MINISTRY OF
FOOD & AGRICULTURE
REPUBLIC OF GHANA

INVEST IN GHANA - AGRIBUSINESS

Rice Strategic Brief

- Last update 12/2020 -

- Key figures
- Recent Trends
- Main Actors
- Dominant Business Models
- Future Outlook
- Opportunities

The strategic briefs are reference tools destined for public and private sector decision makers including Development Partners. Robust methodologies have been used in analyzing key parameters and results presented in concise and modular format. Current data are used to present an overview as accurate as possible. Particular attention is paid to relevant changes that occurred over the past decade as well as main prospects for evolution based on recent trends and perceived market opportunities. Key stakeholders, their business models as well as private sector investment opportunities are identified.

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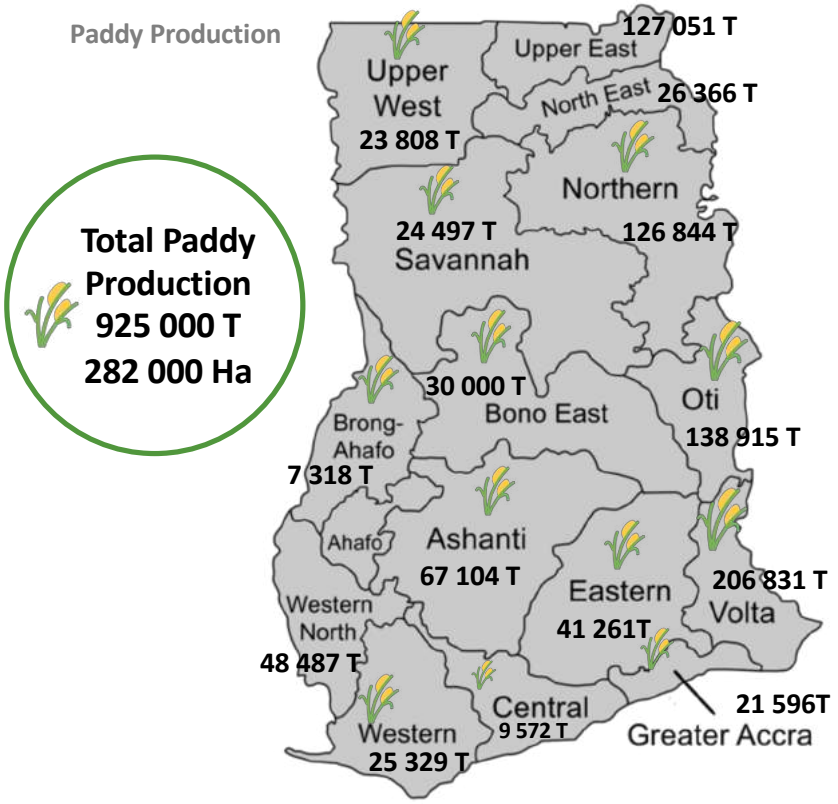
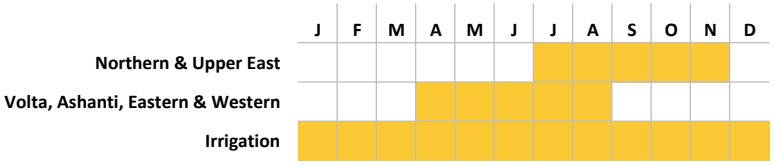
Key figures (1)

Paddy Production



Total Paddy Production
925 000 T
282 000 Ha

Production Calendar by main areas



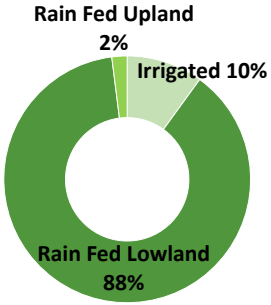
(1) Key figures based on various sources: MOFA National Statistics, FAO, USDA & JICA, CARI, etc.

Average plot size, yields and production systems

2.5 Ha - Average small producer plot size

4 - 6.5 T/Ha - Yields for irrigated rice

2 - 4 T/Ha - Yields for rain fed rice



Market and sources of supply (2019)

Total Rice Consumption 1 300 000 T

55%


730 000 T **

35%


465 000 T

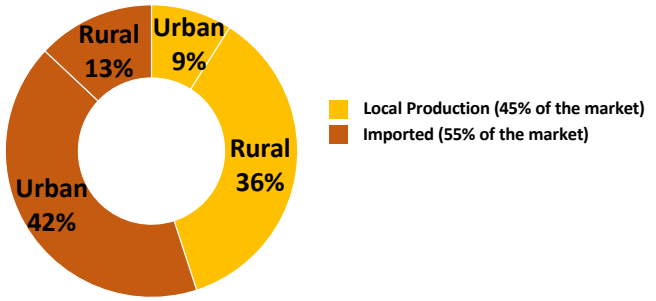
10%

133 000 T***

* 5 main importers account for 75% of total imports
** potentially Including rice re-exported to neighboring countries – volume estimates not available
*** mainly from the North

Consumption Patterns

Local vs imported rice consumption by market segment



Main Changes over the last 10 years

Rapid rise in demand & imports

- Consumption of rice has grown 8% per annum since 2009 and has more than doubled over the last decade, making it the the 2nd most consumed staple in Ghana.
- Local production has more than doubled but the market share of domestic rice has risen by only 5%.
- Import duties were introduced to provide some price protections to the local market
- Imports of long grain fragrant white rice from Asia (Thailand and Vietnam; India, Pakistan) have replaced white rice from the US as the market leader.
- Fragrant whole grain rice has become the quality standard - especially in urban areas. Imported rice is sold at the same price as local rice.
- Broken rice is also imported in to Ghana but volumes have decreased as quality standards have risen.

Expansion of Local Production

- Both area under cultivation and yields have improved significantly, yet remain far below the benchmark of 5 t/ha for rain fed and 8t/ha for irrigated rice in Africa that is achieved in parts of Senegal and Nigeria.
- Access to irrigation and higher rain fall are the main reasons for the five fold expansion of rice production in the Northern Region. In some areas farmers produce all year round.

Distinct Chain Developing

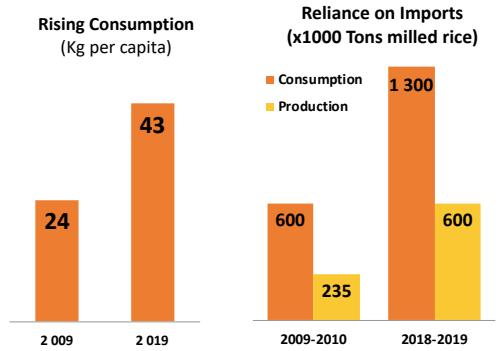
- Differing climates in the North and South have created distinct local-rice value chains: Parboiled and Fragrant White Rice.
- As a result there are 2 distinct end markets selling 4 different rice products:

1. Urban markets that consume Top quality Imported fragrant rice & Local fragrant white rice (albeit a small share of the market).
2. Rural & regional markets that rely on parboiled rice (especially in the North) & low quality affordable village rice

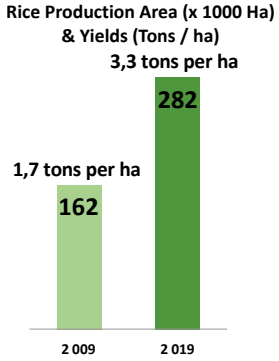
Expansion of Industrial Milling Capacity and Intense Competition for Paddy

- Rice milling capacity has made a large leap forward in Ghana. At least 10 Integrated rice mills with installed capacity of more than 5 tons/hour been established mostly in Central, Ashanti, Volta and Eastern Regions.
- Commercial mills (>2tons per hour) in Ghana tend to operate significantly under-capacity, with many finding it difficult to run 1 shift throughout the year.
- Over 300 small scale village mills compete with industrial mills for paddy, relying on strong local networks, producing low quality rice for own consumption and for sale at the village level.

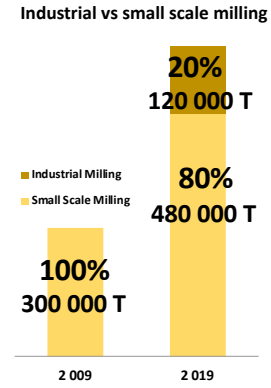
Domestic Demand



Rice Production

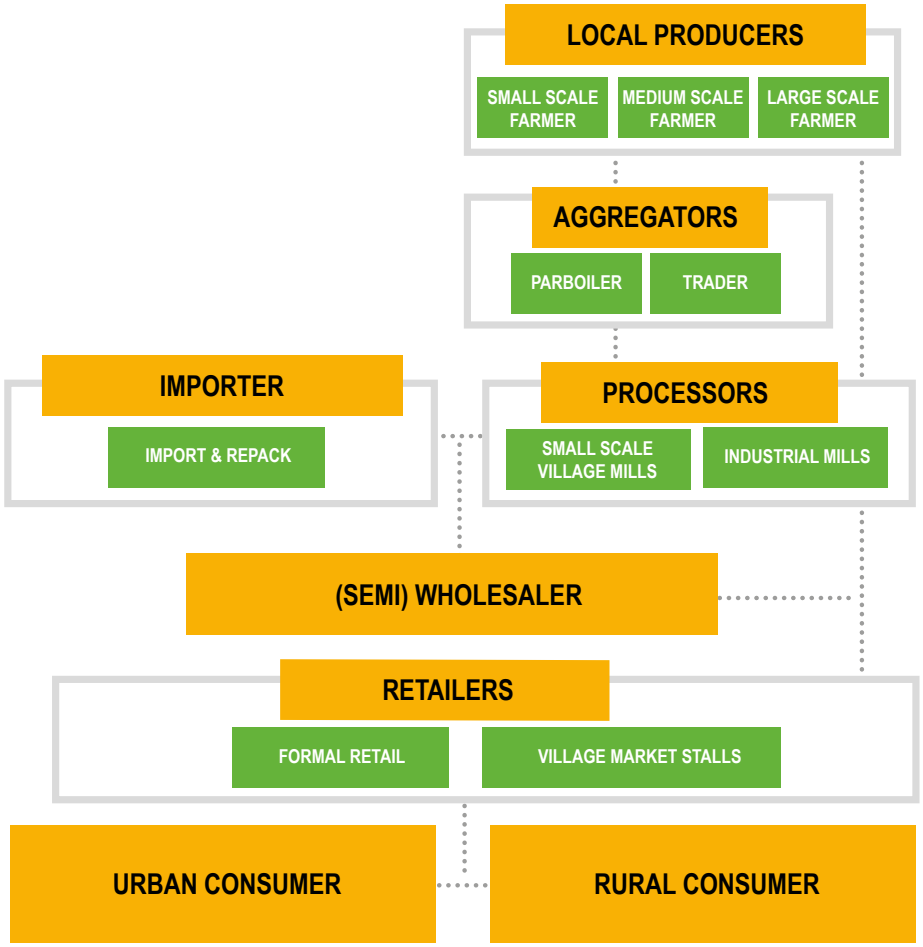


Growing Milling Capacity



Ghana Rice Strategic Brief

Main Actors



Support Services	**Seed Producers**	• Produce long grain aromatic varieties • Mostly work in outgrower schemes of mills or input suppliers • Received training from NGOs or government • 140 trained and registered seed producers trained as a part of the Rice Seed Scaling Project • CSIR-SARI, are responsible for breeder seed production & improves across the country • There's a fair deal of concentration in the seed market with 7 seed producers retailing rice seed.
	Input Suppliers	• A few input suppliers exist (estimated 3 major actors) • RMG (Fertiliser and CPP), IWAD (Irrigation) • Harvester Owners Association • Many 'input dealers' sell paddy as seed
	MoFA & Development Partners	• A very active development sector providing support to government across the value chain. Seed production, irrigation, planting and harvesting and more recently post-harvest handling have become critical areas targeted Some key actors: - GIZ- OVCF (Outgrower Value Chain Fund) - MoFA GASIP (Ghana Agricultural Sector Investment Program financed by IFAD) - World Bank GCAP - National Rice Development Strategy - EXIM Bank - Planting for Food and Jobs (PFJ) - INJARO - AGRA - CARI
Growing	**Small Farmers (0,2 – 5 ha)**	• Average plot size of 1ha, low levels of mechanization, apart from few irrigated areas in the South • Cash crop & own consumption • 80% rain-fed land or upland - 2 tons per hectare. • Lowlands furnished with partial water control 2-3 tons/ ha • Irrigated 4-5 tons/ ha
	Medium & Large Farmers	• Very few medium and large farms exist: - Elhadj's in the Northern & North Eastern Region, 100 ha and above, also aggregate paddy comparable to small scale - Farms owned by large rice mills: GADCO & Brazil Agro, Mainly in Volta Region, With irrigation, Year round production (3 crops), 4-5 t/ ha
Aggregation	**Trader - Millers**	• Collect paddy from small farmers, take this to a toll mill and sell rice to wholesalers and retailers • Often the whole chain operates entirely on credit; the trader, mill and farmer are paid once the wholesaler has sold stock and paid the trader, who then starts a new cycle • They are present in all regions and collect about 16% of rice produced
	Parboilers	• Rural women in the North where over-dried paddy requires parboiling • Some work individually, others in groups with shared infrastructure but for own account
	Aggregators	• Collect paddy from small farmers, sell to village and modern mills or parboilers • A few manage outgrower schemes, they tend to pay cash for paddy

Milling	**Small Village Mills (max 1,5 tons per hour)**	• Dominate rural rice supplies, Some are pure toll millers, others mill for own account but most combine the two • Source rice paddy from aggregators or from farmers, some even have outgrower schemes • Simple Chinese equipment; most have a separate destoner, dehuller, whitener and sorter • Capacity tends to be 1,5 tons per hour, though some operate 2 lines • Low quality product: 30%-50% brokens, • Mostly produce one grade with all brokens to keep price low • Low efficiency: 55% to 62%- due to poor paddy quality and equipment • Those not in an irrigation area often only operate for a few months during and directly after harvest, Work only 8-12 hours per day
	Industrial Mills (150-500 tons per day)	• 10+ Integrated modern mills, with a capacity of 4t/ hour or more and efficiency of 62% to 68% • Can produce fragrant white rice that can compete with imports, provided paddy quality is good. • Process and package local rice into their own registered brands such as Champion rice, Copa, Aduanehene, Mr. Rabbit, etc. and distribute to designated retail centers in the capital • Typically have outgrower schemes but run severely under capacity because competition for paddy makes it difficult to source enough • Mill Grower - GADCO, Brazil Agro, miller Parboiler- Avnash
Importer	**Importers**	• Import fragrant rice in bulk, blend and repack in 25kg, 10kg, 5kg and 1kg bags under their own brands, • Imported broken rice is sold separately, but also used to blend with the regular premium quality imports to reduce the sales price • Fragrant white rice from Vietnam, Thailand and India are responsible for 95% of imports • 5 large importers control more than 75% of the market (Royal Bow Company Ltd., CCTC, Cereal Investment Co. Gh. Ltd, Olam, and Ezal Trading Gh. Ltd.) • Small importers struggle in this high volume low margin business with big currency and price fluctuations
Distribution & Sales	**Wholesaler & Semi Wholesaler**	• Sell both imported and local rice of various qualities, typically in 25kg bags • Often get local rice on credit
	Retailer- Formal	• Rural women in the North where over-dried paddy requires parboiling • Some work individually, others in groups with shared infrastructure but for own account
	Outdoor Market Sales	• Large amount of informal retailers, selling local rice next to imported rice • Urban markets focus on high quality imported rice with very little local rice, packed and branded • Rural markets sell mostly imported rice with a high level of brokens and local rice loose, measured in bowls
	Institutionnal Buyers	• Government feeding schemes & large government institutions • Purchases for cafeterias e.g. universities

Dominant Business Models

Northern Parboilers and Traders

This is a local production model is geared for affordable, albeit low quality rural rice sales

- Women traders source small quantities of paddy all year from farmers at very low prices (<1 C/kg).
- Typically found in the North, where growing conditions require parboiling of the wet season rice to make it palatable. This leaves the rice qualitatively poorer than imported rice, but enables farmers to utilise paddy that otherwise would be waste.
- Their dominant access to paddy through local network allows them to provide year round affordable rice. This access provides intense competition for Integrated Rice Mills.
- Most parboilers are either linked to village mills or in parboiling cooperatives.
- They are also involved in retailing through market stalls and along the roadside.

Small-Scale Farmers

This business model revolves around producing paddy for own consumption, local sales & in some cases to aggregators or mills (outgrower schemes)

- Paddy production is still overwhelmingly small-scale (avergage1ha), with low level of mechanization and with few input investments.
- For farmers in this system scaling up has been difficult due to limitations to land, a lack of financing and inputs.
- The relative scarcity of quality paddy means that mills pay premium prices.

Dominant Business Models

Integrated Industrial Miller Farmers (Volta)

The business model revolves around being able to source quality paddy, process it using improved technology & competing with imported rice for market share in urban centers

- These millers have the potential to achieve imported rice prices, but currently sell rice at a discount to imported rice.
- Critical to competing at a higher price point or winning market share is being able to produce rice that compares to imported fragrant rice- low broken grain %, low in fines, good removal of stones and other impurities etc.
- However being able to justify equipment needed for quality improvements requires scaling up production volumes.
- Competition with parboilers , small scale village mills and for own consumption makes sourcing of quality Paddy a critical limiting factor.
- As result several have their own farms or outgrower programs to control paddy variety and quality
- Both require significant capital investment- either to finance Large land and irrigation infrastructure or to finance outgrower schemes.
- These limiting factors also mean that the Ideal scale in Ghana is 3-4 tons per hour mill, which is significantly smaller that those in other countries

Village Mill

This business model revolves around toll rice milling at the village level for local rural communities

- Village mills fit into the well integrated and localized value chain, particularly in the north.
- Local women aggregate paddy, parboil and either pay the mill for milling, or sell parboiled paddy to the mill.
- Transactions are small, involving a single or a few bags of paddy
- The milling efficiency and product quality is low, but meet the local market expectation of mixed grades and presence of foreign matter
- The system is incompatible with urban markets who require fragrant white rice that meets imported rice on quality and price

5 years outlook

Consumer Gap Widens

- Consumption per capita is expected to rise to 65 kg per capita per year, by 2024.
- Production growth is not expected to keep pace with the growth in demand.

Volta's Importance Grows

- Local production in the Volta Region, is expected to grow.
- 2 growing seasons per year of fragrant rice varieties is possible
- 3 growing seasons per year is even possible for the large farms with reliable irrigation infrastructure
- The area under rice cultivation in this area is not expected to grow due to competition for land with other foodstuffs, cocoa etc.
- However yield improvements are expected as large integrated rice mills get out grower programs fine tuned and own operations to be more productive

Yield Improvements (for some)

- Investments in seed, fertilizer subsidies, growing techniques and irrigation will allow for improved yields.
- However, without the development of functioning, efficient out-grower schemes and widespread adoption of improved growing practices, yields will not reached full potential outside of the few Integrated Rice Mills.

Quality Milling Increases

- Some improvements in paddy quality will be made from current training programs in post harvest handling.
- More millers will invest in >4tons per hour mills to improve the quality of milled rice for urban centers.
- Large millers will remain under-capacity unless they embrace out-grower schemes and irrigation in the north.

Development of Regional Markets

- Continuing growing demand for high quality imported or locally produced white rice.
- Parboiled rice from the north of Ghana will find cross-border markets in Burkina Faso and Nigeria where parboiled rice is preferred.
- This trade already exists informally.

Private investment opportunities

OPPORTUNITY 1

Irrigation Scheme (PPP)

Business Model
- Large irrigation scheme managed by a private company or not-for-profit organization
- Farmers rent land in the irrigation scheme; land rental includes water usage fee
- Management organization uses the proceeds to pay for the initial investment and maintenance and operation of the scheme
- The scheme is linked to a modern integrated rice mill with outgrower program

Typical Potential Investors
- Industrial scale modern integrated rice mills
- Paddy aggregators
- Large farmers
- Consortiums made up of the above actors
- Impact investors

Success Factors (necessary conditions)
- Availability of large area of flat land (flood plain) close to perennial source of water for irrigation
- Independent management organisation or owner that is professionally managed like a private entity, with qualified staff
- Presence of modern integrated rice mill that offers guaranteed market and acts as an anchor for input loans
- Input finance for farmers that enables them to implement GAPs, such as transplanting so high yields can be achieved that enables farmers to pay for land rental and services
- Active management of farmer side-selling and default on loans
- Availability of adequate mechanization services with appropriate farm machinery to such schemes to ensure efficiency of production

OPPORTUNITY 2

Mid Sized Integrated Rice Mill with outgrower scheme

Business Model
- Modern integrated rice mill of 3-4t/ hour, that can process paddy with the same efficiency as Asian competition and can match their quality
- With industrial parboiling unit of targeting the market in the North
- With an outgrower program to supply 15,000 tons of good quality paddy per annum. Programs contains input credit, training, input supply and mechanization services
- Investment can be split over multiple actors

Typical Potential Investors
- Existing undersupplied professional mills that do not have an outgrower program
- Small mills that are operating at full capacity and want to increase scale, improve quality and milling efficiency
- Aggregators or input suppliers with outgrower programs who seeking a premium for high quality paddy that meets mill/market requirements
- Investors interested in investing in the rice sector in Ghana

Success Factors (necessary conditions)
- Access to land with irrigation potential for development
- Support from development institutions with farmer training: Farmer business school and GAP
- Financial institution willing to provide credit for inputs, mechanization services and labour
- Availability of good quality seed
- High quality modern integrated rice mill that can match imported rice quality and milling efficiency

Private investment opportunities

OPPORTUNITY 3

Mechanization Service Provider

Business Model

- Entrepreneur who offers full range of mechanization services to rice farmers
- Owns 1 or more tractors and a complete series of implements for rice cultivation: 85hp 4wd tractor, plough, harrow, boom sprayer, destumper/ subsoiler, laser guided leveler, reaper, thresher and trailer
- Employs at least one sales agent responsible for sales and efficient work planning
- Employs (part time) mechanic
- Has lockable storage shed for equipment
- Cooperates with outgrower programs from mills and aggregators or irrigation schemes to secure client base with access to finance to pay for services

Typical Potential Investors

- Existing mechanization service providers, who tend to have at least one tractor with a plough and harrow only
- Farmers with mechanization experience
- Input provider

Success Factors (necessary conditions)

- Each tractor needs to run at least 150 hours per month, working a total of 450ha/ year. This means offering 4 different services to 112ha of farm land.
- Small farmers need to be grouped in clusters that need the same services at the same time, to avoid loosing time moving from one small field to the other
- A well trained and efficient planner-sales man
- Series of implements that allows work year round and are also suited for other crops
- Trained operators monitored by GPS to avoid 'side servicing'
- Reliable tractors that area easy to maintain with affordable spares
- Ideally works with an input provider

OPPORTUNITY 4

Irrigated rice farmer

Business Model

•Rice farmer who invests in establishing a proper irrigated rice paddy with permanent source of water, dykes & bunts, drainage and levelling

•This increases yield potential from 5t/ ha (1 season) to 24t/ Ha (3 seasons with 8t/ ha)

Typical Potential Investors

•Large-scale rice farmers

•Mills and trading companies with desire for own production

•Existing rice farmers with land close to perennial streams, existing irrigation schemes or shallow ground water; using finance from banks or Micro Finance

•Investment likely to be gradual

Success Factors (necessary conditions)

•Good permanent source of water nearby available land

•Properly acquired farmland with flexible terms that favour agricultural production over long periods

•Presence of a modern mill with outgrower program that can guarantee a good market, offer input loans and training needed to increase yields to 8t/ha

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Business Model Presentations

- **Business Model for integrated rice mill with outgrower program**
- **Business Model for small irrigated rice farmer**

The business model presentations apply to the private investment opportunities identified in the strategic briefs. They identify and present a value proposition based on market opportunities, assumptions, risks and constraints. A viability analysis looks at numbers on capital investments, operating costs and potential revenue streams. Under no pretense is the business model overview a substitute for a business plan or a feasibility study but rather should serve as a benchmark for a constructive dialogue among investors, banks and other relevant stakeholders.

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Business Model Presentation
Integrated rice mill with outgrower program - Ghana

Description of Business Model

A modern integrated rice mill with an outgrower scheme focused on irrigated rice farmers. The mill produces high quality white rice that can compete with imports on quality and price. This requires a best-in-class Bühler or Satake integrated mill, and sufficient supply of quality paddy.

The capacity of the mill is 3t/ hour. The target is to mill 20 000 tons of paddy per year, milling 277 days per year, 24 hours per day using 3 shifts. This requires:

- 2 800 farmers with on average 1,5ha of land
- of which 60% already has irrigation and can do at least 2 seasons.
- Average yield of 6tons per ha over wet and dry season
- Of which at least 50% is sold to the mill

The mill runs a professional outgrower program for these 2 800 farmers, consisting of:

- Farmer business school and good agricultural practices training
- Extension workers for advice and coaching
- Input credits for labour, mechanization and inputs

Focus is on irrigated farmers who can do 2-3 crops per year of quality paddy, and helping farmers to obtain irrigation

Partnerships with local banks are used to source input credit, while partnerships with local mechanization services providers are used for mechanization.

Product of Service

- High quality fragrant white rice that matches imports from Vietnam and Thailand in quality; Max 10% brokens, variety Jasmin 85. Destined for Southern Ghana market
- High quality parboiled rice for the Northern Ghana and Nigeria market (max 10% broken, long grain variety)
- Broken rice; this is a by product of the line
- Fines, polishings, and bran: these are by-products sold as animal feed

The Opportunity

Market

Rice is fast becoming the staple of choice for Urban middle class. Though local production has doubled in a decade, consumption has grown faster. There are 2 major market segments:

- **Urban premium markets**, who want relatively high quality fragrant white rice. This market is mostly served with imported rice and small quantities of rice from the South, predominantly the Volta region.
- **Northern Ghana and Village markets**, who consume mostly parboiled rice and low-quality white rice produced domestically

Competitive Set:

Rice importers: 4 large importers dominate the Ghana rice market with imports from Thailand (best quality, 7,2 GhC/ kg wholesale) and Vietnam (6,2 GhC/Kg but lower quality). Combined import duties, levies and VAT are 36,4%. Profits seem high, but importers temporarily drop prices to eliminate new competitors

Local trader-millers & parboilers buy paddy from farmers partly on credit, process in smaller toll mills and sell on credit to wholesalers and retailers. They produce low quality rice (40% - 60% broken rice, high % of residues and impurities mostly for rural markets. In the North ladies parboil the rice first before toll milling and sales to consumers and restaurants. Their business is limited by access to capital, as they need to receive cash before starting a new batch. Despite lower quality than imported rice they don't struggle to sell.

Local mills: buy paddy from farmers to mill and sell under own brand. Ghana has an unknown number of mini rice mills who can only produce low quality rice, and 15 integrated rice mills with a capacity of more than 4tons per hour. All mills struggle to source sufficient good quality paddy, due to a lack of good outgrower programs and working capital. They mostly use inferior Chinese equipment resulting in low milling efficiency & quality. But all milled rice is usually sold within days.

Key Insight: rice millers compete on sourcing paddy, not to sales of milled rice

Wholesale price/ kg
7.2 GhC for Thai Rice
6.2 GhC for Vietnam & best local rice
5.2 GhC for local 2nd grade rice

12%-22% of paddy is industrially milled
In 15 mills
with more than 4 t/ hr capacity

Rice cultivation 2018
728,000 tons paddy
260,000 ha
16% of land for rice is under irrigation

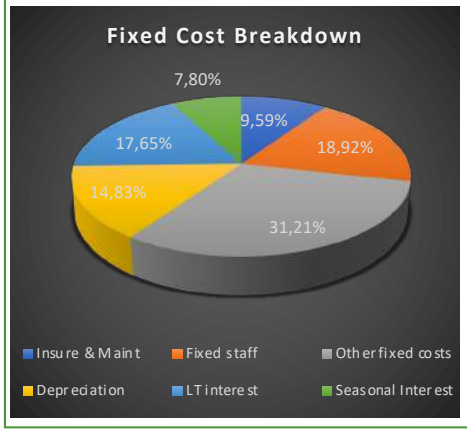
Rice consumption 2018
1,3 mill tons
64% imported
33 kg/ capita
8% growth/ year

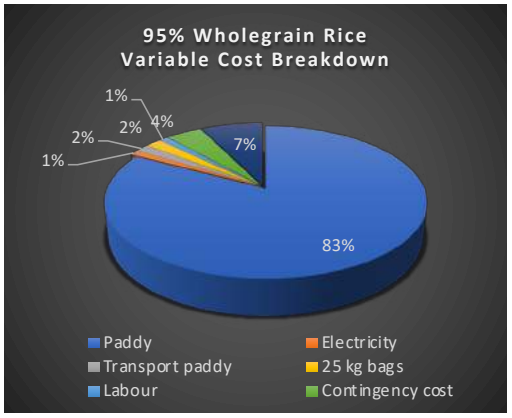
Business Model Presentation
Integrated rice mill with outgrower program - Ghana

Production Costs, Net Profit & CAPEX

Ghana Rice Mill Profit & Loss						
Improved Scenario 1	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**
Total Revenues	30 020 000	50 008 000	75 012 000	75 012 000	75 012 000	75 012 000
Total Variable Costs	22 430 570	28 224 627	42 336 940	42 336 940	42 336 940	42 336 940
Gross Margin	7 589 430	21 783 373	32 675 060	32 675 060	32 675 060	32 675 060
Gross Margin %	75%	56%	56%	56%	56%	56%
Total Fixed Costs	1 631 551	3 831 228	3 780 191	3 729 200	3 723 668	3 662 026
Profit before Tax	5 957 879	17 952 145	28 894 869	28 945 860	28 951 392	29 013 034
Taxation	1 489 470	4 488 036	7 223 717	7 236 465	7 237 848	7 253 258
Net Income	4 468 409	13 464 109	21 671 151	21 709 395	21 713 544	21 759 775
Net Income %	15%	27%	29%	29%	29%	29%
Cumulative Income	4 468 409	17 932 518	39 603 670	61 313 065	83 026 609	104 786 384

- Note: 2020 year is still a toll milling scenario until new mill comes into operation, thus the reason for the lower Gross Margin





Key Investment Figures

Return on Investment

The case we use is a miller/ aggregator with outgrower program in the Volta region who uses a toll mill to do 10,000 tons of paddy per year, and now builds his own mill and in year 3 mills 20,000 tons.

The mill improves efficiency and quality from 60% grade 3 rice sold at about 5,2 GhC to 46,5% 1st grade rice and 14,5% 2nd grade rice (61% together). This is taking into consideration that 5% foreign matter in paddy supplied which is high

Investment Required

The new factory requires an investment of GhC 6,075 in capex, obtained through a 3-year loan of GhC 4,650,000 at a subsidized interest rate of 14% (e.g. via Exim Bank). The own contribution of 30% is 2,325,000

If the mill works with irrigated farmers who can produce year-round, limited working capital loans are needed. We added an overdraft of GhC 1 million

Typical Entrepreneur & Financer

Entrepreneur
- Smaller rice mills wanting to grow and upgrade
- Paddy aggregator wanting to move into rice milling and trading
- Trader-millers using toll mills who want to establish own mill and increase scale
- Foreign and domestic entrepreneurs with experience in agro-processing

Financer
- 30% equity from entrepreneur for capex and working capital of mill
- 70% from local bank or MFI for working capital
- Local banks or MFI for input credit for farmers; using peer guarantee & local leaders and mill to keep default risk low.

Business Model Presentation
Integrated rice mill with outgrower program - Ghana

Key Assumptions & Risks

Risk Factors

- ***Side selling of farmers,*** lowering return on investment of training cost and sales volumes, while increasing fixed cost per unit of product
- ***Crop failure,*** reducing paddy supply and increasing loan defaults
- ***Input loan defaults of farmers,*** increasing cost of the mill
- ***Poor quality paddy,*** lowering milling efficiency
- ***Sales price erosion;*** rice milling, and import is lucrative business with high margins, and future competition may drive prices down. However, if prices drop 38% across all products the company still breaks-even

Key Assumptions

- Year 1: Paddy aggregator is toll milling 10,000 tons of paddy in a small-scale Chinese equipped mill while new Satake Mill (3 t/hr capacity) is constructed.
- Year 2: New mill processes 15,000 tons of paddy into high quality rice
- Year 3: 20,000 tons of paddy milled in 24 hrs/ day in 3 shifts, 277 days per year.
- Mill is erected in the Volta region close a large numbers of irrigated rice farmers, or farmers that can upgrade to irrigation relatively easily.
- Mill sets up an outgrower program of 2800 farmers with 1,5ha on average, reaching in time 6t/ ha and 60% farming 2 or more seasons; Mill employs 20 extension workers
- Farmers receive Farmer Business School and Good agricultural practise training
- Mill provides input loans that cover inputs and labour and mechanisation services; default rate on loans is 10% which is a cost for the mill
- Aromatic long grain varieties are used by farmers: Jasmin 85 or AGRA
- Assume paddy is sourced year-round, but there are still peaks around the end of the traditional wet season and dry season.
- Purchase price of 1,8 GhC/ Kg of paddy, which is the more expensive dry season price
- Milled rice sold to wholesalers in year 1 at 5,2GhC/kg, which is standard for Volta region mixed grade quality (aromatic unpolished rice, mostly ¾ grains, with 20% brokens
- Improved mill can produce quality comparable with Vietnamese imports, which is polished aromatic rice with 5% -10% brokens, sold wholesale at 6,2GhC/ kg. Same price as best Volta rice milled in a comparable mill currently.
- 50% of rice produced by outgrowers is sold to the mill, 50% home consumption & side selling
- Paddy weight loss due to moisture loss and removal of impurities is 5%

Risk Mitigation

Side Selling

- Can be reduced with payment on delivery of paddy, market related purchase price, paddy harvesting & transport service, close monitoring by extension agents, withholding of training and credit for serious side sellers
- We have still assumed a side-selling rate of 50% of the crop in this model

Crop failure

- Work with irrigated farmers where possible and stimulate investments in irrigation
- Provide farmer training and quality inputs through outgrower program

Loan defaults

- Combat side selling and crop failure
- Introduce peer guarantee & use traditional and religious leaders
- Only farmers who completed training can get guarantee
- 10% default is assumed in the model

Sales price erosion

- Ensure the business is efficient so there is margin to accommodate a drop in price; e.g. manage milling efficiency through paddy quality and equipment quality, milling capacity utilization etc.

Economic & Social Impact

- 80 permanent jobs at the mill (50 workers, 5 junior, 5 senior management, 20 extension workers
- Income improvement for 2 800 farmers in the program. A farmer who moves from 3,5t/ ha in one season to 2 seasons of 7t/ ha increases income 4-fold. An irrigated farmer who increases yields from 4 to 7 tons doubles net income.
- Reduction of rice imports and thus relative improvement in trade balance

Environmental Impact

- Fuel and energy from transport and mill operations
- Pesticides and herbicides; proper training of farmers is essential to ensure responsible use

Business Model Presentation
Small irrigated rice farmer - Ghana

Description of Business Model

A small rice farmer with 1 ha of existing rice paddy close to a perennial water source becomes part of an outgrower and invests in dikes and drainage, a small mobile petrol pump and hoses to start fully irrigated rice production.

The first step is to obtain agricultural training & obtain crop finance of GhC 2500 to improve yields during the wet season from the national average of 3.5t/ ha to 4.5t/ha. Farmers who increase yields and repay the loan can then adapt for credit to invest in irrigation. Over 2 seasons yields should increase to 6t/ ha in the wet season and 7t/ ha in the dry season.

The investment decreases risk of crop failure and increases income:

- flooding in the wet season is limited with drainage and dikes, irrigation prevents crop failure due to drought
- Increase yields in wet season due to less partial flooding and supplementary irrigation that allows better farming practices e.g. transplanting
- Farmer can do 2 to 3 crops per year.
- Better farming practices enabled by crop finance increase yields

Farmers need to be part of an outgrower model of an established rice mill.

Product of Service

- High quality paddy for modern rice mills:
  - Long grain aromatic rice accepted by mills, usually Jasmin 85 or Agra
  - Humidity between 12% and 14%
  - Less than 1% foreign matter
  - Less than 5% off varieties
  - Harvested at maturity

The Opportunity

Market

Rice is fast becoming the staple of choice for Urban middle class. Though local production has doubled in a decade, consumption has grown faster. There are 2 major market segments:

- **Urban premium markets**, who want relatively high quality fragrant white rice. This market is mostly served with imported rice and small quantities of rice from the South, predominantly the Volta region.
- **Northern Ghana and Village markets**, who consume mostly parboiled rice and low quality white rice produced domestically, or imported broken rice blended with regular rice

Rice farmers in Ghana never seem to struggle to sell paddy due to competition between millers and traders and parboilers.
Around 80% is milled in small village mills, often by traders who obtain paddy largely on credit and pay a toll milling fee. These traders are limited in scale only by working capital. Their product competes on price with imported rice but is lower in quality. Despite this it has no problems being sold in village markets.

About 20% is milled in about 15 industrial mills with a capacity of more than 4t/ hr. These mills operate only at a fraction of their capacity because of a shortage of good quality paddy. Some of these mills can compete on quality with imported rice. These mills compete for paddy with traders and smaller mills as well as parboilers and lack the outgrower programs, social networks and aggregators to get their hands on paddy. In addition most paddy from the north cannot be milled into quality white rice because it is too dry. This business is however be very profitable due to high milling efficiencies, and high market prices.

With the exception of the lower Volta region, mills only run in the dry season. The market potential for dry season paddy is high, provided there is enough of it to make it interesting for traders or millers to start dry season milling

Paddy prices depend highly on quality and season, with Northern wet season paddy being much cheaper because of poor quality.

Paddy prices 2018

North: 1 – 1.2 GhC/ kg

Volta: 1.6 – 2 GhC/ Kg

Rice cultivation 2018

728,000 tons paddy

260,000 ha

16% of land for rice is under irrigation

Rice consumption 2018

1,3 mill tons

33 kg/ capita

64% imported

8% growth/ year

Business Model Presentation
Small irrigated rice farmer - Ghana

Production Costs & Gross Margins

Cost of production for 1ha of paddy (GhC):

	Original	Wet 1ha	Dry 1 ha
Fertiliser	1 100	1 390	1 390
Seed	135	60	60
bags	35	45	60
Chemicals	188	188	188
Petrol	0	482	2 408
Labour & Mechanisation	1 654	2389	2 539
Total	**3 112**	**4 553**	**6 644**

Gross Margin for 1ha of paddy:

	Original	Wet 1ha	Dry 1 ha
Cost of production	3 112	4 553	6 644
Yield (tons/ha)	3,5	6	7
Sales price (GhC/kg)	1,6	1,6	1,8
Revenues (GhC/ha)	5 600	9 360	12 285
Gross margin	**2 488**	**4 807**	**5641**

Wet Season: Improved yield through introduction of transplanting, increased fertiliser usage and labour cost and supplementary irrigation. Yields will increase gradually with experience to 4,5t in year 1 and 6t after

Dry Season: Yields increase to 6t in year 1 and 7 t afterwards. Yields in dry season are higher due to more sun and less flooding, but fuel cost are higher

Planting: Move from direct seeding to transplanting reduces usage and cost of seed. But transplanting can only be done with irrigation.

Key Investment Figures

Return on Investment

- Profit per year increases from GhC 1815 to GhC 4537 in year one to GhC 8201 after 2-3 years when yields have maximized, and the loan is paid off.
- The impact comes from an increase of production from 3,5 to 13 tons per year. This is due to increased yield in the wet season and introduction of a lucrative dry season crop.
- The farmer can pay off the investment loan within 1 year (2 production cycles). Payback period is about 1,5 - 2 years.

Investment Required

Input credit of GhC 2500 via outgrower program per season for the first year to cover increased cost of production

Land improvements of 1ha existing rice paddy:

- GhC 3000 for building dikes to guard against flooding and drainage for total water management.
- GhC 4100 for mobile petrol pump with hoses, depreciated in 3 years

Typical Entrepreneur & Financer

Entrepreneur

- Existing small-scale rice farmer with land close to a perennial water source

Financer

- Savings from the farmer
- MFI for irrigation & land improvement investments
- Local bank or MFI for crop finance if program is linked to mill outgrower program
- Mill for crop finance

Business Model Presentation
Small irrigated rice farmer - Ghana

Key Assumptions & Risks

Risk Factors

Lower sales prices due to reduction of import duties/tariffs and reduced demand
- More difficult for paddy rice to compete with imported rice

Crop failure or reduced yields
- Most rice growing areas are in valley bottoms and or flood plains that can flood
- Drought can dry up perennial water source
- Inferior or fake inputs can lower yields
- Poor farming skills
- Limited implementation of good agricultural practices due to lack of working capital (e.g. line planting, correct fertilizer dosage

Default on Loans
- Farmers unable to repay their loans due to crop failure
- Moral Hazard: Farmers not willing to repay loan and side selling to avoid mill taking the loan amount

Risk Mitigation

Low sales prices
- Import duty reduction is unlikely given the political priority for local rice production;
- Rice consumption has been growing fast for decades and even with a surge in local production Ghana will struggle to keep its market share at the same level

Crop Failure or reduced yields
- Irrigation and drainage reduce the risk of crop failure significantly.
- Careful site selection is crucial to avoid flooding
- Quality inputs and proper training provided through outgrower program with mill will improve yields
- Loans for irrigation equipment must include a working capital component to promote good farming practices

Loan Defaults
- Borrow only to farmers who are part of an outgrower program of a mill with training
- Mill to do rigorous selection & recoup loan payments from payment for paddy supplied
- 2 seasons helps to reduce defaults

Key Assumptions

- Rice farmer has 1 ha of existing rice paddy close to perennial water source that can be upgraded
- Farmer receives training in rice intensification and farmer business school
- Farmer buys seed and fertilisers from reputable private sector input suppliers, without government subsidies
- Farmer does only 2 seasons, though 3 has proven to be possible in Ghana
- Farmer has access to mechanised services for land development, levelling, land preparation and combine harvesting. Secondary winnowing is required because the combine harvester is not 100% effective.
- The farmer consumes 3,5% of the crop him/ herself
- Sales price of paddy is GhC 1,6 in the wet season and 1,8 in the dry season
- Yields take 2-3 years to improve to 6t/ ha for wet season and 7t/ ha for the dry season. This have been proven in Nigeria in several projects. The maximum average yields in Africa are widely assumed to be 5t/ha for rainfed and 8t/ ha for irrigated rice

Economic & Social Impact

- 4-fold increase of farmer income
- Increased availability of paddy for mills, allowing better capacity utilization
- Better paddy quality increases milling efficiency and product quality, which means higher sales prices and can translate into higher paddy prices for farmers
- Relative reduction of rice imports and forex usage

Environmental Impact

- Careful site selection is necessary to ensure paddies are not established in sensitive wetlands, and perennial water sources are not used at unsustainable rates at the detriment of other users downstream