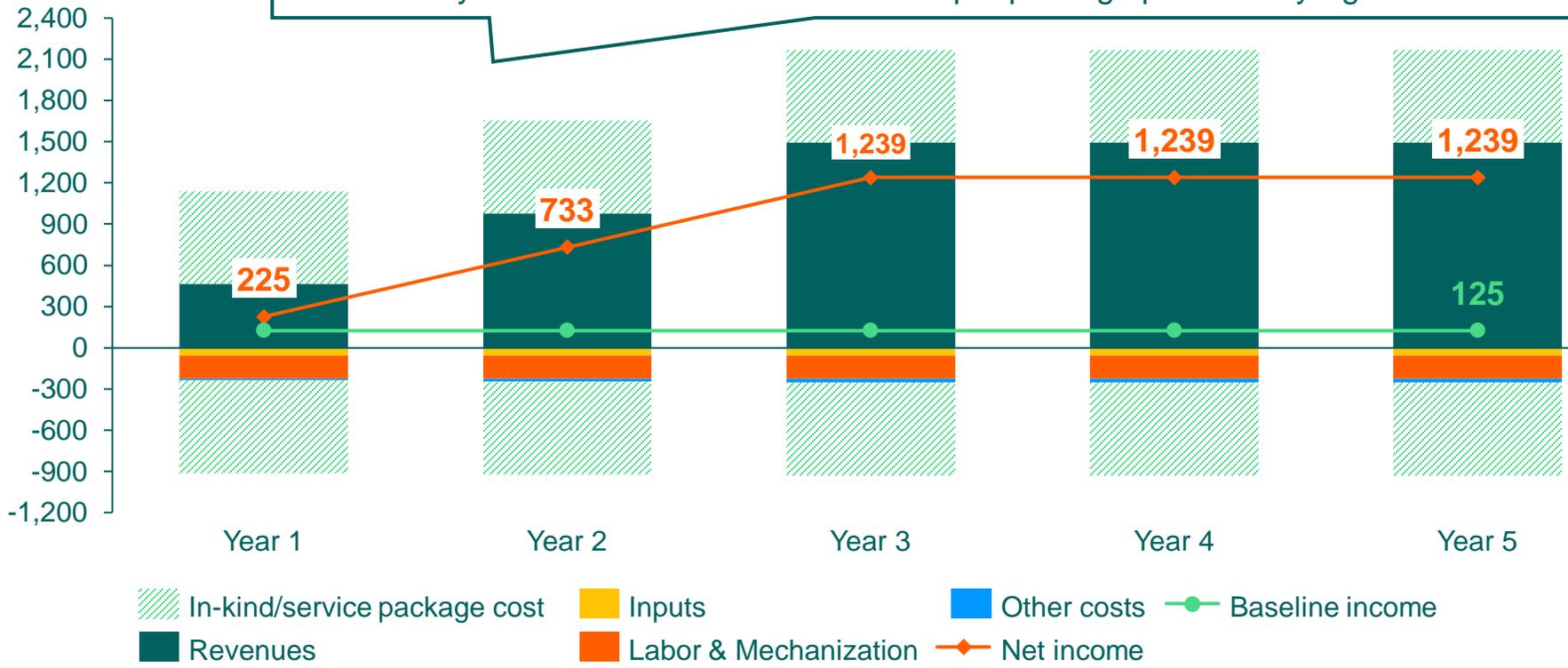
Source: [Sustainable Food Lab \(2018\)](#).



Farm P&L – Rainfed outgrowers* | SDM rainfed farmers are projected to grow their revenues by 450% as services provided by Agric Trade results in higher productivity

Rainfed outgrowers profit and loss for the total farm for a five-year period (USD)

SDM farmers are expected to grow their yields by **75% (from 1,450 kgs/acre)** and **100% (from 350kgs/acre)** for paddy and soybean respectively by Y3 before reaching a steady state as farmers utilize the full input package provided by Agric Trade.



The difference in the net income of baseline and SDM farmers grows exponentially **(up to 10 times)** by Y3 as baseline farmers are not able to access quality and affordable inputs and services

* This segment has farmers with 2 acres of soybean and 3 acres of paddy (all rainfed). We are assuming farmers are supported by Agric Trade on all the acres. Currently however, farmers are only supported on 1 acre of paddy and 1 acre of soybean.

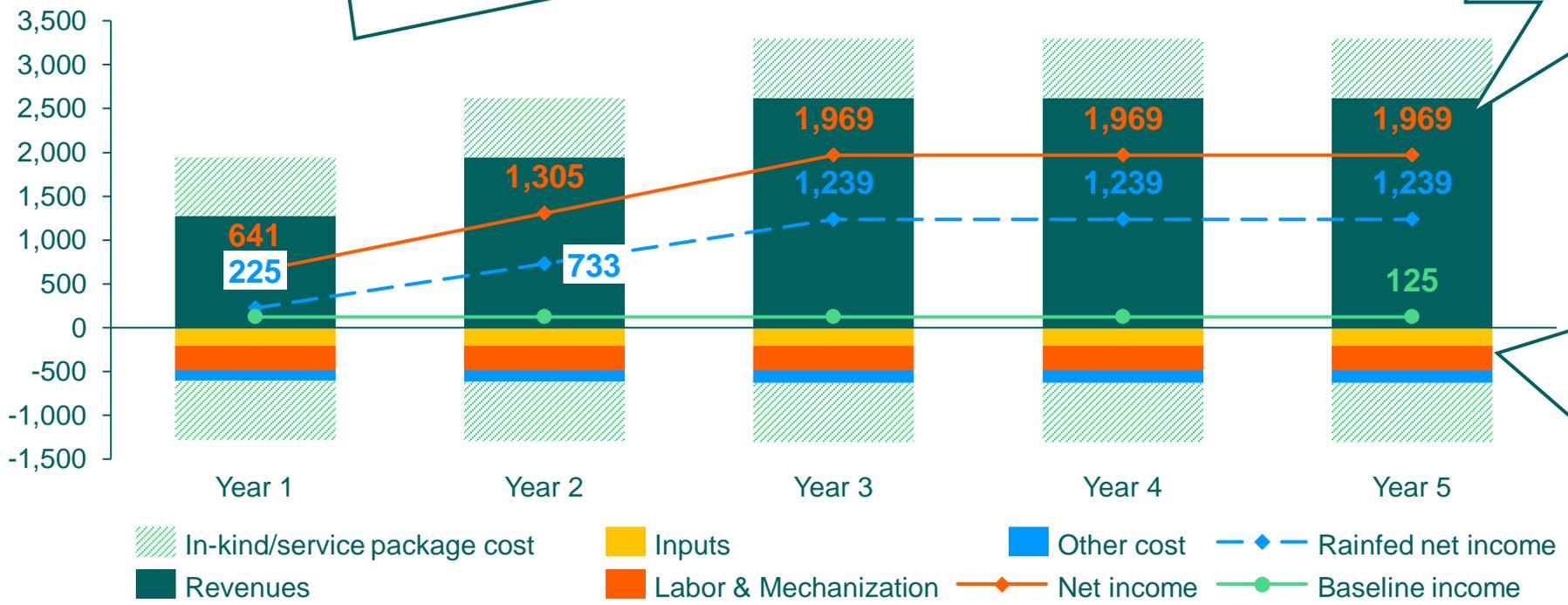


Farm P&L – Irrigated outgrowers* | Access to irrigation results in a substantial income uplift (average \$636 higher) compared to farming only on rainfed land. Access to irrigation is limited

Irrigated outgrowers profit and loss for the total farm for a five-year period (USD)

Access to irrigation enables farmers to farm for **two seasons** on the same land with higher farm gate prices received during the lean season. Irrigated land also yields **+30%** more than the rainfed land. The irrigation infrastructure is however, underdeveloped in the region limiting the number of farmers with access

Farmers with access to irrigation generate **\$730** higher incomes than rainfed farmers from YR 3 onwards



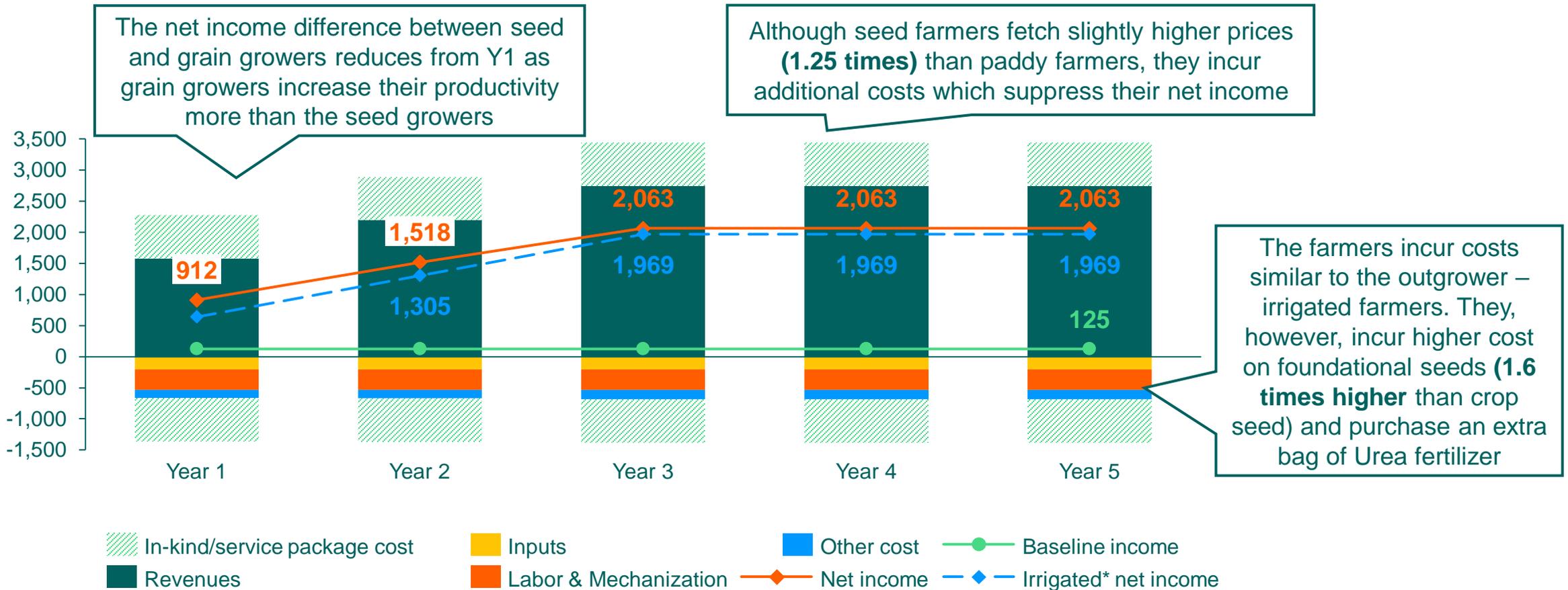
While irrigated land requires transplanting which reduces the amount of seed needed (by 50% compared to broadcasting), it increases the labour cost substantially. Further, during the lean (irrigated) season farmers are not supported by Agric Trade, and thus incur higher input costs

* This segment has farmers with 2 acres of soybean and 3 acres of paddy (1 irrigated, 2 rainfed). We are assuming farmers are supported by Agric Trade on all the acres during the main season. No support is provided during the lean season for the irrigated land. Currently however, farmers are only supported on 1 acre of paddy and 1 acre of soybean.



Farm P&L – Seed growers* | The additional income generated from growing seed drives net income by \$94 as of YR3, in comparison to growing paddy on this irrigated acre

Seed outgrowers profit and loss for the total farm for a five-year period (USD)

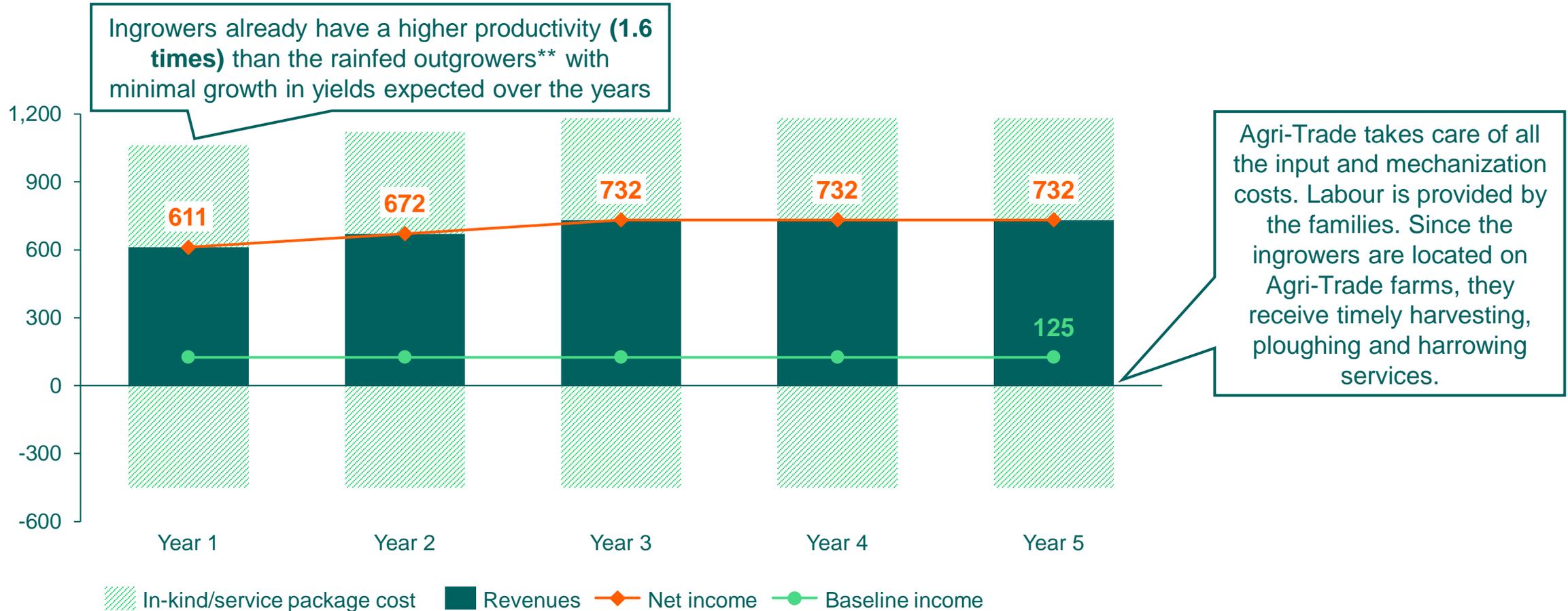


* This segment has farmers with 2 acres of soybean and 3 acres of paddy (1 irrigated, 2 rainfed), the acre of irrigated land is used for seed production during the main season. We are assuming farmers are supported by Agric Trade on all the acres during the main season. No support is provided during the lean season for the irrigated land. Currently however, farmers are only supported on 1 acre of paddy, 1 acre of seed and 1 acre of soybean.



Farm P&L – Ingrower* | The ingrowers do not face any upfront investment since all costs are borne by Agri-Trade and recovered at harvest

Ingrower profit and loss for the total farm for a five-year period (USD)



* These are rainfed farmers growing paddy on land owned by Agric Trade. They farm on 2 acres of land and are fully supported by Agric Trade on all services

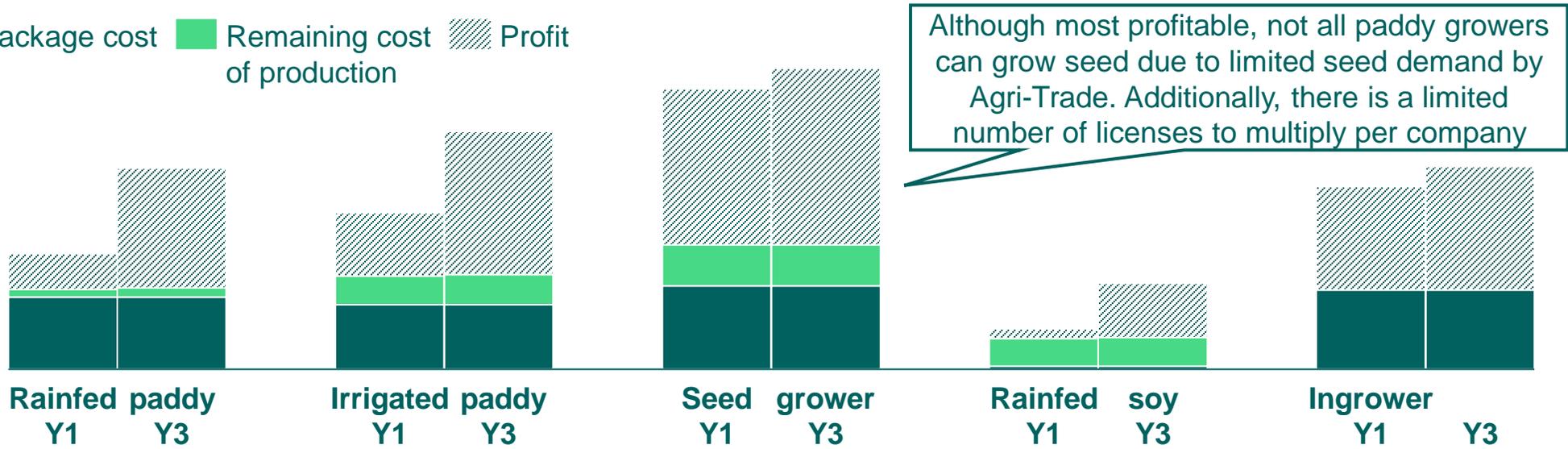
** To further compare ingrowers with rainfed outgrowers, profitability per acre see [Profitability per acre](#)



Profitability per acre | With higher profits earned on seed production compared to paddy, farmers are likely keen to shift their irrigated acres from paddy to seed production where possible

Cost of production and profit* (USD/acre)

■ Service package cost ■ Remaining cost of production ▨ Profit



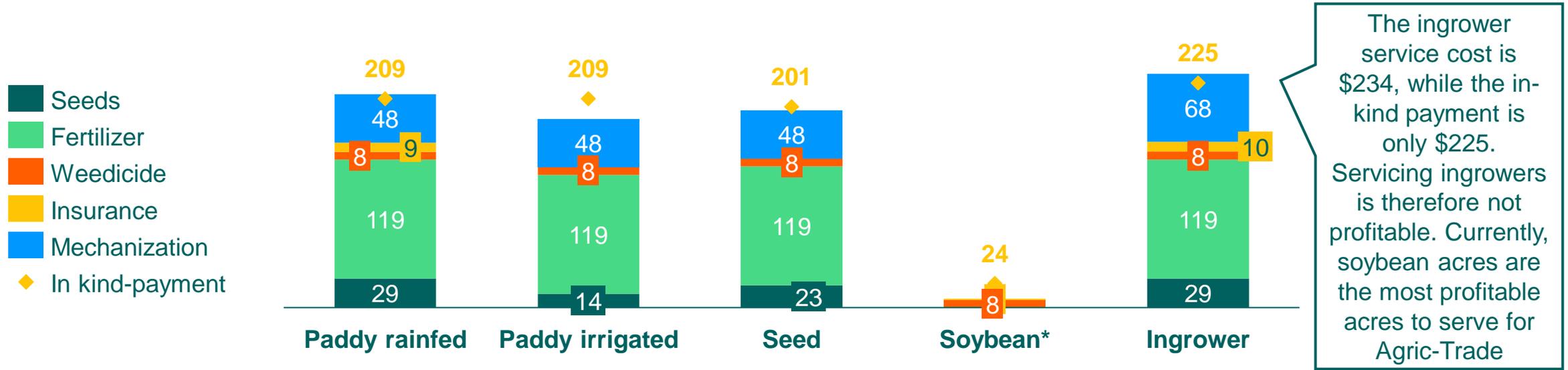
Marketable surplus (MT/acre)*	<i>This information is only available in the private version of the report</i>
Profit (USD/acre)	
Profit (USD/MT)	

* Marketable surplus and profit are depicted for year 3, the moment from which yields are expected to be stable and no further yield increases are expected



Service package cost per acre - per crop | Though in-kind payment for an irrigated and rainfed rice acre is the same (\$209), cost is \$24 higher for a rainfed acre due to insurance and seeds

Cost of serviced acre (USD/acre)



The ingrower service cost is \$234, while the in-kind payment is only \$225. Servicing ingrowers is therefore not profitable. Currently, soybean acres are the most profitable acres to serve for Agric-Trade

Farmgate price (USD/MT)	322	322	402	483	322
Marketable surplus (MT/acre)**	1.19	1.60	1.38	0.51	1.14
Profit (USD/acre)*	355	425	432	161	366
Profit (USD/MT)*	299	266	314	317	322

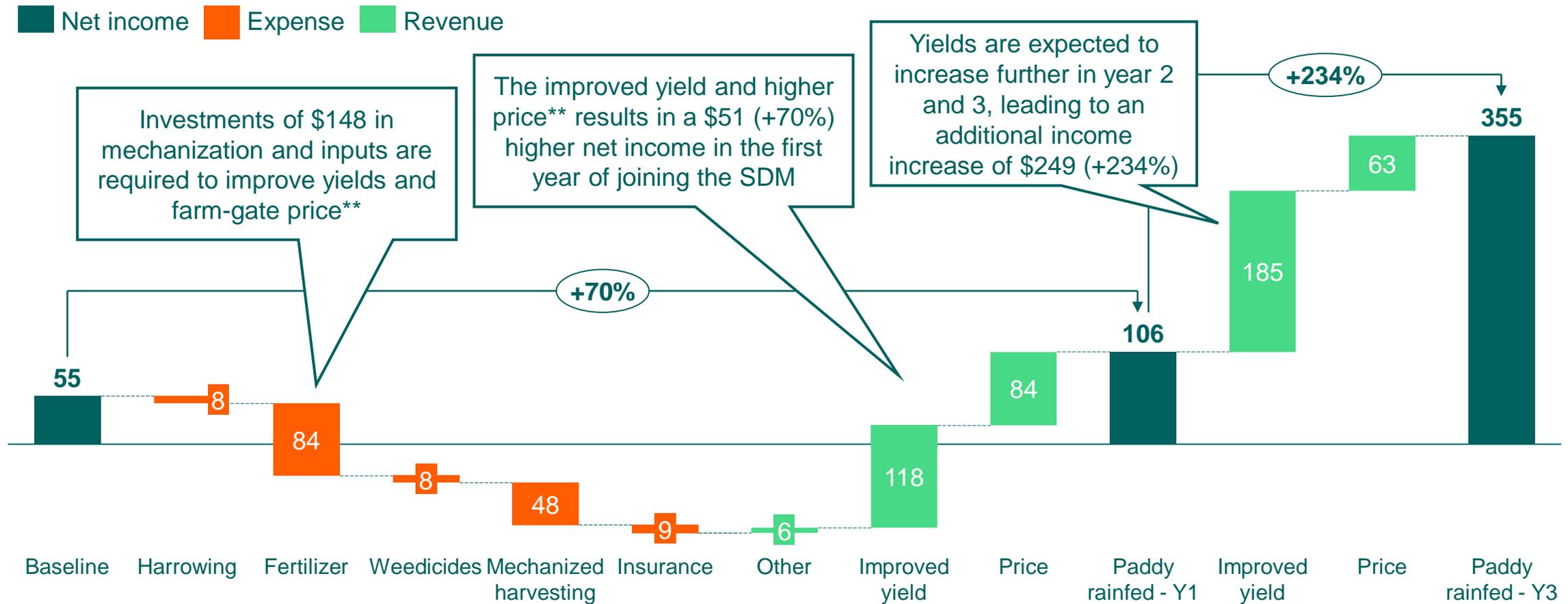
* Even though soybean is least profitable for both farmers and Agri-Trade, the crop requires low input cost and can be grown on marginalized grounds. Additionally, it allows to diversify risks

** Marketable surplus and profit are depicted for year 3, the moment from which yields are expected to be stable and no further yield increases are expected



Income build-up | Investments of \$148 in mechanization and inputs increases farmers' income with \$51 in year one and an additional \$299 from year 3 onwards, as a result of improved yields

Drivers of income improvement for rainfed paddy farming (USD/acre)*



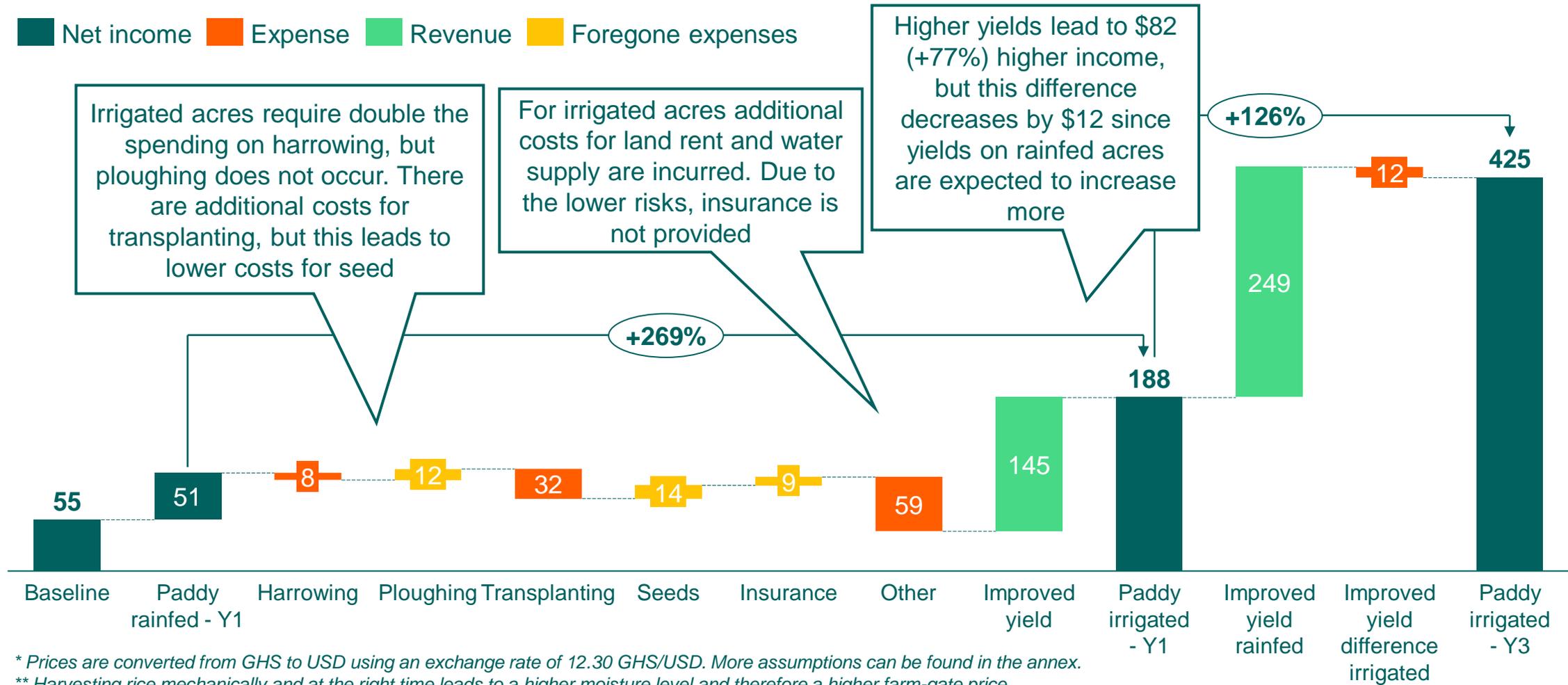
* Prices are converted from GHS to USD using an exchange rate of 12.30 GHS/USD. More assumptions can be found in the annex.

** Harvesting rice mechanically and at the right time leads to a higher moisture level and therefore a higher farm-gate price.



Income build-up | Higher yields for irrigated acres more than make up for higher costs, leading to \$82 higher income. The difference decreases with \$12 as yields on rainfed acres increase more

Drivers of income improvement for rainfed versus irrigated paddy farming (USD/acre)



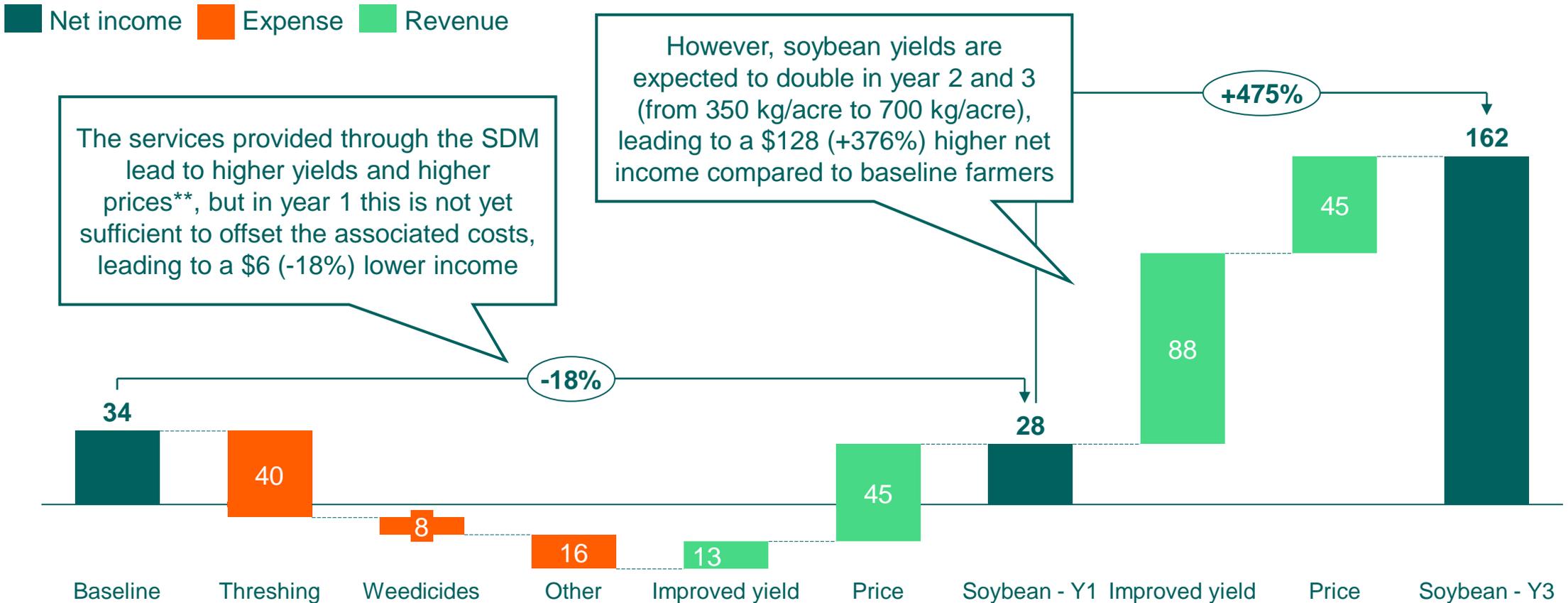
* Prices are converted from GHS to USD using an exchange rate of 12.30 GHS/USD. More assumptions can be found in the annex.

** Harvesting rice mechanically and at the right time leads to a higher moisture level and therefore a higher farm-gate price.



Income build-up | Higher costs are not fully offset by a higher yield and price in year 1, leading to a \$6 lower income. When yields double as expected, incomes are \$128 higher than baseline

Drivers of income improvement for rainfed soybean farming (USD/acre)

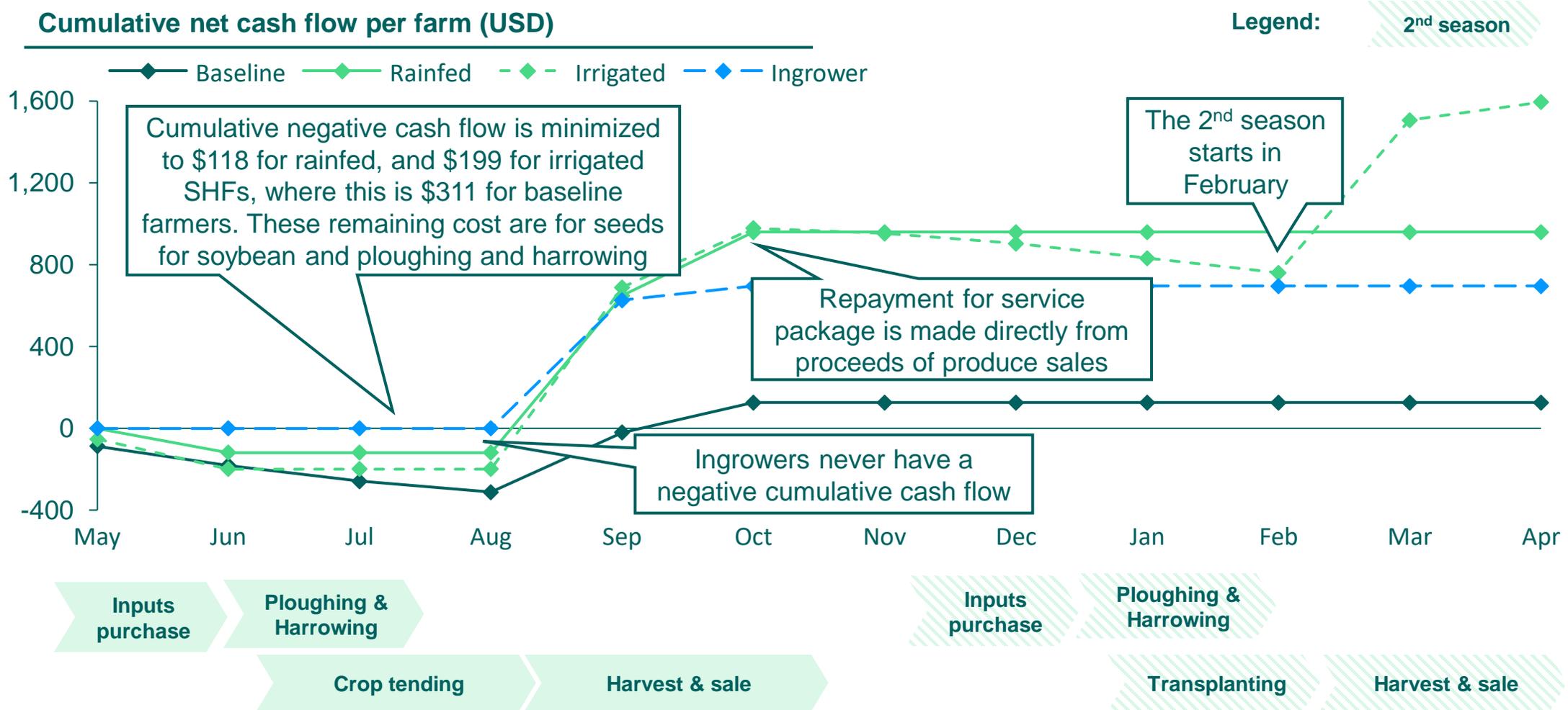


* Prices are converted from GHS to USD using an exchange rate of 12.30 GHS/USD. More assumptions can be found in the annex.

** Threshing results in cleaner soybeans (lower contamination), resulting in a \$0.16 (+50%) higher farm-gate price per kg



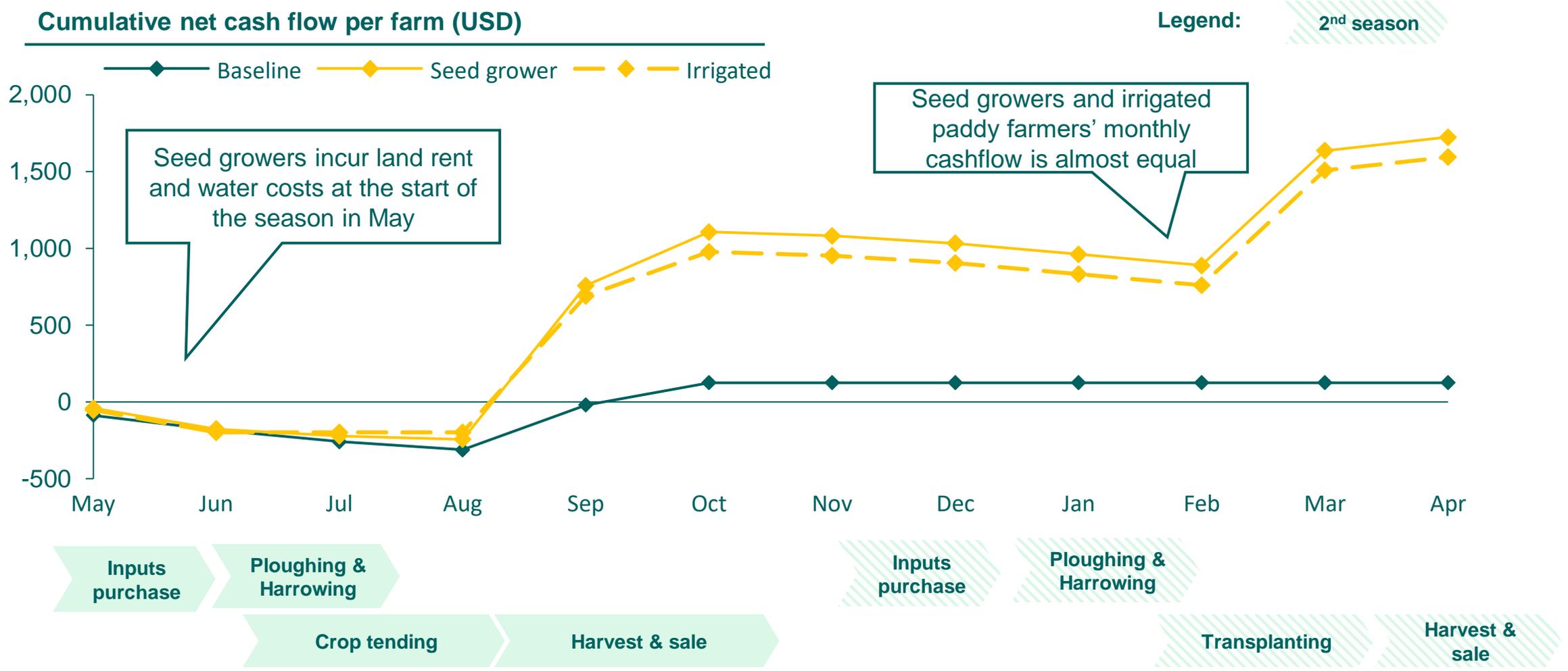
Monthly cash flow | Service package is paid at produce sales, minimizing cumulative negative cash flow risk to \$118 for rainfed SHFs, \$199 for irrigated SHFs. This is \$311 for baseline SHFs



* Prices are converted from GHS to USD using an exchange rate of 12.30 GHS/USD. More assumptions can be found in the annex.



Monthly cash flow | Seed growers' maximum negative cash flow is \$243. They reach the positive peak in April with a positive cash flow of \$1,723



* Prices are converted from GHS to USD using an exchange rate of 12.30 GHS/USD. More assumptions can be found in the annex.



Sensitivity analysis | To improve incomes of **rainfed outgrowers**, the focus should be on higher yields and farm-gate prices. Next, farm size might be increased to further close the LI gap

The tables below shows the relative change that is needed (all else equal) for each of the income drivers* to increase rainfed farmer incomes to the level of the living income benchmark of 3,948 USD/year. With a current annual income of USD 1,239, an income increase of USD 2,709 (+219%) is required.

Income driver	Crop	Current value	Required value	% change	Comment
Farm size (acre)	Paddy	3	11	+267%	Farm size is not the most efficient lever to drive farmer incomes, but it can contribute significantly. However, focus should first be on increasing farm-gate prices and obtaining higher yields
	Soybean	2	19	+850%	The same holds for soybean, increasing farm size alone is not sufficient. By improving profitability with higher farm-gate prices and yields, it becomes more attractive to scale up
Yield (kg/acre/year)	Paddy	2,450	6,261	+156%	6,261 is more than double the maximum yield of 3,000 kg that farmers can achieve in the most favorable circumstances, but increasing yields can still contribute to higher incomes
	Soybean	700	4,250	+507%	Reaching the required yield of 4,250 kg for soybean to earn a living income is not feasible, especially since the 700 is already a huge improvement that is expected to take place
Farm-gate price (USD/kg)	Paddy	0.32	1.15	+258%	Prices are determined by the market, out of the control of Agric Trade. It is worthwhile to be attentive to paying premiums in the future when quality tracking systems are in place
	Soybean	0.48	3.46	+617%	Required farm-gate price changes for soybean to achieve earning a living income are not feasible
Cost of production (USD/year)	Paddy	708	N/A	N/A	Although decreasing cost of production to 0 would still not be sufficient to reach a living income, it is worthwhile to see how these costs can be decreased since they are relatively high. For example, by switching to local organic fertilizers to improve the profitability
	Soybean	222	N/A	N/A	

* The different income drivers influence the farm income through the following simplified formula: $Total\ household\ income = Farm\ size \times Yield \times Price - Cost\ of\ production + Other\ income$



Sensitivity analysis | Since irrigated outgrowers cannot easily acquire additional irrigated land, increasing farm-gate prices and yields of their rainfed acres are the main drivers to close the LI gap

The tables below shows the relative change that is needed (all else equal) for each of the income drivers* to increase irrigated farmer incomes to the level of the living income benchmark of 3,948 USD/year. With a current annual income of USD 1.969, an income increase of USD 1,979 (+100%) is required.

Income driver	Crop	Current value	Required value	% change	Comment
Farm size (acre)	Paddy	2	8	+300%	Increasing farm size of rainfed paddy is an interesting driver to focus on. Where possible, farmers should consider changing from soybean to paddy, which is more profitable
	Soybean	2	14	+600%	For soybean, farm size is a less efficient and thus interesting driver to reach living income
Yield (kg/acre/year)	Paddy	2,450	6,626	170+%	6,626 is more than double the maximum yield of 3,000 kg that farmers can achieve in the most favorable circumstances, but increasing yields can still contribute to higher incomes
	Soybean	700	3,292	+370%	Although the required yield of 3,292 kg/acre is not feasible, incomes can significantly increase when yields improve
Farm-gate price (USD/kg)	Paddy	0.32	1.13	+250%	Prices are determined by the market, out of the control of Agric Trade. It is worthwhile to be attentive to paying premiums in the future when quality tracking systems are in place
	Soybean	0.48	2.65	+450%	Required farm-gate price changes for soybean to achieve earning a living income are not feasible
Cost of production (USD/year)	Paddy	1,128	N/A	N/A	Although decreasing cost of production to 0 would still not be sufficient to reach a living income, it is worthwhile to see how these costs can be decreased since they are relatively high. For example, by switching to local organic fertilizers to improve the profitability
	Soybean	256	N/A	N/A	

* The different income drivers influence the farm income through the following simplified formula: $Total\ household\ income = Farm\ size \times Yield \times Price - Cost\ of\ production + Other\ income$



Sensitivity analysis | Seed growers can bridge the living income gap of \$1,885 by doubling their income. Scaling up the farm size for paddy might be an interesting driver to explore further

The tables below shows the relative change that is needed (all else equal) for each of the income drivers* to increase seed growing farmer incomes to the level of the living income benchmark of 3,948 USD/year. With a year 3 annual income of USD 2,063, an income increase of USD 1,885 (+91%) is required.

Income driver	Crop	Current value	Required value	% change	Comment
Farm size (acre)	Seed	1	5	+400%	Most farmers have 1 acre for seed multiplication, while some have 2. Due to high labor intensity and time requirements, it is unlikely for farmers to go beyond 2 acres
	Paddy	2	7	+250%	Increasing farm size of rainfed paddy is an interesting driver. Where possible, farmers should consider changing from soybean to paddy, which is more profitable. However, availability of (family) labor is crucial in combination with the labor-intensive seed cultivation
Yield (kg/acre/year)	Seed	3,000	9,342	+211%	It is unlikely for farmers to increase their yields beyond the 3,000 kg
	Paddy	2,450	6,428	+162%	With a maximum yield of 3,000 kg/acre, it is not feasible to bridge LI gap by increasing yield alone
Farm-gate price (USD/kg)	Seed	0.40	1.61	+300%	Agric Trade is already paying a higher farm-gate price, since they want to operate outside of (and therefore not being dependent on) the government subsidy scheme
	Paddy	0.32	1.21	+275%	Prices are determined by the market out of the control of Agric Trade. It is worthwhile to be attentive to paying premiums in the future when quality tracking systems are in place
Cost of production (USD/year)	Seed	360	N/A	N/A	Even if cost of production would be zero, living income would not be achieved if. However, it is always worthwhile to see how cost of production could potentially be decreased
	Paddy	586	N/A	N/A	

* The different income drivers influence the farm income through the following simplified formula: $Total\ household\ income = Farm\ size \times Yield \times Price - Cost\ of\ production + Other\ income$

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IDH Annual Report 2021

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Thanks

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



Partners



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5

Annex

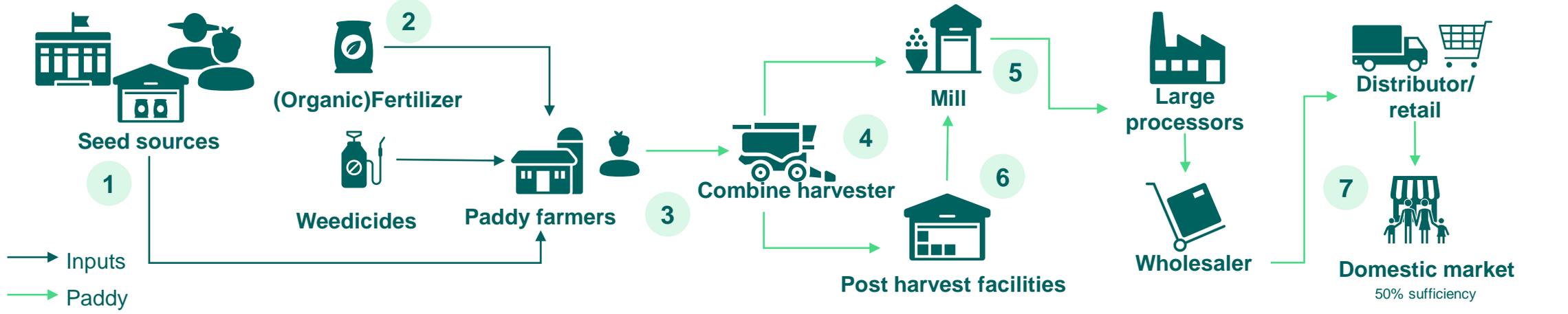


5.1

State of the Sector



Value chain | Ghana relies heavily on imported inputs, equipment and machinery for producing paddy. The government stimulates self sufficiency in production to meet domestic rice demand



Inputs	Cultivation & Mechanization	Processing
--------	-----------------------------	------------

- | | | |
|---|---|---|
| <p>1. Rice farmers in Ghana have a range of seed sources, i.e., government programs, community-based seed multiplication and commercial seed companies. However, there is still a need to improve seed production and distribution.¹</p> <p>2. Over 90% of the farm equipment used for tillage are manufactured in Europe, America or Asia.² Farmers rely heavily on imported fertilizers from Russia and China.³ Glyphosate is the weedicide most used. In many countries this weedicide is slowly being phased out and banned.⁴</p> | <p>3. 90% of agriculture is on small farms. Farms are difficult to access during rainy season. 50% of roads are in maintainable condition.²</p> <p>4. Tractor population stands at +/- 6,200. 50% are over 10 years old and imported second-hand. To serve all (paddy)hectares, with ploughing, 5.5 times as many tractors are required. There are insufficient combine harvesters resulting in dry paddy, and in the worst case into losses due to bush fires.²</p> <p>5. There are over 30 large and medium-sized mills, and several small-scale mills. However, milling capacity is still inadequate. A significant amount is processed manually at farm level</p> | <p>6. The inadequate levels of post-harvest facilities in Ghana pose a major bottleneck to accelerating agricultural growth. Small-scale farmers are invariably forced to dispose of their produce immediately after harvest to meet urgent cash needs.²</p> <p>7. An estimated 419 collectors and small processors collect paddy rice from farmers. They process 55 percent of the paddy rice collected (900 tons processed per operator) and sell the remaining 45 percent to large processors. Via wholesalers and retail, it reaches the domestic market. The current rice production suffices 50% of domestic demand.¹</p> |
|---|---|---|

Sources: 1) [MoFA \(2020\)](#); 2) [AGRA \(2020\)](#); 3) [FAO \(2018\)](#); 4) [Politico 2022](#);

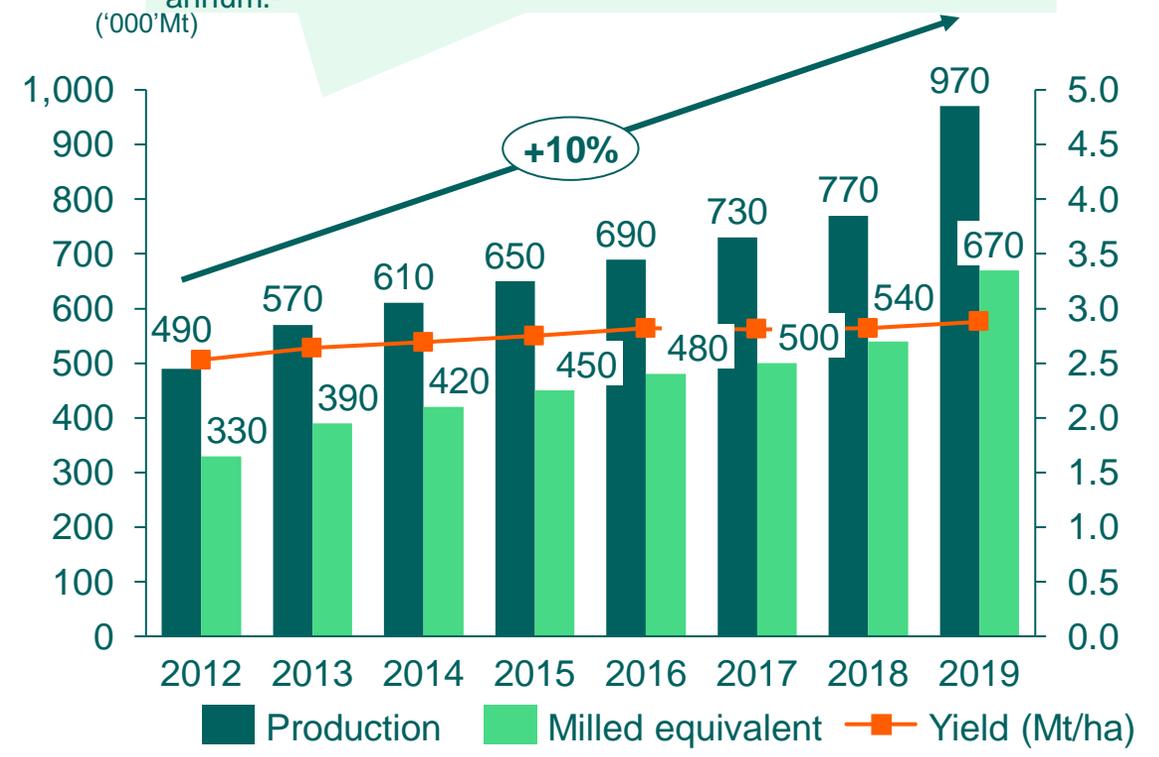
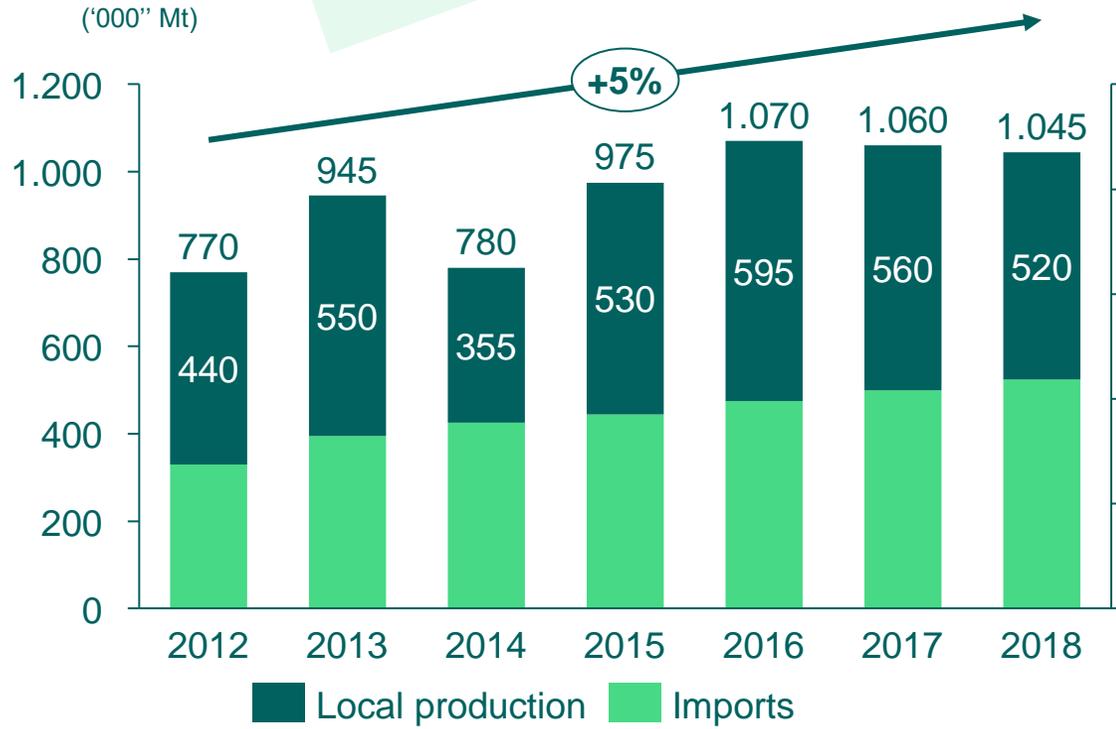


Production trends | Ghana wants to move away from rice importation by increasing local production. Both production and productivity have been increasing steadily

Paddy supply (000 Mt) and productivity (Mt/ha) trends

Ghana depends largely on imported rice to make up for the deficit in domestic rice supply. Annual rice import is about 500,000 MT. The self-sufficiency ratio of rice in Ghana declined from 38% in 1999 to 24% in 2006 (CIRAD, 2007) and increased to around 42% in 2017.¹

Between 2008 and 2020, paddy production was in the range of 302,000 MT and 987,000 MT (181,000 to 622,000 MT of milled rice) with large annual fluctuations. The total rice consumption in 2020 amounted to about 1,450,000 MT which is equivalent to per capita consumption of about 45.0kg per annum.²

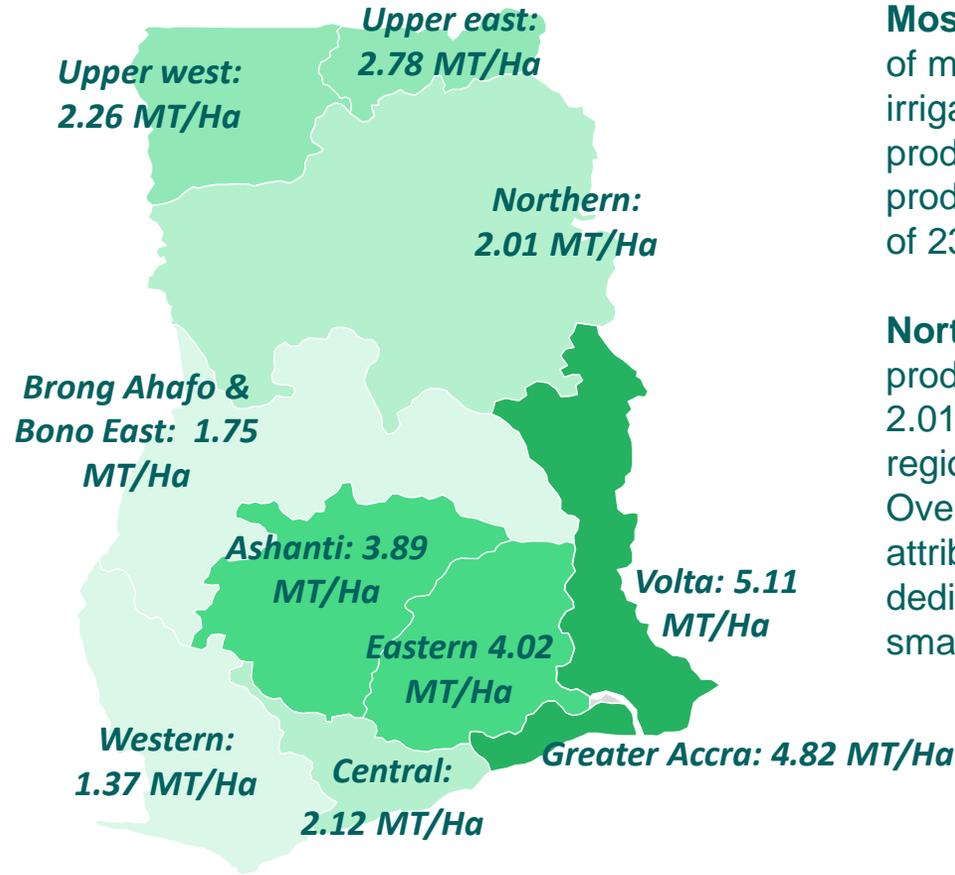


Sources: 1) [MoFA \(2018\)](#); 2) [MoFA \(2020\)](#)



Yield | differences in yield and production per region can provide insight into areas of improvement that are within the control of rice producers in the Northern Ghana regions

Paddy productivity (Mt/ha) per region



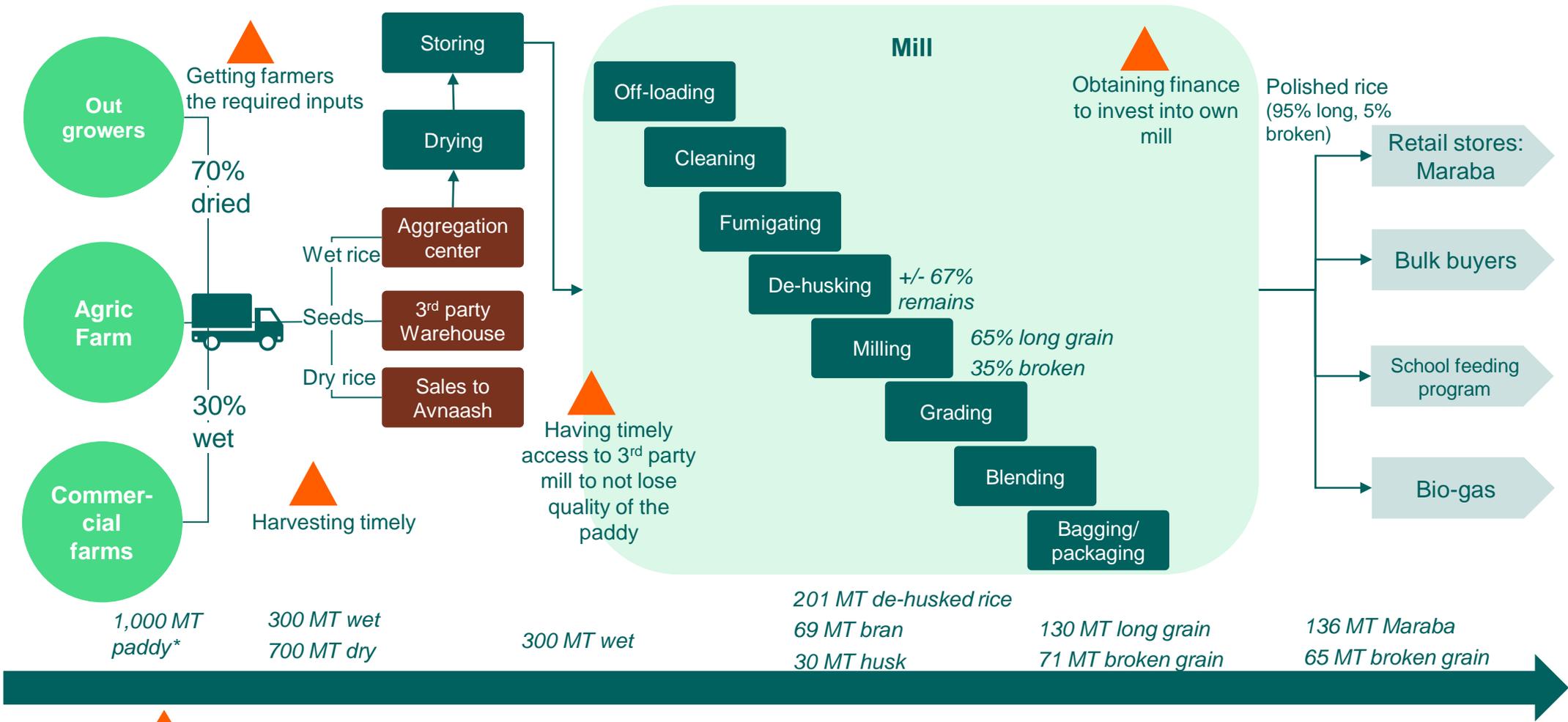
Most productive regions: the region with the most advanced level of mechanized assets and infrastructure deployment especially irrigation (Volta region with 44%) reported the highest average rice productivity yields of 5.1Mt/ha, and the highest level of rice production (39%), although area under production in the Volta region of 23% is less than the 31% reported by the Northern region.

Northern: The Northern region has the second highest level of production (21%), although it reported the lowest yield productivity of 2.01 Mt/ha, lower than the weighted average of 2.96 Mt/ha for all the regions
Overall, the low yields but high production in northern Ghana can be attributed to a combination of factors, including the larger land area dedicated to rice production, favourable growing conditions, smallholder farming, and traditional farming methods.

Source: 1) [AGRA \(2020\)](#)



Agric Trade supply chain | Harvesting 1,000 MT* from which (currently) 30% wet rice, turns into 130 MT long grain. When Agri-Trade sources 70% wet this can become 304 MT



* 1,000 MT is taken as an example amount to illustrate how this amount changes throughout Agric Trade processing flow at this moment

Source: Agric Trade Management (2023)



Organisational capacity (1/2) | hiring an FEA manager will tremendously relieve management from spending time on the SDM, allowing to direct focus towards strategy and investments

	PARAMETERS	OBSERVATIONS/GAPS
Governance & Legal Structure	Vision & mission	Agri- Trade does have a vision and mission statement, but not a strategic plan
	Legal status	Permits required are in place. There are no up to date by-laws to govern and manage the organization
	Organizational structure	There is no up to date organogram. View on which roles are required for expansion is very fluid. There are many vacant positions. Many people take on multiple roles and therefore have many people report to them. Current roles and lines of reporting are not able to support envisioned growth.
	Board composition	The complete Advisory Board is vacant at the moment. Agri- Trade is already engaged with potential members. These members will be experts relevant to the business e.g., lawyer, political figure etc
	Leadership	There are no women in leadership positions. There are grievance mechanisms in place. There is an appointed gender specialist
	Succession & Key person risk	There is a deputy general manager that is appointed to succeed the key person in case of unforeseen circumstances. However, not all knowledge sits with both individuals
Human resources	Adequacy of staffing	There is no good gender diversity in the composition of staff. FEAs have agronomical degrees and are encouraged to continue obtaining degrees. Management has adequate education
	Recruitment, retention, and performance	Overall, personnel tends to stay a long time with the company. This is not the case for the board. The entire board that was present 2 years ago, is not present today. FEAs are rewarded competitively based on performance
	Personnel policies	There are policies present that address health and safety, anti-harassment, leave and time off and codes of conduct. There are documents with roles and responsibilities for staff. However, in reality these are continuously changing and not updated.

Sources: Company interviews & documents (2023)



Organisational capacity (2/2) | SOPs and M&E frameworks are instruments that need to be implemented to facilitate envisioned growth

	PARAMETERS	OBSERVATIONS/GAPS
Finance & internal control systems	Planning & budgeting	Deputy and general manager develop the budget together. Budgets are not always finished in time.
	Accounting and Finance systems	The company uses computerized double entry accounting on a Tally system. There is no annual master budget for this year yet
	Auditing	The company has externally audited financial statements from the previous 3 years.
Organizational management	Communications	The complete Agri-Trade management team meets twice a month, but they are often in touch over phone. Farmers can always reach out to FEAs by phone. Deputy takes care of website
	Monitoring & evaluation	There is no specific M&E framework. Data is disaggregated collected for men and women on yields, services received, and acres served. There is no Theory of Change, roadmaps, or list of KPIs
	Farmer base management	Management spends 70% of time on the rice SDM. This must change when a farm operations officer is hired. Agri-Trade is implementing an application for farmer data collection. This app (part of Agrocenter FMS) will allow for communication and (weather) info sharing to farmers and amongst farmers.
	SOPs	No quality management, aggregation or storage SOPs nor SOPs. Agric Trade is not yet able to track quality of paddy, back to a farmer. Implementing a reward system with premiums is not possible.
	Infrastructure and processes	Agri-Trade mills paddy at a 3 rd party mill. There is only one 3 rd party mill that can provide this, meaning limited availability. Agric Trade will invest into their own mill and silos (these prolong paddy storage time). These silos will allow to prolong storage. Agric Trade expects to independently make the investment
	ICT systems	Deputy is responsible, supported by an external IT person. There is no IT officer on board yet, even though the company is digitizing their data collection. No ICT system that ensures real time tracking of operations

Sources: Company interviews & documents (2023)



SWOT | Whenever Agric Trade fills pivotal vacant positions and increases processing and servicing capacity it should be able to optimally tap into its strengths

	Helpful	Harmful
Internal	<p>Strengths</p> <ul style="list-style-type: none"> • Demand: There is plenty demand for the companies' rice brand <i>Maraba</i>. At the same time, the services the company offers on the farm side are in high demand. Moreover, farmers are requesting more services such as rotavating, signaling sufficient service offering expansion potential • Diversified product portfolio: The company not only processes rice but also sources and off-takes soybean and seed from farmers, giving them additional revenue streams. 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Vacant positions: The company has vacant positions, such as farm operations officer and head of operations, which can result in inefficiencies and management challenges. • Lack of adequate capacity: The company does not have enough capacity to provide all farmers with mechanized services, leading to reliance on 3rd parties for ploughing and harvesting. Same holds for processing and storing, relying on 3rd party warehousing and milling.
External	<p>Opportunities</p> <ul style="list-style-type: none"> • Local branding: Rice brands produced locally are showing improvement in branding, accessibility, and taste. However, in order to further educate consumers on the available varieties and the importance of consuming locally produced rice, greater exposure and promotional efforts are required.¹ • Industry development potential: As an oil producer, Ghana has the potential to leverage this advantage to produce agriculture fertilizers. Ammonia is a by-product of petroleum and is used to produce nitrogen for fertilizers.¹ 	<p>Threats</p> <ul style="list-style-type: none"> • Infrastructure: Key infrastructure deficit of the sector includes the dearth of efficient irrigation schemes, motorable roads, modern markets, developed agricultural lands, efficient storage and warehouse facilities.² • Government subsidies: The government's recent allocation of \$29 million USD to the rice sector is insufficient to create a competent industry capable of satisfying the high demand for rice in a country that consumes over \$1 billion USD worth of rice each year.¹

Sources: 1) [IDH \(2023\)](#); 2) [AGRA \(2020\)](#)



5.2

Assumptions



Learning Questions

Topic	Question
Business model	<ul style="list-style-type: none"> How can Agri-Trade optimize their current sourcing and service delivery model?
Business model	<ul style="list-style-type: none"> What are the key pressure points and opportunities in the supply chain - is it production, transport, procurement (and working capital), storage, processing?
Organic fertiliser	<ul style="list-style-type: none"> To what extent does the use of organic fertilizer affect the business case of service provision? How does the P&L impact compare for farmers who are using organic fertilizers vs those using none and those using inorganic fertilizer?
Community based seed multiplication	<ul style="list-style-type: none"> What is the impact of community-based seed multiplication on input costs for farmers? What is the business case for community-based seed multiplication vs in-house seed multiplication?
Mechanisation	<ul style="list-style-type: none"> What is the business case for expanding mechanised harvesting services? Should Agri-Trade focus on acquiring more own equipment or outsourcing? How should the services be priced? How can leasing mechanization to other service providers SDM operators (directly or through platforms like TroTro Tractor) during idle months improve commercial viability of further investments?
Milling	<ul style="list-style-type: none"> What is the business case for having an own mill versus outsourcing the milling to Tamanaa?
Business case	<ul style="list-style-type: none"> What are the main profitability drivers for the business?

These topics, challenges and recommendations were derived from a set of learning questions that were formulated up front. A list of these learning questions can be found [in the annex](#)



Farm composition | The farmer segments differ in land size, use of land and the number of seasons farmed

Legend:

Paddy rainfed:



Paddy irrigated:



Seed:



Soybean:



2nd Season Paddy irrigated



Segment 1: Paddy & Soybean – Rainfed

- 3 acres of rainfed paddy and 2 acres of rainfed soybean



Segment 2: Paddy & Soybean – Irrigated

- 2 acres of rainfed paddy, 1 acre of irrigated paddy and 2 acres of rainfed soybean



Segment 3: Seed outgrower

- 2 acres of rainfed paddy, 1 acre of seed and 2 acres of rainfed soybean



Segment 4: Paddy ingrower

- 2 acres of rainfed paddy



Note: For analyses purposes we assumed farmers to be supported for more acres than they currently are. Minimizing complexity of analyses and since Agric Trade plans to move towards supporting more acres per farmers in the future, explains the reasoning behind our assumptions for this analyses



Farm assumptions

Variable	Unit	Paddy - rainfed	Paddy – irrigated	Ingrower	Seed	Soybean
Current yield	MT/acre	1.40	2.00	2.20	2.80	0.35
Obtainable yield	MT/acre	2.45	3.00	2.45	3.00	0.70
Yield increase	MT/acre	+1.05	+1.00	+0.25	+0.2	+0.35
Post-harvest losses	%	25%	25%	25%	25%	20%
Home-consumption	Kg	300	300	300	80	100
Volume sold to Agri-Trade, year 1	Kg	320	680	950	1,450	184
Volume sold to Agri-Trade, year 3	Kg	950	1,280	1,138	1,600	408
Farm-gate price	USD/MT	322	322	322	402	483
Cost of input package	USD/acre	209	209	225	201	24
Seeds	Yes/No	Yes	Yes	Yes	Yes	No
Fertilizer	Yes/No	Yes	Yes	Yes	Yes	No
Weedicides	Yes/No	Yes	Yes	Yes	Yes	Yes
Insurance	Yes/No	Yes	No	Yes	No	Yes

Source: Company interviews (2023)



SDM operator assumptions

Farmer numbers	Unit	2022	2023	2024	2025	2026
Ingrowers	# of farmers	100	100	100	100	100
Outgrowers	# of farmers	2,500	2,550	2,600	2,600	2,600
TOTAL	# of farmers	2,600	2,650	2,700	2,700	2,700
Acreege - Outgrowers						
Paddy rainfed	Acres	1,750	3,600	5,215	5,215	5,215
Paddy irrigated	Acres	150	175	200	185	185
Seed	Acres	50	100	150	150	150
Soybean	Acres	4,000	4,100	4,200	4,200	4,200
TOTAL	Acres	5,950	7,975	9,765	9,750	9,750
Own farm						
Paddy	Acres	2,025	2,271	2,252	2,152	2,152
Soybean	Acres	200	200	200	200	200
Seed	Acres	75	229	148	148	148

Source: Company interviews (2023)



SDM operator assumptions

This information is only available in the private version of the report



Organic fertilizer assumptions

Yield implications

- The continuous use of chemical fertilizers leads to depletion of soils, eventually decreasing the yields steadily with two 100 kg bags per acre from the optimal levels (2.5MT/acre). On the other hand, with increased use of organic fertilizers yields of 2.0MT/acre can be achieved year on year¹

Yield development (MT/acre)

Year	1	2	3	4	5
Chemical	2.5	2.3	2.1	1.9	1.7
Organic	2.0	2.0	2.0	2.0	2.0
Yield to break-even*	2.1	1.9	1.7	1.5	1.3

Context

- However, to switch a gradual transition is required, i.e., for example first 2 bags of basal NPK are maintained and only the urea is replaced by organic. The gradual shift might take around 5 years.
- At the same time, the risk of bushfires are at play, that can complete reverse the by organic fertilizer use accumulated soil health/life
- Another factor still limiting the adoption of organic fertilizer is the immaturity of the industry and the therefore inconsistent quality and quantity of supply
- Moreover, organic practices are not yet rewarded in higher prices or premiums¹

Sources: 1) IDH Agronomist

* Yield to break even implies the yield at which organic fertilizers earn the same net income as chemical fertilizer users



Mechanized harvesting assumptions

This information is only available in the private version of the report



5.3

Methodology



Gender ladder

Gender unintentional

No steps taken to understand the different needs and preferences of men and women, or target gender gaps/barriers.

Gender intentional

Considers the different needs and constraints of women and men and takes some steps to create gender equality. Such projects adapt to the needs of women and men without seeking to change gender norms or barriers.

Gender transformative

Understands the different needs and constraints of women and men and address the root causes of gender inequality. A gender transformative approach needs to foster changes in **individual capacities (agency)**, **gendered norms and expectations (relations)**, and **institutional rules and practices (structures)**.

Why we believe investing in women can work for business

- By tailoring goods and services to the needs of women, companies can reach a large and often underserved market, potentially increasing revenues from service provision or enhancing their supply security.
- If women had similar access to and control of productive resources as men, yields of female farmers could increase by up to 30 percent. Higher farm yields and incomes create greater business opportunities for companies working with those farmers.
- Companies that are committed to gender equality outperform their peers. Improving gender diversity in the workplace can improve a company's financial performance by up to 25 percent.
- When companies are seen to invest in gender equality, this has the potential to lead to higher levels of farmer and/or worker loyalty. Conversely, unequal opportunities for women can negatively affect companies' reputations which can lose businesses customers as well as workers.



Poverty line methodology

Poverty line

- The general poverty line is 1.90 USD/day for one adult, which is equal to 693.50 USD/year
- The PPP adjusted poverty line for Ghana is 106 USD/year*¹ for one adult
- A typical Ghanaian smallholder household consists of 4 people², including 1 male adult, 1 female adult and 2 children

Poverty line adjustment

- Simply multiplying the poverty line with 4 would not take into account the composition of the household and would not take into account economies of scale
- For a proper representation, the poverty line was adjusted with the OECD-modified scale to better reflect reality
- This scale differentiates between the household head, other adults and other children. The scale assigns a value of 1 to the household head, 0.5 to each additional adult member and 0.3 to each child
- Using this scale, a typical Nigerian smallholder household consists of $1 + 0.5 + 2 * 0.3 = 2.1$ adult equivalents
- Therefore, the adjusted poverty line for a household would be $106 * 2.1 = 222$ USD/year

Sources: 1) [Ghana Poverty Mapping report \(2015\)](#); 2) [Ghana Living Standards Survey, p. 29 \(2019\)](#)

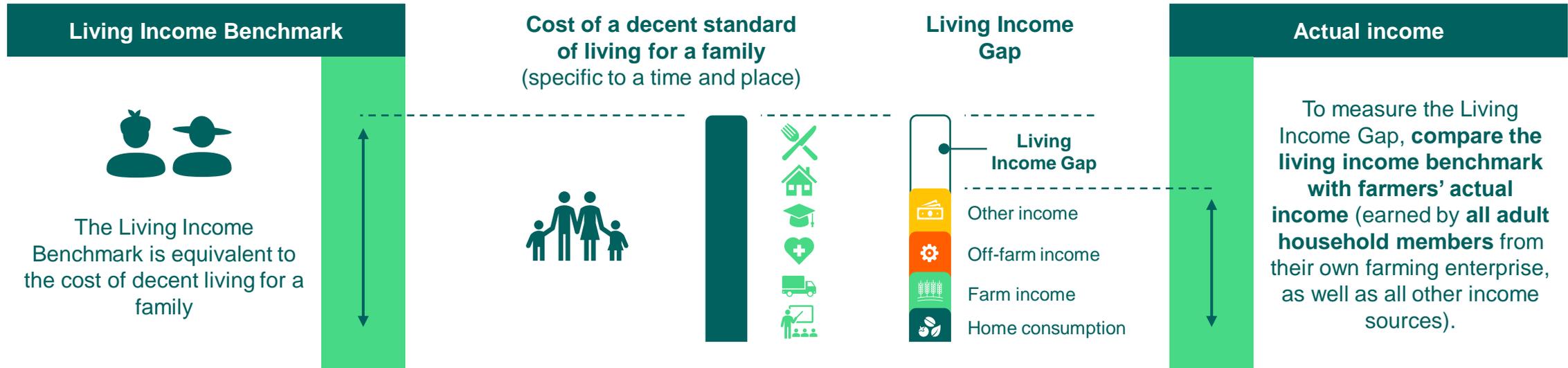
* Conversion factor: 12.3 GHS per USD

LI definitions



Living Income

Earning a living income means that all income sources from a farming household are sufficient to afford a basic but decent cost of living for a family



Next steps

Once gaps are identified, you can take action through a smart-mix of solutions that include: delivering bundled services to farmers, adopting better procurement practices, collaborating with and beyond your trade partners, innovating through brand and consumer engagement, and embracing transparency