

ENDING
RURAL
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Developing Regional Commodity Exchanges in Africa

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Background

Agriculture represents the largest private sector component in most African countries, employing a large share of the population and accounting for a significant portion of rural income. It is estimated that a \$1 increase in agricultural value-added generates a \$1.3-1.8 increase in the rural non-farm economy. Agriculture in Africa has significant growth potential given the increasing demand for food crops from domestic markets and cash crops from emerging markets. Sustained growth in the agricultural sector is therefore critical for overall development of many African economies.

To support their growth ambitions, African farmers need better access to markets and reliable and accurate information about prices for their goods. In addition, they need better and improved access to finance to make informed investment decisions. On the other hand, agricultural commodity buyers from across Africa need better information and access to products and markets in a timely and cost efficient way. A viable commodity exchange can play an important role in addressing the needs of both African farmers and commodity buyers.

This paper makes the case for the creation of platforms for African farmers to exchange their products in an organized and transparent manner via the establishment of commodity exchanges. There is already some success with commodity exchanges on the continent and an increasing demand from countries in the region for support to establish such facilities. The note therefore also responds to growing requests from other countries to explore the idea of commodity exchanges. For sustainability over the long run, the paper argues for a regional approach in addressing these requests, a means to more effectively develop critical mass in modernizing the continent's agriculture and other commodity sectors and boost regional integration. Such an exchange will also facilitate South-South trade in a greater variety of commodities consumed on the continent.

Summary of the Role and Impacts of Commodity Exchanges

A commodity exchange is a market in which pre-approved buyers and sellers trade commodity-linked contracts (goods) on the basis of commonly agreed rules and procedures, as implemented by the exchange. Delivery of goods can be on a spot basis and/or specified for a mutually agreed future delivery date. Many modern exchanges today go beyond this. They are centers of information, quality and market discovery and broadcast local and world prices, supply and demand data, weather, and relevant government actions. The price and product discovery function¹ of the commodity exchange also help private sector importers in developing countries have better product information and enables producers to have a better sense of market capacity when making production and marketing decisions (i.e., what to plant in what proportion; when and how much to sell versus store). They can also play an important role in connecting rural areas to the urban centers as well as linking small farmers to major buyers.

A regional approach to commodity exchanges can add liquidity to the market by virtue of the larger number of sellers and buyers of commodities which it pulls together. In other words, a regional commodity market can help solve the problem of thin markets by creating much needed mass and concentrating supply and demand in specific trading venues and delivery locations. Such an exchange could help address issues of market transparency and fair trading conditions, which can be often a

¹ Product discovery refers to the value a commodity exchange creates by defining the benchmark standard and trading specifications for a given commodity

problem in developing country physical commodity markets, as well as help in the development of innovative financing tools for agriculture, in particular, and for infrastructure, in general.

The functions of a commodity exchange depend in large part on the nature of the specific instruments that are traded—spot, forwards, derivatives or innovative financing instruments such as repos.

By simply centralizing trade in a commodity, an exchange can facilitate title transfer, market transparency (i.e., everyone has access to a neutral reference price), price discovery (i.e., demand and supply developments are reflected in price levels) and improving competition.

Transaction costs are reduced because coordination through a centralized exchange can reduce costs associated with identifying market outlets, physically inspecting product quality, and finding buyers or sellers. By reducing transaction costs and enhancing information flows, an exchange can improve returns to market agents while reducing short term price variability, spatial and temporal price dispersion.

The exchange also provides valuable information on the availability of different commodities at specific points in time—information specifically valuable, for example, to a government seeking to monitor stocks across the country to guide a more predictable policy response on food security.

As a commodity exchange develops, a natural progression is to develop contracts allowing trade in commodity futures and options, types of derivative instrument which enable price risk management and more generally, according to research, have been shown to have a stabilizing influence on the underlying physical commodity markets when they are introduced.

Exchanges normally assist to define better quality standards, speed up the process of product standardization, and improve the discipline in the market place. Exchanges create incentives for market participants to produce commodities that meet exchange specifications, and behave according to exchange rules. Exchanges are dynamic tools to remedy some of the weaknesses in the market place and they can address many of the market failures in rural agricultural markets in Africa today.

However, while indications of commodity exchange impact are broadly positive, it may also be cautioned that they are neither a panacea—they do not alone tackle all the challenges faced by African commodity markets and require complementary action to realize their full potential—nor are they without their challenges to ensure successful implementation. Key implementation challenges include: building sufficient liquidity to create an efficient market, particularly in low-productivity areas; developing the capacity to guarantee trades; obtaining initial participation from larger players already having on-the-ground infrastructure and strategic intelligence; and striving through established regulatory best practices to create a market that is free, fair, robust, and competitive.²

Toward a Regional, Farmer-Friendly Exchange

The regional commodity exchange envisaged in this case is one that centralizes a number of trading places into one trading platform. This means that national commodity exchanges will also assume the role of being regional platforms for trade. This option allows for each of the participating countries to develop one or more national commodity exchanges which are then linked to the others. The countries will sign up to harmonize policy, information, quality, and financial standards in order to participate in the regional exchange.

² Parts of this summary have been adapted from the Africa 2.0 Food Security Task Force proposal for Regional Commodity Exchanges.

The benefit of such a regional exchange is that first and foremost it broadens the market options for both buyers and sellers—and in particular the African farmer.

Today many farmers are dependent on a specific purchaser for their commodities and have very little price bargaining power. Selling into a wider market can improve the producer's pricing power while also increasing their responsiveness to market signals, triggering upgrades in productivity, improved quality consistency, better timing of marketing decisions within the season, and more optimal planting decisions across the seasons.

A second advantage of a regional exchange is it can provide agents across a broader geographical space with timely market information, which would be useful in facilitating buying and selling decisions on a regional rather than purely national basis.

Third, the creation of a regional exchange will facilitate product standardization and grading, again on a regional rather than purely national basis. Creating transparency and standardization on pricing premiums (and discounts) for better (worse) quality product in turn incentivizes production of better quality commodity, and transparency for pricing variations across different grades of a similar commodity (e.g., white maize, yellow maize)

Fourth, the creation of a commodity exchange will help develop the financial sector as new financial tools associated with the exchange, such as warehouse receipts, can be developed. Providing a regional rather than a purely national scale will provide a stronger incentive for financial innovation and the development of more diversified and thus more secure regional financing portfolios.

Fifth, the exchange could help harmonize and accelerate the path to regional trade and integration as goods are increasingly traded across borders and are shipped and delivered within participating countries and to third country destinations.

Despite these advantages, creating competition among purchasers in the rural areas, rather than merely in wholesale markets, would require a number of ecosystem-building steps to be taken that support the operations of a commodity exchange:

- Development of a regional rural warehousing footprint meeting defined standards for managerial professionalism and financial status.
- Encouraging linkages with financial institutions in the rural areas—whether banks directly, or more likely through empowering microfinance institutions and farmers' organizations as agents of a mainstream financier for purposes of warehouse receipt³ or crop receipt⁴ finance.
- Development and capacity-building of a concerted regional rural broker capability to deliver services to producers and aggregators.
- To a certain extent, improving the road and transportation infrastructure for linking rural locations to wholesale markets within country and cross-border—although this is obviously a huge challenge that goes beyond the agenda for commodity exchange development alone.

³ A warehouse receipt is a document of title representing a quality- and quantity-certified commodity stored in a designated warehouse under control of and guaranteed by a designated operator. Increasingly in the developing world, banks see warehouse receipts as good collateral against which finance can be provided. Warehouse receipt finance is most commonly used as a form of post-harvest finance for producers and seasonal finance for aggregators.

⁴ A crop receipt is effectively a tradable promissory note issued by a producer for title to a certain quantity of quality-specified commodities that are still in the ground being produced. This instrument was pioneered and has become most accepted in Brazil through the "Cedula de Produto Rural" and a portfolio of related instruments, enabling producers to access pre-harvest finance from banks and through capital markets.

The African Context

Commodity exchanges exist in other mature and developing markets, including in Latin America, Asia, North America, and Europe. However, World Bank and FAO research has shown that many domestic markets, particularly in Africa, are not well integrated with world markets, and that price transmission to these markets is slow or limited. In addition, the residual basis risk (the difference between the price of a commodity in one market versus another) is high due to transportation costs,⁵ quality differences, and variations in seasonality. As a consequence, there are substantial economic costs of not having commodity exchanges in Africa. Therefore, in order to reap the benefits of an organized competitive market, it appears optimal to create market institutions locally in Africa, with a strong evidence that the development of regional exchanges will be particularly beneficial for regional and domestic staples.

Although many African countries have been trying for over a decade to develop commodity exchanges, to date only the JSE of South Africa has been successful in global terms. That said, studies show exchanges to be organic institutions that evolve in different form and structure according to their context. In that sense, the ongoing experience of 24 sub-Saharan African countries—three with active exchanges in Ethiopia, Malawi and Rwanda, and others with initiatives in the pipeline such as Ghana, Kenya, Mozambique, Nigeria, Tanzania, Uganda, Zambia, and Zimbabwe—will provide valuable insight as to what does and does not work well in the African context. Also of interest, the Members of the West African Economic and Monetary Union (WAEMU, also known by its French acronym, UEMOA⁶) have recently completed a study to set up a regional commodity market for food crops, and the Economic Commission for West African States (ECOWAS, also known by its French acronym, CEDEAO⁷) have undertaken a strategic review of commodity exchange and Warehouse Receipt System (WRS) development under World Bank auspices.

In South Africa, the JSE's commodity futures market was established as a corollary to market liberalization during the post-Apartheid transition. The market was essentially the formalization and scaling of the over the counter (OTC) activities of several large South African banks, leveraging the established infrastructure and large-scale commercial farming sector that emerged from South Africa's pre-1990s experience. The commodity futures market was domiciled within what was an established financial futures market, then known as the South African Futures Exchange ("SAFEX"), subsequently acquired by the JSE, to take advantage of an established institutional platform.

The JSE is unique worldwide in having over 200 delivery points for each of its deliverable grain futures contracts—maize, wheat, sorghum, soya beans, and sunflower seeds—providing countrywide access and high levels of integration between JSE futures and the underlying commodity spot markets. More recently it has introduced local currency-denominated, cash-settled contracts on Chicago agricultural, energy, and metals contracts.

⁵ African commodities are typically benchmarked against global exchanges whose pricing is based on "Cost Insurance Freight" (CIF) for delivery Europe, U.S., or Asia. Hence by applying these benchmarks, African exports may be subject to unjustified discounts—especially where, as is unfortunately all too prevalent, goods are exported from one part of Africa to another region and then re-imported back into Africa whether in raw or processed form. An Ex-Works (EXW) or "Free on Board" (FOB) benchmark, offered in a local currency, may create a more efficient basis for African domestic and even export trade.

⁶ The members of UEMOA are Benin, Burkina Faso, Cote d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, and Togo.

⁷ The members of ECOWAS include those of UEMOA plus Cape Verde, Gambia, Ghana, Guinea, Liberia, Nigeria, and Sierra Leone.

Key Stats – JSE Agricultural Commodities:

- JSE agri-commodity futures transactions average approximately 175 million metric tons (MT) per annum in recent years.
 - Approximately average of 140 million MTs per annum on deliverable grains futures contracts, of which 125 million are deliverable maize futures.
- Total physical deliveries ranges between 2.3 to 3.6 million MTs, approximately 2 percent of total volume.
- Futures transaction volumes typically exceed 10 times national production for maize, wheat, soya beans, and sunflower seeds.
- Delivery volumes average approximately 20 percent of national maize production, nearly 30 percent of wheat, nearly 40 percent of soya beans and nearly 60 percent of sunflower seeds

Malawi, through its Agricultural Commodity Exchange (ACE), founded in 2006, has created financing and marketing frameworks that have secured the engagement of commercial banks and agribusiness, while also creating inclusive conditions for smallholder participation in the grains, pulses, and legumes chains.

Accredited and supervised by ACE as part of its WRS and commodity exchange is a network of village-based warehouses, enabling smallholders to supply from their villages the WFP, among others, and secure finance from commercial banks. Accredited agribusiness-owned facilities are located in the commercial metros and some of the larger agricultural centers.

Trade takes place through auctions and reverse auctions, with bid-offer “spot” contracts on the horizon. Financing of farmers and traders takes place on the back of warehouse receipts, as well as through forward contracts secured by an offtake arrangement with agribusinesses.

A second entrant, Auction Holdings Commodity Exchange (AHCX), founded in 2012, is also active in Malawi in both the financing and marketing space.

Key Stats – ACE (Malawi):

- In the last 5 years, transactions on ACE ranged between approximately 20 – 60,000 MTs, all volume deliverable through auction-based structures.
- ACE taps into approximately 2 percent of the total market potential—annual maize production of 3 million MTs, the majority of it smallholder-produced.
- The majority of trade on ACE has been maize-related, but there have also been meaningful and growing transaction volumes of soybeans, groundnut, pigeon pea and cowpea.
- As a WRS, ACE financing activity has increased from \$2 million in 2013 to \$6 million in 2014, and is expected to surpass \$10 million in 2015.

Ethiopia introduced in 2008 an agricultural commodities spot market, the Ethiopian Commodity Exchange (“ECX”). Commentary on ECX suggests that it is transforming the agricultural sector in Ethiopia, enabling farmers to reach new markets and obtain better prices. More importantly however, ECX has the potential to radically improve food security in the country. In addition, to trades in internationally acclaimed quality Ethiopian coffee, the exchange trades in sesame seeds, pea beans, and maize, deliverable at 17 exchanged-owned warehouses across the country. ECX has also

introduced a WRS which is understood to be financing farmers for the aforementioned commodity chains.⁸

Headquartered in Kigali, Rwanda, but serving the broader East African Region, the East African Exchange (EAX) was launched in July 2014. EAX is a subsidiary of African Exchange Holdings (AFEX), a private sector organization, comprising African and international investors with an intent also to launch exchange solutions in Nigeria and other jurisdictions. EAX launched with physical trade through auctions and reverse auctions, as well as warehouse receipt finance, but is seeking to introduce spot transactions shortly.

Key Stats – EAX (Rwanda, East Africa):

- In its first full year of operations, EAX transacted approximately 25,000 MTs through auction-based structures
- The majority of this volume was maize-related, with some trade in beans also featuring
- If volume is appraised only relative to Rwanda's potential market, EAX tapped in to approximately 4 percent of annual maize production and 0.3 percent of beans production
- However, it is understood transactions took place with maize and beans sourced across the wider East African Community, implying much larger market potential of over 10 million MT production of maize and nearly 3 million MT of beans.

Commodity Selection

With increasing food price volatility, there is a need to look at various smoothing mechanisms to help farmers manage volatility and transmit information in a timely manner. The development of a regional commodity exchange in Africa is one such tool.

The commodities to be sold on the exchange would include food and cash crops. While a few years ago, the distinction between food and cash crops or crops sold for export was clear, that distinction is not as pronounced today. Therefore, the exchange would carry major food and cash crops such as coffee, cassava, yams, cotton, sesame, chick peas, corn, wheat, soybean, rice, cocoa, sugar, sorghum, peanuts, among others. Over time, solutions could also be developed to address risks faced by the livestock, dairy, and horticulture sectors.

A largely similar infrastructure can also offer trade in non-agricultural products altogether. Whereas exchange trade of metals and energy products may be seen as industrial, and targeting larger corporations, trade of refined petroleum products (e.g., diesel, kerosene, cooking oil) or fabricated metal derivatives (e.g., copper wire, steel ingots) could create value for small and medium-sized enterprises in markets facing similar structural challenges with transparency, competitiveness, and infrastructure-deficiency.

Incorporating multiple commodities in one exchange is arguably the dominant practice across the developed and developing world. Not only would this be feasible—most of the systems, processes, and procedures for trading agricultural products are almost identical to those for trading non-agricultural commodities and even financial instruments—such an approach would also create strong commercial synergy, allowing an expensive and largely fixed cost base to be shared across sectors

⁸ No data has been made available on ECX for inclusion within this paper.

in order to help reduce transaction costs to levels affordable for the smaller and medium-sized players who most struggle with market access.

However, it should be emphasized, the selection of the commodities to be listed would be determined by country participation, stakeholder demand, available infrastructure, and market breadth both within the region and outside. This flexibility would be another distinguishing aspect of the exchange and would help encourage the production of local foods. In this sense, it will be an important component of the food security agenda on the continent.

Enabling conditions for a viable commodity exchange

There are four broad categories of conditions which facilitate the development of a viable commodity exchange.

Commodity specific conditions

A contract can only be traded on a commodity exchange if both buyers and sellers are reasonably certain about the availability of the specified commodity at a particular date and location. An important indicator of the feasibility of establishing an exchange is therefore the cost of improving warehouse capacity to a minimum standard in the country in which it will be sited. It is equally important to have good physical infrastructure such as roads which facilitate the connection of warehouses to each other and to central wholesale markets.

For a commodity to be tradable, it should be subject to grades and standards that account for relevant attributes such as moisture content, impurities, and safety standards. A commodity is also likely to be traded effectively on an exchange if a large spot market exists in terms of value and number of participants. Since one purpose of a futures market is to manage price risk, cash market price flexibility is an important requirement for a commodity futures exchange. Where prices are regulated or markets are monopolistic, futures contracts that deviate from the international norms are unlikely to attract buyers. On the other hand, cash-settled and/or local currency-denominated equivalents of global benchmark contracts could be successful even in these conditions.

Contract-Specific Conditions

An exchange can only function effectively if it offers contracts that are attractive to market participants. For instance, futures contracts must appeal to both hedgers and speculators in order to attract adequate volume. Furthermore, by creating conditions conducive for arbitrage—for example, along the commodity chain, over time, or across similar contract markets offered at different exchange venues—an exchange can tap into a significant liquidity boost, which may be further assisted by the appointment of market makers.

That said, the key to a successful futures market lies in having distinctive price discovery, which can only at root be driven by participation from the local commodity chain, and this must remain the priority constituency when developing contracts.

Other factors of importance include predictable interest rates, warehousing costs, and transportation costs. These enable more efficient pricing and trading calculations based on the costs of carry that differentiate today's spot price from the futures price at different points in the calendar. Also the size and quality of the standardized contracts must be appropriate for traders and made fungible and usable as collateral in the banking system. Finally, the contracts must not favor some market participants over others.

Institutional Factors

The institutional arrangements for the commodity exchange must be right to attract liquidity. Key areas to look at would be facilitative regulation including rules and terms of participation and a trusted dispute resolution mechanism, a strong brokerage network, robust institutional ownership, and governance arrangements, an efficient and accessible technology platform, and a positive informational environment, including dissemination of market data through multiple channels.

Economic and Policy Environments

The main benefits of a commodity exchange are best realized in an environment where there is adequate infrastructure, efficient flow of information, sound macroeconomic and financial environment, stable rule of law, and effective contract enforcement. Public policy must also support commodity exchanges by refraining from controlling commodity markets and by allowing producer organizations and other entities to emerge as intermediaries between farmers and exchanges.

A commodity exchange depends on a developed financial system. For an exchange to function successfully there must be adequate numbers of potential hedgers and speculators in the economy, though arbitrageurs and market makers may also provide some additional liquidity. These individuals must understand risk-taking and trading and must have financial capacity. The exchange itself must have a clearinghouse with sufficient capital to serve as a guarantor of all transactions.

Communication, storage and transportation infrastructure is critical to a well-functioning exchange. For instance, trade at a futures exchange requires a communication network that can enable efficient, timely access to markets, carry spot price and other market information, and facilitate a robust disaster recovery strategy. Information regarding product quality, quantity, form and price in all relevant markets should be available across various spot markets. A commodity exchange also needs to be supported by a reliable system for storage, transportation, and distribution, so that delivery locations can be credibly specified in the contract.

Transaction costs must be stable enough for traders to evaluate the spread between the spot and futures contract prices, and to facilitate the required convergence between spot and futures prices at the expiry of a futures contract to ensure efficient hedging and price discovery.

A credible commodity exchange must also be supported by appropriate legal “infrastructure,” particularly (i) a system of grades and standards, (ii) contract enforcement mechanisms, (iii) governance in spot markets, and (iv) a strong foundation in insolvency law to manage risks associated with defaults and bankruptcies.

A commodity exchange, particularly one that offers trade in futures, cannot be sustained without reasonably sound and predictable policies for fiscal and monetary management and foreign trade.

In particular, macroeconomic policy needs to maintain stable, reasonably undistorted real interest rates, exchange rates, and inflation rates. A fair, predictable and potentially preferential⁹ taxation framework should define fiscal obligations arising from exchange transactions.

While these four categories of conditions outlined above describe an ideal, experience has shown that countries can begin to develop commodity exchanges while simultaneously improving enabling environments.

⁹ Preferential treatment for purposes of tax and duties may be considered by government as a softer alternative to outright mandating of trade through the commodity exchange. The justification for the preferential treatment would be grounded in transparency, price discovery, equitable market access, and other public benefits generated from transactions being routed through a commodity exchange compared with other venues.

In some cases, experience has shown that the development of the commodity exchanges has served to accelerate the desired improvements. Some examples include:

- By developing **rules and bylaws**, backed by arbitration, the commodity exchange helps to create a functional regulatory framework, even before formal legislation comes in at national or regional level.
- By defining **contract specifications** in consultation with the market, the commodity exchange helps to define a uniform structure and process around which the value chain can perform.
- By defining **quality standards** against which pricing premiums and discounts are attached, the commodity exchange helps to incentivize all players to invest in upgrading their quality so as to achieve a premium (or avoid a discount)—importantly, it can be argued, that many of the world’s most trusted and enduring quality standards are those that have been created by the world’s commodity exchanges.
- By creating a **brokerage network**, the commodity exchange helps to open up the market to previously marginalized players, and incentivizes private sector at their own cost to capacitate the value chain.
- By building a **reliable settlement system**, the commodity exchange helps participants to trade with all counterparties, including smallholders, with whom they would not previously have considered dealing.
- By developing or integrating with a **WRS**, the commodity exchange helps participants find a new channel for financing to better invest in bulking their production and improving quality performance.

Specific Requirements in Africa

Recent good macroeconomic performance in a number of African countries has created a conducive environment for the development of commodity exchanges.

However, in most African countries, agriculture is dominated by smallholders who are unable to access commodity spot or futures markets directly. They often lack know-how, have insufficient collateral for margins, have difficulty monitoring prices, cannot compete internationally, and are constrained to deal with monopsony buyers as well as banks due to increasing “know-your-customer” (KYC) obligations.

More fundamentally, they may lack bank accounts, be unable to arrange transportation to exchange warehouses, and produce insufficient quantities to deliver under prevailing contract specifications.

Consequently, additional institutional mechanisms are usually required to help link smallholders to competitive markets. The engagement of producer organizations, microfinance institutions, and/or specialized rural brokers, for instance, could be important in aggregating production, building awareness and capability to meet quality standards and providing transportation solutions.

What is therefore needed?

A need to link physical markets with a financial market dimension

Physical goods can be traded on an exchange or auction floor, which may lower search costs for participants, but trading in physical commodities imposes other costs associated with warehousing and transportation, for example, and does not provide the capability to manage the risks associated with commodity price fluctuations.

The attempt to develop commodity exchanges represents an effort to move beyond ‘auction floors’ and create an electronic platform for the trading of fungible contracts that can also be used as price-smoothing instruments.

A need for extensive ‘market infrastructure’

This includes investments in physical warehousing facilities, more complex communications infrastructure to facilitate information dissemination down to the level of local farmers and the adaptation of more simple technologies such as SMS-based Mobile Banking platforms which are now prevalent across the Continent.

The infrastructure required for a commodity exchange to succeed can be costly. For an exchange to succeed:

- a) Its services must be sufficiently valued by users that they are willing to pay fees to cover such costs.
- b) The size of the economy—national, regional, or continental—and the number of users therein needs to be large enough to cover such costs.

A need for legal, contractual, and regulatory infrastructure

The legal and regulatory infrastructure required to support a commodity exchange includes, among other things:

- (a) A system of grades and standards for different underlying commodities.
- (b) Contract enforcement mechanisms.
- (c) A framework for governance in spot commodity markets, including a non-distortionary role for government intervention¹⁰ and effective industry associations to represent and mobilize their constituencies.
- (d) An insolvency regime that gives confidence to participants in the event of default or insolvency.

A need for commercial and financial sector development

This includes capacity building and training for financial intermediaries in financial product development and risk management; developing a financial information infrastructure, which facilitates the scope, quality, and availability of credit reporting; implementing systems to enhance contract enforcement; and establishing security depositories and reliable clearing and settlement systems.

A need for greater involvement of the private sector

Aside from trading and financing, the private sector has a significant role to play in the provision of warehousing, transportation infrastructure, and in collateral management. Recognizing the opportunities from unlocking the potential at the “bottom of the pyramid,” private sector may also stand to benefit significantly by taking on an active role in supporting producer organizations or smallholders cooperatives to facilitate access to the exchange, its markets and participating financiers.

¹⁰ With respect to government policy, commodity exchange practitioners and policy experts have been calling for food reserve agencies to operate through WRS and commodity exchanges. Rather than holding vast levels of physical stock, running large storage infrastructures, and intervening directly in the physical markets, it is argued that such agencies may operate more efficiently through holding “paper” or “virtual” stock through the WRS and running auctions or reverse auctions through the exchange according to requirement. The main challenges to this appear to be rooted in both capacity and political economy.

Toward a Regional Commodity Exchange

Countries need to be of sufficient size to be able to support the development of a national commodity exchange. In fact, many domestic markets in sub-Saharan Africa are not of sufficient scale to support the development of purely standalone exchanges, hence the idea for a regional platform that pulls together a large enough market. A regional exchange can in this way increase breadth (number of commodities), depth (volume of commodities traded), and to promote sufficient liquidity in the market.

A market penetration simulation performed by the World Bank on the 15 ECOWAS countries¹¹ identifies the annual tonnage of trade that a warehouse receipt system, spot commodity exchange, or derivatives commodity exchange would need to accomplish in the fifth year of its operations to break even for the year.

The simulation shows that—apart from Nigeria whose agricultural market accounts for a dominant share of regional production—other purely national approaches would be unattractive compared with regional approaches. For example, the analysis suggests even relatively large economies such as Ghana and Cote d'Ivoire would need to finance and trade a similar amount of tonnage as the ECOWAS region¹² as a whole in order to breakeven for the year, clearly demonstrating the scale benefits underpinning the economics of commodity exchanges.

Indeed, not all countries would need to develop an exchange over time. With the development of well-placed warehouses and appropriate governance arrangements, countries could enter into agreements to list their products on an overseas exchange on the basis of equitable fee-sharing arrangements.¹³

How can international actors support the effort?

First, the World Bank Group and other development partners can bring international relevant best practice to bear on the regional exchange including the use of innovative information and communications technology to improve efficiency. The bank can bring experiences from other emerging market countries such as South Africa, Brazil, Hungary, India, China, Malaysia, and the United Arab Emirates.

Second, International Financial Institutions (IFIs) can help develop the financial products needed for the exchange function effectively. The simplest instrument that can be traded by an exchange is most likely a spot contract settled through transfer of a warehouse receipt. Trade in warehouse receipts implies immediate title transfer of a commodity with specific quality, quantity, and location as specified on a warehouse receipt. While exchange in warehouse receipts can lower transfer costs in a marketing system, they do little to help agents manage risk based on price variability. In addition, spot markets do not always clear.

By contrast, by trading contracts for future delivery, commodity exchanges can help strengthen market liquidity, improve price discovery, and facilitate price risk management. An exchange can improve liquidity because a futures contract is a fungible financial instrument which buyers and sellers are willing to hold and exchange. However, while futures contracts serve to reduce the level of price risk in a transaction, they do not eliminate risk altogether. This must be clear upfront. These contracts provide predictability and can improve planning. In addition, over time as the commodity markets

¹¹ See footnote 6

¹² Documented in Annexure A. For a spot commodity exchange to breakeven in the fifth year for the year, based on standard assumptions, the simulation suggests: A Nigerian exchange would require trade of approximately 70,000MT; an ECOWAS exchange would require approximately 110,000MT; a Ghanaian exchange would require approximately 110,000MT and an Ivorian exchange would require 100,000MT.

¹³ For example, the Zambian Agricultural Commodity Exchange (ZAMACE) has entered into just such a relationship with South Africa's JSE commodity futures market to list on the JSE a U.S. dollar-denominated, Zambia-deliverable grain futures contracts.

evolve into more mature trading platforms they could create a clearinghouse which virtually eliminates the counterparty risk and, by instilling trust, can lead to more business opportunities with a broader array of counterparties.

Third, to launch a regional commodity exchange, one of the most important requirements will be to have IFIs and others provide comfort to the financial sector regarding the credibility of the institution. This can be done by underwriting the warehouse receipts through a guarantee mechanism—especially as for most commodities huge variations in prices tend to occur, creating concerns for the financial as well as the trading community in consideration of these documents as collateral, either on a bank loan or as a margin deposit.

It can also be done by underwriting a “settlement guarantee fund” (SGF) that stands behind a clearinghouse to provide sufficient capital strength which would act as a credible guarantee in the event of a counterparty default.¹⁴ Underwriting a clearinghouse’s SGF would send a similar signal and be an equally vital contribution—effectively boosting the credibility of the clearinghouse to take on the counterparty risk of all participants in the market. However, to eliminate moral hazard, such a guarantee must be based on the clearinghouse having rock-solid procedures and systems. An offshoot of The Currency Exchange Fund NV (TCX)—a special purpose fund which provides currency risk management solutions in developing countries—called FrontClear, focusing on credit risk, does something like this in partnership with European Development Finance Institutions.

These kinds of guarantee will send an important signal, particularly to foreign investors whose perception of markets, contract enforcement, and capital adequacy in Africa is varied. IFIs could help to mobilize public and private resources to further bolster this guarantee. Fourth, the international community can also support initial development of the exchange by providing technical assistance for quality enhancement programs and the development of warehouse facilities which could be privately operated.

Finally, IFIs and the private sector could play a role by working with small holder farmers to help them aggregate their products, through the development of rural grain elevators that store and distribute grain (also privately run) around a community, facilitating access to market information, and providing technical capacity.

Warehouse Receipts Financing

Financing agricultural production, processing and trade, especially in sub-Saharan Africa, remains a major challenge because the sector is perceived to be very risky by financiers. This is compounded by the lack of satisfactory collateral arrangements to provide some comfort to lenders especially the commercial banks.

A possible solution appears to be warehouse receipt financing, which is currently being deployed in many developed countries to provide sustainable financing for agriculture. Under a warehouse receipt financing scheme, goods (usually agricultural commodities) of a certain quantity and specification are lodged in an accredited warehouse and a receipt is issued against it. Depending on the existing legal framework, these receipts can be negotiable instruments that can be traded, sold, swapped or used for collateral to support borrowing from financiers.

Several public benefits emerge from a warehouse receipt system of this kind. The possibility for commodity chain participants to access finance through goods deposited in a warehouse creates an

¹⁴ This is particularly important for banks under the Basel frameworks in which capital provisioning is differentiated between bank exposures to “qualifying” and “non-qualifying” clearinghouses. Capital strength is a key factor for a clearinghouse to attain a qualifying status.

incentive to reduce the historically high levels of post-harvest loss that many African countries face. The information that becomes available through the system's stock monitoring of goods in the warehouse can also inform government in real time of the food security situation in the country, providing a basis for a more stable, informed, and predictable policy response—critically important when supposedly unpredictable government interventions are said by many to be among the largest deterrents to agricultural investment on the continent.

A simulation performed on the returns on WR finance for Nigerian maize suggests positive returns in most seasons for most carries, exclusive of costs.¹⁵ Nigeria is understood to be a jurisdiction in which there is relatively low interventions by government in the physical markets and therefore provides something close to a “best case” for the viability of WR finance to borrowers and financiers alike. When costs of storage and finance are factored in, returns become rather more mixed—yet these costs are in reality highly variable and generally under-specified due to the immaturity of the market in offering third party storage and WR finance. Over time, with growing liquidity and market maturity, falling costs can only help to make WR financing more compelling.

Importantly, in all seasons, on all occasions, the bank's collateral would be safe on the basis of loan-to-value ratios (LTVs) of 80 percent. In reality, though, the current WR financing pilots in Nigeria have WR finance being provided only where an offtake arrangement and a fixed forward price are in place so as to remove concerns about price development and thus allow LTVs of 100 percent (assuming banks are convinced about the creditworthiness of the offtake). While this kind of transaction may be safer, it would be important to look carefully at the ramifications of this approach with concern in particular about inclusivity.

There are a number of prerequisites for a well-functioning warehouse receipt financing scheme. In the first place, the warehouse receipts should be backed in law ensuring that the ownership established by the receipts cannot be challenged and that it entitles the owner to the goods in the warehouse, even where one or more of the parties involved in the transaction become insolvent. Secondly, there must exist a warehouse infrastructure, grading, and collateral management system that guarantees that the goods in storage match those specified on the receipts. This is essential to providing comfort and confidence to all stakeholders to accept the warehouse receipts as secured collateral.

Finally, there must exist a combination of fair and transparent spot and futures markets that provide liquidity and price discovery, enabling stakeholders to be able to value and trade warehouse receipts at short notice if needed.¹⁶

The implementation of successful WR financing schemes in sub-Saharan Africa would benefit a complement of investment facilities and advisory services. Investment facilities may benefit at two levels. First is a guarantee fund to provide integrity to the warehouse receipts and ensure that the issuer of the warehouse receipt can always make good any legitimate claim on it. Second, an investment fund can provide guarantees and/or liquidity to commercial banks to extend credit facilities against warehouse receipts beyond current exposure constraints such as commodity or single obligor limits.

¹⁵ Documented in Annexure B.

¹⁶ Where a futures market is not in place, holders and financiers of receipts are effectively exposed to the risk of price falls, undermining for the borrower the return on financing, and for the bank the value of the collateral. As such, where a predictable price rise across the season is not in place (and when this happens it is often due to government interventions), it may be that warehouse receipt finance would be more secure when an offtaker for the receipt is already in place and a forward price has been fixed.

Annexure A: Simulation of Warehouse Receipt System and Commodity Exchange Economics with respect to development in the ECOWAS¹⁷ region of West Africa at a Regional versus a National Level

Introduction

This commodity exchange market penetration simulation identifies the annual tonnage of trade a warehouse receipt system (WRS), spot commodity exchange or derivatives commodity exchange would need to do in the fifth year of its operations to breakeven for the year.

The analysis compares six scopes of geography: three national (Nigeria, Ghana, Cote d'Ivoire) and three regional (ECOWAS, UEMOA, Rest of UEMOA), as the possible scope of operations for a WRS and commodity exchange.

The analysis uses FAOSTAT volume and value data averaged for 2007-11; an assumed institutional cost base for the WRS and/or commodity exchanges in question; and assumed WRS and commodity exchange fee metrics based on common practice.

The analysis identifies commodities of sufficient scale to be warehouse receipt-financed, and then take subsets that could be standardized for trade on a commodity exchange—with both an optimistic and conservative view, due to the uncertainties in a desk exercise.

The analysis also assumes a fixed regional production base in both volume and value terms—this is safest due to unknowable factors such as commodity price volatility, conflict, and drought.

Method

Per each of the six scopes of geography, the analysis reduces total production value per averaged FAOSTAT volume and value data to the marketable surplus based on assumptions in FAO 2013 (Rebuilding West Africa's Food Potential).

Total value of the marketable surplus drives the WRS analysis. However, for commodity exchanges the analysis looks at commodities for which an existing African or benchmark global standard exists (“conservative”) and where a draft or a non-benchmark global standard exists (“optimistic”).

The analysis defines simplified fee metrics broadly based on African and international practice for warehouse receipt issuance, for commodity exchange spot trade, and for commodity exchange derivatives trade.

From this, the analysis calculates the total addressable market in U.S. dollars for each platform type (WRS, spot, derivatives) for each of the six scopes of geography.

The analysis quantifies a simplified U.S. dollar cost base for each platform type for each scope of geography—here referring to the fifth year estimates. In doing so, it has been assumed in pertinent dimensions (personnel, business development, etc.), albeit in a non-linear manner, that the larger the geographical scope, the larger the cost base.

Finally, the analysis calculates the penetration required in the fifth year of the addressable market to breakeven against the annual cost base. Based on the tonnage production volume data, the analysis

¹⁷ See footnote 6 above

then calculates how many MTs would need to be financed and/or traded in order to reach that breakeven target.

Conclusions

Apart from Nigeria—whose agricultural market accounts for a dominant share of regional production—other purely national approaches would be unattractive compared with regional approaches.

For example, the analysis suggests Ghana would need to finance and trade a similar amount of MTs as the ECOWAS region as a whole in order to breakeven. This conclusion applies across platform types—WRS, spot, and derivative.

This clearly demonstrates the scale effect driving WRS and commodity exchange economics, and motivates toward regional approaches. However, this does not speak to the model for a regional exchange. While a unitary regional exchange with one cost base has been assumed for purposes of this analysis, it is expected that similar conclusions would arise based on national exchanges saving on cost by pooling technology, business development, and personnel spend with other national exchanges across the region.

Data Tables

USD VALUE OF MARKETABLE SURPLUS FOR SELECTED WRS/EXCHANGE-CONDUCTIVE CROPS IN WEST AFRICA

Sum of Average		Country Classification					Grand Total	Marketable Surplus Adjustment
Category	Item	Nigeria	Ghana	Côte d'Ivoire	Rest of UEMOA	Other		
Roots & Tubers	Cassava	4,737	763	225	796	60	6,581	40%
	Onions, dry	403	40	-	48	2	492	40%
	Potatoes	299	-	-	49	4	352	40%
	Sweet potatoes	560	6	2	43	8	619	40%
	Taro (cocoyam)	474	208	6	3	5	696	40%
	Yams	9,907	842	420	535	1	11,705	40%
Cash/Export	Cashew nuts, with shell	2,045	20	107	13	7	2,191	100%
	Cocoa beans	880	908	1,886	238	17	3,929	100%
	Coffee, green	10	4	112	11	12	148	100%
	Cow peas, dry	2,736	-	-	491	-	3,227	100%
	Groundnuts, with shell	1,626	417	41	809	141	3,034	100%
	Natural rubber	246	75	242	-	11	575	100%
	Oil palm fruit	14,874	260	211	6	510	15,861	100%
	Seed cotton	297	3	57	443	21	821	100%
	Sesame seed	141	-	-	108	1	250	100%
	Sugar cane	384	6	58	80	14	542	100%
	Tobacco, unmanufactured	165	10	5	5	6	190	100%
Foodgrain	Maize	2,144	251	83	504	36	3,019	42%
	Millet	590	21	3	412	14	1,040	19%
	Rice, paddy	1,480	124	200	619	137	2,560	60%
	Sorghum	1,040	32	3	294	3	1,372	23%
	Wheat	26	-	-	4	-	31	42%
Fruit & Veg	Chillies and peppers, dry	29	38	11	4	2	84	20%
	Citrus fruit, nes	894	-	5	-	12	911	20%
	Plantains	488	292	102	-	5	886	20%
	Tomatoes	270	65	3	53	4	395	20%
Livestock	Cattle Live Weight	338	12	34	323	39	746	20%
	Meat nes	-	219	18	-	-	237	100%
Grand Total		47,081	4,618	3,833	5,893	1,071	62,495	

Market Potential

USD m (per annum)	ECOWAS	UEMOA	Nigeria	Ghana	Côte d'Ivoire	Rest of UEMOA
WRS	62,495	9,725	47,081	4,618	3,833	5,893
CE - Optimistic	59,179	9,526	44,790	3,824	3,695	5,832
CE - Cautious	34,307	6,379	25,372	1,735	2,899	3,480

Fee Assumptions

	Fee Estimate	Multiplier
WRS	0.25%	1
CE spot	1%	1
CE derivatives	0.0025%	10

Annual Maximum Revenue Potential (Based on Current Production Base and Selected Commodities)

USDm	ECOWAS	UEMOA	Nigeria	Ghana	Côte d'Ivoire	Rest of UEMOA
WRS	156	24	118	12	10	15
CE (Spot) - Optimistic	1,184	191	896	76	74	117
CE (Spot) - Cautious	686	128	507	35	58	70
CE (Derivatives) - Optimistic	30	5	22	2	2	3
CE (Derivatives) - Cautious	17	3	13	1	1	2

Likely Year 5 Cost Base

USDm	ECOWAS	UEMOA	Nigeria	Ghana	Côte d'Ivoire	Rest of UEMOA
WRS	0.68	0.57	0.55	0.40	0.40	0.46
CE (Spot) - Optimistic	1.29	1.07	1.05	0.75	0.75	0.86
CE (Spot) - Cautious	1.29	1.07	1.05	0.75	0.75	0.86
CE (Derivatives) - Optimistic	2.48	2.19	2.01	1.61	1.61	1.75
CE (Derivatives) - Cautious	2.48	2.19	2.01	1.61	1.61	1.75

Breakeven Penetration Requirement of Addressable Market (Annual Basis.. i.e. Excluding potential cumulative losses to this point)#

USDm	ECOWAS	UEMOA	Nigeria	Ghana	Côte d'Ivoire	Rest of UEMOA
WRS	0%	2%	0%	4%	4%	3%
CE (Spot) - Optimistic	0%	1%	0%	1%	1%	1%
CE (Spot) - Cautious	0%	1%	0%	2%	1%	1%
CE (Derivatives) - Optimistic	8%	46%	9%	84%	87%	60%
CE (Derivatives) - Cautious	14%	69%	16%	185%	111%	101%

Year 5 Tonnage Targets to Reach Annual Breakeven

MT	ECOWAS	UEMOA	Nigeria	Ghana	Côte d'Ivoire	Rest of UEMOA
WRS	471,881	639,417	292,811	449,984	412,737	542,946
CE (Spot) - Optimistic	111,493	150,053	68,773	112,464	95,392	126,688
CE (Spot) - Cautious	94,147	147,039	49,225	98,159	79,076	139,972
CE (Derivatives) - Optimistic	8,618,378	12,268,660	5,290,219	9,647,399	8,182,907	10,379,678
CE (Derivatives) - Cautious	7,277,479	12,022,173	3,786,577	8,420,328	6,783,277	11,467,992

Annexure B: Simulation of Returns on Warehouse Receipt (WR) Finance on White Maize in Nigeria

Introduction

This WR financing simulation was performed on data provided for Nigeria white maize by IFPRI and the Abuja Securities and Commodities Exchange (ASCE). Nigeria is understood to be a jurisdiction in which there is relatively low interventions by government in the physical markets, and therefore provides something close to a “best case” for the viability of WR finance to borrowers and financiers alike.

Specifically, the analysis strives to simulate the returns on WR finance for someone storing at harvest and waiting to sell until later in the season in the anticipation of rising prices.

The simulation carries imperfections—in particular, the date of harvest is different every year, differs by place across Nigerian maize producing regions, and usually takes place across a range of dates rather than one specific day, week or month. There has had to be made simplifying assumptions. There has also been need to build into the simulation the costs of storage and finance, which are in reality highly variable and generally under-specified due to the immaturity of the market in offering third party storage and WR finance. For purposes of this analysis, assumptions provided by the World Bank country team have been used.

IFPRI Simulation Outcomes

The IFPRI simulation for seven seasons between 2007-13 shows that WR finance would deliver a gross return—i.e., excluding costs of storage and finance—in all seasons over a three-month, six-month, and nine-month carry, with only one exception for a six-month carry in one of the seven seasons.

However, if assumed costs of storage and finance are taken into account, the net return would not be consistently positive over any carry period. The closest would be a three-month carry, which is profitable in six of seven seasons (for six- and nine-month carries, returns would be negative in most seasons). In other words, for a borrower, it would be likely that there would be a positive return on WR finance over three months, albeit with occasional risk of loss. However, it may be wondered whether the size of this return—apart from a stellar 55 percent in 2007, it ranges between 2 percent and 11 percent—may be sufficient to justify the risk of the one bad season when a loss of 7 percent would have occurred.

For a bank, which would be looking from the perspective of collateral preservation at the gross price development irrespective of storage and finance cost, the data would be encouraging - under most scenarios the prices rise consistently, and a 70 percent loan-to-value (LTV) ratio provides a more than sufficient haircut to cover the only collateral loss that occurred during the period (10 percent for a 6-month carry in 2008).

The consistent price rises over the course of the season appear to confirm the facilitative policy environment—there does not seem to be shocks during the period which would be typically caused by interventions such as export/import bans and quotas, or government direct intervention in the market for buying, selling, or pricing purposes.

Thus, it is seen that WR finance, excluding costs, would be almost always profitable. The challenges, therefore, are the costs. Facilitating more competitive interest rates and storage fees than those used in the simulation would unlock greater confidence for farmers and traders about returns on WR finance, including for longer carries.

ASCE Simulation Outcomes

The ASCE simulation for four seasons between 2007-10 shows that WR finance would deliver a gross return—i.e., excluding costs of storage and finance—in all seasons over a nine-month carry, but not consistently for a three- or a six-month carry with one of the four seasons in each case yielding negative returns.

However, if assumed costs of storage and finance are taken into account, the net return would not be consistently positive over any carry period. The closest would be a three-month carry, which is profitable in three of four seasons (for six- and nine-month carries, returns would be negative in two of four seasons). In other words, for a borrower, it would be likely that there would be a positive return on WR finance over three months, albeit with occasional risk of loss. However, it may be wondered whether the size of this return—ranging between 3 percent and 16 percent—may be sufficient to justify the risk of the one bad season when a loss of 18 percent would have occurred.

For a bank, which would be looking from the perspective of collateral preservation at the gross price development irrespective of storage and finance cost, the 2010 season alone would give some pause for thought but would be far from fatal—under most scenarios the prices rise consistently enough, and a 70 percent LTV provides a more than sufficient cut to cover the only collateral losses during the period (8 percent for a three- or six-month carry in 2010). The consistent price rises over the course of the season again point to a facilitative policy environment as discussed above.

Conclusions

First, it would be interesting—but beyond scope—to understand why the IFPRI and ASCE datasets have some divergence and attempt to triangulate across them.

Second, under both scenarios, on a net of costs basis, WR finance would be most attractive over a three-month carry, but comes with risk of loss in an occasional season, and with rather limited returns in the ballpark of 2-16 percent.

Third, for banks, WR financing—without an offtake or fixed price agreed—at 70 percent LTV would provide more than enough protection of the collateral, and even an 80 percent LTV may be considered on the basis of these datasets.

In reality, though, it is understood that the WR finance pilots currently taking place in Nigeria are offering WR finance only when an offtake and forward contract is in place—this effectively removes any concerns about price development or market liquidation risk and assures the profitability of the transaction to borrower and lender even at 100 percent LTV, assuming banks are convinced about the creditworthiness of the offtake. (This structure is becoming more prevalent in Malawi too, known as “forward contract finance.”)

On the other hand, while this kind of transaction may be safer, it would be important to look carefully at the ramifications with concern in particular about inclusivity. Among other factors, producers depositing goods and taking finance for food security rather than marketing purposes— as is common, for example, under warranty arrangements in UEMOA countries—would be excluded if an offtake and forward contract is required.

However, any such conclusion would depend on a detailed study of specific market conditions and value chain relationships under assessment.

Data Table

Assumptions	Source			
Ave Depositor Size (Farmer) - kg	2500	Estimate		
Average Bag Size (kg)	100	World Bank Group		
No of Bags per Farmer	25	Estimate		
Interest Rate	28%	World Bank Group		
LTV	70%	Estimate		
Variable Storage Fee (USD/bag/m)	0.15		NGN	USD
			25	0.15
Fixed Storage fee (USD/kg)			NGN	USD
Handling	7.58	From WBG per 100kg bag	Per Bag	50
Drying	15.15	From WBG per 100kg bag		100
Fumigation	7.58	From WBG per 100kg bag		50
WRS	3.03	From WBG - fixed		500
Total Fixed Cost	33.33			165

Value of Commodity, Interest and Storage

	USD/Kg - Maize Dawanau				Farmer Commodity Value				Financed Amt	Farmer Interest				Variable Storage Fee			
	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun	Apr 70%	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun
2007	0.22	0.37	0.49	0.54	550	925	1225	1350	385	0	27	54	81	0	11.36	22.73	34.09
2008	0.38	0.39	0.34	0.42	950	975	850	1050	665	0	47	93	140	0	11.36	22.73	34.09
2009	0.3	0.35	0.35	0.3	750	875	875	790	525	0	37	74	110	0	11.36	22.73	34.09
2010	0.28	0.32	0.32	0.38	700	800	800	950	490	0	34	69	103	0	11.36	22.73	34.09
2011	0.35	0.41	0.39	0.38	875	1025	975	950	613	0	43	86	129	0	11.36	22.73	34.09
2012	0.33	0.4	0.45	0.53	825	1000	1125	1325	578	0	40	81	121	0	11.36	22.73	34.09
2013	0.33	0.37	0.42	0.36	825	925	1050	900	578	0	40	81	121	0	11.36	22.73	34.09

Farmer P&L

	Farmer Net Income				Farmer Profit over Harvest Sale				Optimal Sales time
	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun	
2007	550	853	1,115	1,202	0%	55%	103%	118%	9 mths
2008	950	884	701	843	0%	-7%	-26%	-11%	Harvest
2009	750	794	745	572	0%	6%	-1%	-24%	3 mths
2010	700	721	675	780	0%	3%	-4%	11%	9 mths
2011	875	937	833	754	0%	7%	-5%	-14%	3 mths
2012	825	915	988	1,136	0%	11%	20%	38%	9 mths
2013	825	840	913	711	0%	2%	11%	-14%	6 mths

Assumptions	Source			
Ave Depositor Size (Farmer) - kg	2500	Estimate		
Average Bag Size (kg)	100	World Bank Group		
No of Bags per Farmer	25	Estimate		
Interest Rate	28%	World Bank Group		
LTV	70%	Estimate		
Variable Storage Fee (USD/bag/m)	0.15		NGN	USD
			25	0.15
Fixed Storage fee (USD/kg) - Pvt Sector Model			NGN	USD
Handling	7.58	From WBG per 100kg bag	Per Bag	50
Drying	15.15	From WBG per 100kg bag		100
Fumigation	7.58	From WBG per 100kg bag		50
WRS	3.03	From WBG - fixed		500
Total Fixed Cost	33.33			165

Value of Commodity, Interest and Storage

	USD/MT - W Maize ASCE					Farmer Commodity Value					Financed Amt	Farmer Interest					Variable Storage Fee				
	Sep	Dec	Mar	Jun		Sep	Dec	Mar	Jun		Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun			
2007	184	241	340	401	401	459	602	851	1003	321	0	22	45	67	0	11.36	22.73	34.09			
2008	279	343	360	378	378	697	857	900	946	488	0	34	68	102	0	11.36	22.73	34.09			
2009	353	400	363	373	373	883	1000	907	934	618	0	43	86	130	0	11.36	22.73	34.09			
2010	343	316	314	384	384	857	789	785	959	600	0	42	84	126	0	11.36	22.73	34.09			

Farmer P&L

	Farmer Net Income				Farmer Profit over Harvest Sale				Optimal Sales time
	Sep	Dec	Mar	Jun	Sep	Dec	Mar	Jun	
2007	459	534	750	868	0%	16%	63%	89%	9 mths
2008	697	778	776	776	0%	-12%	11%	11%	3 mths
2009	883	912	764	736	0%	3%	-13%	-17%	3 mths
2010	857	702	645	765	0%	-18%	-25%	-11%	Harvest

Source: IFPRI ASCE