

# Africa Current Issues

Could better storage infrastructure transform  
Africa's agriculture?

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### Introduction

Most African economies are highly dependent on agriculture. Production across most of the continent relies on smallholder farmers cultivating between one to two hectares. Such production is highly dependent on rainfall patterns, with little application of fertilizer or modern technology to improve yields. Post-harvest systems are mostly moribund or non-existent, leading to post-harvest losses of 10% to 12% before crops reach markets.<sup>1</sup> Several other value chain issues severely constrain returns to smallholder farmers. These include lack of adequate storage systems, high transport costs, limited access to markets, and poor access to finance. An absence of transparent market information leads to spatial price distortions and high inter-seasonal price variability.

Appropriately managed warehouse receipt systems (WRS) can address some of these problems. The resulting increase in net yields provides incentives for higher productivity, which leads to higher returns and enhanced livelihoods for the farmers.

Warehouse receipt systems are increasingly ubiquitous in Africa's agricultural value chain, with active operations in Ghana, Nigeria, Tanzania, Ethiopia, and, Kenya. A WRS is a financial instrument that confers ownership of agricultural commodities stored in a warehouse, subject to prescribed conditions on their storage and retrieval. If warehouse receipts are in a negotiable form, they can provide farmers with collateral for loans. Such loans permit farmers to store their crops safely in warehouses, to be sold later in the marketing year when prices are higher, while providing farmers with cash flow at harvest.

Development practitioners hail warehouse receipts as a solution to many of the marketing problems faced by smallholders in Africa. A pilot study conducted by the International Fund for Agricultural Development (IFAD), reported that farm gate prices in Tanzania increased by 300 per cent following the introduction of WRS.<sup>2</sup> The primary argument for WRS is that absent mechanisms for safe and affordable storage of agricultural commodities, farmers must sell their output at harvest, when prices are generally at their lowest due to transient oversupply factors.

Inter-seasonal price volatility is one of the more fundamental marketing problems faced by marginal agricultural producers across the developing world (e.g., Weidemann, 2000; USAID, 2013; Onumah, 2010)<sup>3 4 5</sup> Warehouse receipt financing theoretically addresses this issue, by providing safe storage for crops that will serve as collateral for loans that enable them to pay their household expenses and finance the next crop.

In practice, warehouse receipt financing has yet to deliver the benefits to smallholders hoped for by development economists and practitioners. Throughout Africa, the current users of warehouse receipt financing are almost exclusively large traders, processors, and exporters. At best, the scheme has indirectly benefited only those few smallholders who are integrated into the industrial value chain for processed foods. Under their contracts, they continue to sell their grain at harvest without directly accessing warehouse receipt financing.

To provide deeper insights into who currently benefits from WRS and why, this article first reviews recent WRS experiences in sub-Saharan Africa. We then explore how this mechanism works and identify the key actors involved in the trend. Based on these country experiences, we will identify the benefits and challenges of WRS. After exposing these potential promises and pitfalls, we will conclude by presenting the inherent weaknesses of WRS agreements and highlight ways both lenders and policymakers can proceed.

### Warehouse Receipts in Africa

This section provides a brief review of WRS experiences in six countries in sub-Saharan Africa: Ghana, Tanzania, Ethiopia, Côte d'Ivoire, Kenya and Uganda.

## Ghana

Warehouse receipt is a common practice in Ghana. It started in the early 1990's with unregulated warehouse inventory credit initiated by the Ghanaian government, state owned storage facilities operated by the Ghana Food Distribution Corporation (GFDC), and financing by the Agricultural Development Bank (ADB) and Barclays Bank Ghana Ltd. The system offered farmers (mostly nucleus farmers) and traders the opportunity to store their grains in public warehouses and to receive a receipt, which at that time noted only the quantity of the grain in store. Deposits and financing grew steadily, reaching 5,500 MT in 1996. Initially, the grains supply and value chain also grew.

The new warehouse inventory credit system collapsed only a year later. The operational issues included poor security of stock and lack of insurance policies. At the national level, ad hoc government interventions on import duties reduced the likelihood that prices would rise later in the season, when market supply was low.

In 2008, with the support of USAID projects (ATP and ADVANCE), a body of Ghanaian grain business (farmers, traders, processors and financial institutions) formed the Ghana Grains Council (GGC), a regulated cooperative warehouse receipt system. The GGC mission was to intervene in the grains value chain to improve productivity and quality and support commercialization. Its main goals were to: (i) establish a functioning organization; (ii) lead the development of an improved grain warehouse system; (iii) become the recognized independent advocate for the grain system and thereby help develop a constructive public-private dialogue; and (iv) facilitate smallholder integration into more competitive markets.

GGC established a regulated warehouse receipt system governed by Ghanaian contract law, with GGC acting as the certification and regulating agency. The cooperative operates the warehouse receipt system under rules and regulations that members developed and approved. All members must sign on and abide by these rules. Membership embraces a range of value chain players, including producer groups, traders, grain processors, agribusinesses and banks. Together, they form a unique partnership that develops markets for Ghana's grains.

There are many rules governing the issuance of GGC warehouse receipts. The main requirements include: (i) the minimum volume to qualify for a warehouse receipt is approximately 50 bags (50 kg bag sizes); (ii) grains are to be stored in GGC certified warehouse for a maximum of five (5) months; and (iii) a GGC Warehouse Receipt shall not be issued for grains that require further drying or cleaning. These requirements essentially preclude individual smallholder farmers from participating unless they form groups.

Today many key actors are involved in the Ghana WRS. First, WRS do not link to the newly created Ghana Commodity Exchange. More than 120 actors are involved in Ghana WRS, including the largest aggregators, farmer-based organizations, warehouse operators, processors, input suppliers, insurance companies, banks and non-bank financial institutions. Smallholder farmers are not directly involved in WRS in Ghana.

## Tanzania

Tanzania has one of the most advanced warehouse receipt systems (WRS) in Africa. WRS system for coffee started in late 1990s. About 25%-30% of the country's export coffee crop passes through the system. WRS has also been used for cotton in northern Tanzania for many years. This helps farmers increase their output and obtain higher earnings.

A pilot project for microfinance-linked WRS system on grains was unsuccessful. This failure was mainly due to farmers' inability to predict price movements and government interventions such as export bans on maize. However, the system was successfully applied to paddy rice aggregation, where prices tend to be more predictable. The success of WRS for paddy rice attracted banks to provide financing for the crop. CRDB, the leading bank in paddy rice WRS financing, reports that it holds a Tsh 2.9 billion portfolio of Microfinance-linked loans, equivalent to about 10,000 tons of paddy rice.

Tanzania developed institutional arrangements in their commodity value chain to ensure efficient WRS operations. These operate at the village and the primary production levels. They interact seamlessly to ensure that both farmers and end-users benefit from the WRS. Village-level players are responsible for assembling commodities at the farm-gate. The primary level players are responsible for the aggregation of commodities and ensuring adherence to quality standards. The primary level and village level players formed Agricultural Marketing Cooperatives (AMCOs) to supply farmers with agricultural inputs and create markets for agricultural produce. These cooperatives also offer credit, insurance and transport services. For example, AMCOs in the cashew nut subsector obtain loans from banks and use them to aggregate raw cashew nuts for trading through an auction involving 30 exporters and processors.<sup>6</sup> It is estimated that AMCOs require \$ 85 million per season in inventory financing.

The leading financial institution involved in WRS in Tanzania is CRSB Bank, the country's largest private Bank. Other key players include AMCOs, who deal with production, processing, transportation, and marketing various crops in Tanzania.

### **Ethiopia**

Ethiopia uses the Warehouse Receipt System (WRS) largely for delivery and settlement on its commodity exchange and to finance export of cash crops. When goods are received at the warehouse, warehouse managers issue an electronic warehouse receipt. In theory, the receipt can then be traded on the exchange or used as pledge for bank loans. But the short expiry dates of the receipts (maximum 30 days in the case of coffee and 60 days for sesame and pea beans) do not encourage long-term storage. This policy limits the use of WRS receipts as collateral. IFC reported that in 2012, 42 borrowers used WRs for access to credit, with a total of 122 WRs issued and 114 disbursements made. The short certification term of the WRs in Ethiopia discourages long-term storage. This policy prevents farmers from delaying sales to earn higher prices.

Ethiopia Commodity Exchange (ECX) is the main outlet for sales of most of the commodities stored in Ethiopian WRS. The Ethiopian government established in 2008 the Ethiopian Commodity Exchange (ECX), to modernize the marketing and grading process of coffee all over the country. The main objectives of ECX are to address problems that affect the coffee sector in Ethiopia and by increasing producers' income, to reduce poverty.

Since October 2008 all coffee commercialized in Ethiopia passes through the ECX (replacing the earlier auction centres) and is graded using official standards. Growers, cooperatives or traders that decide to sell green coffee must deliver it at one of the 14 ECX warehouses located in growing regions.

### **Ivory Coast**

Neither public warehouses nor electronic warehouse receipts are present in Ivory Coast, where collateral managers are the main players in field warehousing operations by large trading companies engaged in exports. However, the Government, with support from the World Bank Group and private stakeholders, is developing a Warehouse Receipts System. The project intends to start with cashew nuts. The country's production of cashews is rising. It now reaches about 450,000 tons per year, making Ivory Coast the world's second-largest producer after India. The country seeks to increase local processing of raw material through aggregation and public warehousing, and to make these services accessible to farmers and cooperatives.

The IFC and industry stakeholders worked with the government to draft a Warehouse Receipts Bill, which will govern public warehousing. Banks, insurance companies, producers, cooperatives, processors, CMs, and Ministries of Trade, Industry and Finance have all reviewed the Bill and contributed to its drafting. After the WRS is in place, the country plans to move to establish a commodity exchange.

## Kenya

Two types of WRS are in use in Kenya- certified and uncertified. The East African Grain Council (EAGC) initiated the first pilot initiative for Certified WRS in 2008, while the National Cereals and Produce Board (NCPB) ran a second trial in 2010. In contrast, the uncertified WRS scheme pulls together many small-scale grain aggregation initiatives by development partners in rural areas.<sup>7</sup>

The East African Grain Council (EAGC) does the regulation and coordination of WRS in Kenya. According to KENFAP, EAGC does the following:

- Certify warehouses
- Provide WRS rules and protocols
- Enforce the rules and coordinate arbitration
- Print warehouse receipts and issue to specific warehouse
- Register all WRS issued
- Confirms WRS to banks before loans are issued
- Transfer ownership of WRS
- Confirm WRS to potential buyers
- Link potential buyers to WRs owners and categorize Warehouse Receipt
- Arrange for financing of Warehouse Receipt with banks especially Equity Bank and cooperative societies.

## Uganda

In Uganda, farmers are issued warehouse receipts upon delivering their crops to certified warehouses. The farmer can use the receipt to obtain bank loans. In Uganda, banks usually cap loans at between 60% and 70% of the value of warehouse receipts. However, this policy varies among banks. The Uganda Commodities Exchange (UCE) publishes the information in the warehouse receipt. UCE then publishes prices and available quantities of commodities in the newspapers weekly.

Until 2006 the UCE traded without a network of accredited warehouses. The verification of quality and quantity of commodities offered for sale was typically through on-site physical sampling by personnel of the exchange. This process was costly and unreliable. It led to non-performance of contracts, particularly by sellers, which undermined confidence in the UCE, leading to shallow trading volumes (only 11 contracts were traded between March 2002 and June 2004). The UCE was restructured with support from the EC to enhance its viability. As part of this process, the UCE developed a WRS for cotton and coffee under a project funded by the Common Fund for Commodities (CFC), which enabled the government to adopt warehouse legislation that recognised warehouse receipts as negotiable documents of title. Uganda also instituted regulatory oversight of the receipt system, and the Ministry of Trade delegated its enforcement to the UCE. Despite all these efforts and investments, the UCE failed to achieve operational viability and failed.

WRS is on the move in Mozambique, Malawi, and Madagascar, although the legislative framework and infrastructure are work in progress.

## Problems of Warehouse Receipt Financing

The mixed performance of WRS in Africa illustrated above exposes numerous problems. While the prices of agricultural commodities tend to be at their lowest at harvest, waiting to market commodities later in the marketing year require the farmer to absorb the costs to store the commodity. Moreover, storing an agricultural commodity rather than selling it at harvest exposes the farmer to risk arising from uncertain movements in prices across the seasons. Even though prices tend to rise during the marketing season, this does not guarantee that a farmer will benefit from access to storage. Storage benefits the farmer only when prices are high enough to cover the added costs of storage plus the implicit costs of the price risk borne by the farmer.

The benefits to farmers of using warehouse receipts as collateral for loans are also subject to limitations. Loans extended by lenders to farmers are subject to moral hazard in the form of possible strategic default by the farmer on loan repayment. The likelihood of default is greatest when the rise in commodity price is insufficient to cover storage costs plus interest on the loan. When default occurs, the lender is forced to take ownership of the stocks offered as collateral and liquidate them at relatively low prices, incurring additional transaction costs in the process.

The ability to default on a warehouse receipt-backed loan creates a real option that provides additional value to the farmer. However, lenders must bear the cost of default. Lenders address this problem by raising the interest rate on such loans and reducing the loan cap well below the value of the commodity stocks offered as collateral. Higher interest rates and lower loan amounts reduce the benefits of warehouse receipts to farmers.<sup>8</sup>

The costs of storing grain in a commercial warehouse and obtaining a warehouse receipt loan are significant. They can easily exceed the costs of storing grain on the farm. These costs include charges: for transporting the grain to the warehouse; for sampling, grading, cleaning, drying, and bagging the grain on delivery; for pest control, fumigation, utilities, and use of warehouse space while the grain is in the warehouse; and for collateral management, such as for security, insurance, and quality and moisture monitoring. Storing grain in a warehouse may avoid losses suffered by grain stored on the farm under less favourable conditions. The processing required to meet standards for the issue of a warehouse receipt will raise its overall quality. However, these costs will not be recovered unless the enhanced grain brings a premium in the market. In such a case, the smallholder would be better served by selling the grain at harvest or by storing it on the farm for sale when prices rise.

In Ghana, for example, the costs for warehouse receipt financing, including the costs of processing grain to meet regulatory standards for the issue of warehouse receipts, are reportedly as much as 30% of the value of the grain. This figure is far more than reported rates of loss from on-farm storage, which are generally less than 10%. Moreover, most smallholders sell their grain in regional markets. These markets do not confer a premium on higher standard grain, given that most is destined for livestock feed and consumption by households that do not value the higher quality. As such, smallholders are unable to recover the additional costs required to access warehouse receipt financing and thus shun the use of warehouse receipt financing, preferring instead to market their surplus at harvest or otherwise store it on the farm.

Table 1 portrays net revenues earned by a farmer under various marketing scenarios. The model assumes: 1) the Ghanaian smallholder produces a surplus of ten 100 kilogram bags of grain at harvest; 2) the market price at harvest in mid-November is GHC (Ghanaian Cedis) 80 per bag, and appreciates by 40% to GHC 112 per bag at the end of the five-month marketing season in mid-April. 3) Stocks stored on the farm suffer a 10% loss during the marketing season. 4) Stocks stored in a certified warehouse do not suffer post-harvest losses, but incur transaction costs of 24 GHC per bag (one-third on deposit, and two-thirds on withdrawal). 5) The lender is willing to offer a marketing season loan for 75% of the value of the grain stored in the warehouse, at 10% interest. We consider four marketing scenarios. Under Scenario 1, the smallholder sells his entire surplus at harvest, netting 800 GHC. Under Scenario 2, the smallholder stores his surplus on the farm at harvest, suffering a 1-bag loss over the marketing season, and sells in April at a higher market price, netting GHC 1,008, more than by selling at harvest. Under Scenario 3, the smallholder stores his surplus in the warehouse, takes out a warehouse receipt loan for GHC 600, and at the end of the season sells his grain at the higher April market price, repaying the loan with 10% interest. The smallholder incurs GHC 240 for warehouse storage, netting him GHC 820, more than he would have earned by selling at harvest, but less than storing on the farm. Scenario 4 is similar to Scenario 3, except we now assume that the smallholder can earn a 30% premium over the prevailing market price for grain stored in the warehouse; under this scenario, the smallholder nets GHC 1,156, more than under any other scenario.

*Table 1. Smallholder Net Revenues under Various Storage and Warehouse Receipt Financing Scenarios.*

	Scenario			
	1	2	3	4
<b>Marketing Revenue</b>				
Bags Sold in November	10	-	-	-
Bags Sold in April	-	9	10	10
Price at Sale (GHC/bag)	80	112	112	146
<b>Loan Expense</b>				
Loan Proceeds November (GHC)	-	-	600	600
Repayment in April (GHC)	-	-	(660)	(660)
<b>Transaction Costs</b>				
Incurred in November (GHC)	-	-	(80)	(80)
Incurred in April (GHC)	-	-	(160)	(160)
<b>Net Revenue (GHC)</b>	<b>800</b>	<b>1,008</b>	<b>820</b>	<b>1,156</b>

Source: Adapted from Miranda et al (2018)<sup>9</sup>

The expectation of rising prices over the marketing season is necessary for warehouse storage and receipt financing to benefit the smallholder. However, it is not sufficient. The model illustrates that prices must rise sufficiently to cover costs to store and maintain the commodity in the warehouse, including loan interest.

### **Way Forward and What Does this Mean for Investors?**

Warehouse receipt financing will benefit smallholders in Africa only through reducing the overall cost of warehouse receipt financing or increasing the price premium earned by the enhanced grain stored in the warehouse. A variety of approaches might increase demand for higher quality grain. First, the state could institute standards for grading and labelling of grain stored in a warehouse. This would ensure that its higher quality is recognized at the point of sale, particularly when sold in regional auction markets. Second, the state could promote expansion of the downstream high-value-added grain-processing sector, which would demand higher quality grain needed for efficient industrial processing and uniform quality output. Third, the state could promote increased exports of raw grain, which have to meet high international quality standards that would justify higher prices.

There is less scope for reducing the cost of warehouse receipt financing to smallholders. Electronic registration of warehouse receipts, modernization of warehouses, and improvements in commercial infrastructure might reduce costs to a small degree. Another path to reducing the costs of warehouse receipt financing for smallholders would be to institute a dual or graduated warehouse receipt system that allows the issue of warehouse receipts for grain that meets only the lower quality standards accepted by non-industrial users, livestock producers, and households. Under such a graduated warehouse receipt system, lower quality grain produced by smallholders could be used as collateral for limited financing. This approach would bypass costly processing steps needed to meet the higher standards demanded by processors and exporters, as currently required for issuance of a legal warehouse receipt.

In the long run, value chain players such as aggregators, farmer-based organizations, warehouse operators, processors, input suppliers, insurance companies and banks will find WRS participation beneficial. However, incentives in form of tax rebates, utilities, flexible contract allocation, expertise training and other forms of support are needed to entice private investment into building warehouse structures and management processes.

WRS are often seen as a first step before creating commodity exchanges. The rapid spread of WRS in Africa is a signal that African countries are considering creating commodity exchange to emulate the success of the Ethiopian Commodity exchange. Some of the notable commodity exchanges include;

Commodity Exchange (ACE) in Malawi established in 2004, Nigeria's exchange established in 2006, Zambian exchange (ZAMACE) established in 2007, and the recently created Ghana Commodity Exchange established in 2020. Investors should expect some disruptions of the agricultural value chains where commodity exchanges may wipe out middlemen, as was the case in Ethiopia (Nyarko and Pellegrina, 2020).<sup>10</sup> But the main investment opportunities will come from demand for large storage and warehouse, especially climate-controlled warehouses. As African countries homogenize their agricultural commodities by establishing and imposing standards, investment opportunities will be created in food storage (including hermetic bags), food transport infrastructures, and food processing equipment (drying machines and sorting machines).

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## References

- <sup>1</sup>[https://www.aphlis.net/en/page/20/data-tables#/datatables?year=20&tab=dry\\_weight\\_losses&metric=prc](https://www.aphlis.net/en/page/20/data-tables#/datatables?year=20&tab=dry_weight_losses&metric=prc)
- <sup>2</sup> International Fund for Agricultural Development. 2008. "Empowering Farmers in Tanzania through the Warehouse Receipt System." Brief, September, Rome, Italy.
- <sup>3</sup> Onumah, Gideon E. 2010. "Implementing Warehouse Receipt Systems in Africa: Potential and Challenges." Working paper presented at the Fourth African Agricultural Markets Program Policy Symposium, September 6-7, Lilongwe, Malawi.
- <sup>4</sup> U.S. Agency for International Development. 2013. "Improving Food Security with Warehouse Receipts." Brief, Washington, DC.
- <sup>5</sup> Weidemann Associates, Inc., 2000. "Warehouse Receipts: Financing Agricultural Producers." Technical Note No. 5, Washington, DC.
- <sup>6</sup> Warehouse receipt financing in agriculture in Africa <https://www.agrifinfacility.org/warehouse-receipt-financing-agriculture-africa>
- <sup>7</sup> KENFAP-Kenya October 2011 The role of Warehouse Receipt System and Financial Services in improving produce marketing by smallholder farmers in Kenya.
- <sup>8</sup> Miranda, M., F. Mulangu, and F. Kameze. 2019. "Warehouse Receipt Financing for Smallholders in Developing Countries: Challenges and limitations." *Agricultural Economics* 50 (5): 629–641. <https://doi.org/10.1111/agec.12514>
- <sup>9</sup> <http://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/132263/filename/132474.pdf>
- <sup>10</sup> <file:///C:/Users/mulangufm/OneDrive%20-%20Millennium%20Challenge%20Corporation/Nyarko%20and%20Pellegrina%202020.pdf>



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