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Digitalization of Last Mile Aggregation and Logistics Services to Enhance Market Access of Farm Produce Towards Reducing Post-Harvest Loss and Achieving Value Chain Improvement

Making a Case for Improved Income for Smallholder Farmers and Making Rural Economy Work for the Poor.

Policy Contribution Document

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Document Type:
This document highlights a critical gap in Nigeria's effort to drive high productivity in agriculture and improved income for smallholder farmers. Two key issues are discussed: the magnitude of the impact of post-harvest loss on the income of the smallholder farmers and how digital technology can help to address the gaps.

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Nigeria.

Areas:
Smallholder Agriculture, Post-Harvest Loss Assessment, Last Mile Aggregation, Storage, Transportation, Improving Farmers' Income; and Rural Economy.

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Development Financing
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Core Implementation Participants:
Agricultural Intervention Fund Providers
Farmer Aggregation Platforms
Offtaking and Processing Platforms
Logistics Service Providers

Implementation Partnerships:
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Summary

Despite the discussion around the need to produce 70 per cent more food by 2050, emerging field research and experience are revealing that it might just be only a half of this figure (35 per cent) that would be required if good progress is made in the reduction of post-harvest losses; a large fraction of which can be associated to the poor aggregation, storage and transport infrastructure - generally classified as poor logistical efficiency.

Sub-Saharan African agricultural produce loss is estimated at 100 Million metric tonnes per year. The value of post-harvest losses for grains alone is estimated to equal USD 4 Billion/year (at 2007 prices), which is equivalent to annual food requirements of about 48 million people and surpasses the annual value of grain imports into Africa and total food aid received in sub-Saharan Africa over the past decade1. These are profound numbers that require urgent attention.

At 0.13 against a recommended benchmark of 1.0, Nigeria is categorized as belonging to the category of Not-on-Track Countries on Post-Harvest Loss Reduction Indicators according to the 2017 Biennial Report to the African Union Assembly on implementing the Malabo Declaration. The regional scorecard identified lack of financing and inadequate investments in Post-Harvest Reduction activities as one of the key challenges. To put this in the right perspective, Nigeria's Agricultural Transformation Plans and Implementation may be incrementally ramping up agricultural production, however, it still lacks an intentional action plan for an innovative last mile post-harvest loss reduction.

By leveraging technology to enable real time situational awareness of harvest/yield, aggregation hubs and logistics service providers, an efficient and sustainable ecosystem of logistics will be created – where costs are affordable, and capacity optimally utilized. Such a system would generate real time data, such as produce availability, weight, location, and owner; then match those with logistics data such as, vehicle availability and capacity, warehouse location and size, while also facilitating linkages and usage of these assets for smallholder farmers, aggregators, off takers, processors and traders. Implementing a system as described above can result in up to 50% reduction in post-harvest loss and 45% improvement in revenues of smallholder farmers and other actors in agricultural value chains.

For example, a wholistic approach that creates aggregation hubs in rural farming communities across Nigeria, link them with transportation assets around them and generates data and insights for expected yields and location from farms in those communities, holds promise of increasing cost, time and utilization efficiency through precision and well targeted logistics. A combination of the aggregation hub data, transportation asset data and farm data can be used to improve end to end planning for produce logistics and off-takers' fulfillment, thereby helping to create a

structured, transparent and competitive pricing framework for all logistics actors from the farm to the mill. This will help to reduce prices of logistics services as the data provides visibility of ready market for logistics providers that encourages them to drop unit price as volume grows through market consistency-think of ride hailing solutions and their low pricing when compared to traditional taxis services. Providing a digital platform to view and access affordable logistics services required to convey farm produce to aggregation hubs and warehouse services for the storage of aggregated produce will unlock massive reduction in post-harvest losses.

Therefore, to achieve the much-desired food security and improved income for smallholder farmers, post-harvest loss reduction must be aggressively pursued within a broader context of digitization for the integration of value chain actors. However, in the face of inadequate capacity on the part of Government, the fragmented last mile distribution across various value chain and the unattractive private financing and investment landscape, the hope of solving the post-harvest loss challenge by using improved logistics interaction between farmers and other value chain actors lies in creating new models and using new tools to foster new partnerships that will provide innovative ways of creating and funding high impact solutions.

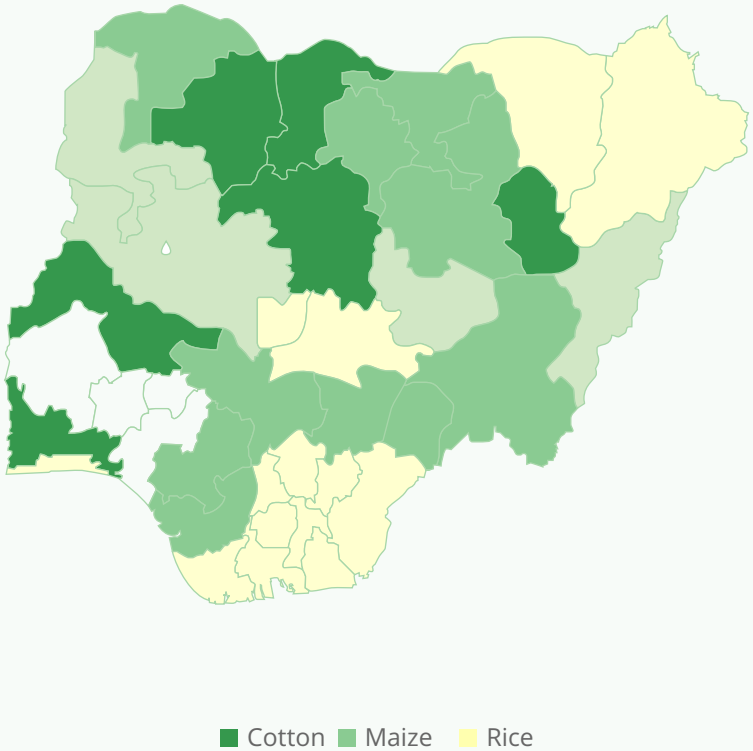
There is new thinking aimed at creating a digitized last mile value chain ecosystem to enable Last Mile Aggregation and Market Access that will reduce food losses, address logistical issues, and link Agribusinesses directly with smallholder farmers in win-win arrangements. It will also help to secure a sustainable supply of produce, while boosting rural incomes and economic growth; and encouraging private sector participation in financing improved agricultural logistics at the last mile.

By leveraging digital technology to enhance agricultural logistics, the last mile of the agricultural value chain in Nigeria is capable of reinventing access to market in ways that will link smallholder farmers to modern logistics assets and supply chain capabilities. This will result in minimization of post-harvest loss and opportunity creation for improved economic outcomes of small and large actors across the agricultural value chains.

As A Last Mile Partner to Smallholder Farmers, AgroMall is in a Position to Understand the Pain Points at the Last Mile.

By working with over 1 million farmers in rural communities across Nigeria's 36 States; we use technology to implement digital farmer and farm registration and data capture. We partner with financial service providers and other value chain actors to facilitate agricultural financing and rural financial inclusion, digitizing input distribution mechanism and production support through agronomy and extension that enables our provision of yield prediction, harvest validation, produce aggregation and logistics facilitation. Overall, we have come to the realization that the scenes and experiences in rural farming communities in Nigeria are quite similar. Smallholder farmers are confronted with lack of physical and economic access to competitive markets for their produce. With such problems ranging from long distance to travel on poor road network and relying on bicycles or motorbikes due to physical isolation from markets, to the need for immediate payment for produce, lack of facilities to safely store yields, and overall poor knowledge of logistics services beyond the farm gate are fundamental limitations to dealing with post-harvest losses and maximizing income from yields2.

Country Spread Of Agromall's Produce Aggregation and Logistics Activities



Source: AgroMall Field Data

In field surveys analyzing the production, processing and trading of rice in Kogi and Niger States: two States that typify Nigeria and therefore offer good representation of the entire country, the results show an estimated post-harvest loss of 24.9 per cent; resulting in a substantial loss of revenue for smallholder farmers, including resources used in production (land, water, energy, seed and fertilizer) and consequential environmental impacts3.

Table 1: Quantification of post-harvest loss of paddy and milled rice for Nigeria (farmers and millers)

Post-Harvest Loss Farmers/Millers/Marketers	Mean in %	Annual Production in Tonnes	Quantity Lost in Tonnes	Price per tonne (NGN)	Value of losses (NGN)
Damaged rice panicles during harvest	4.35	4,830,000	210,000	40,000	34 Billion (EUR 159 Million)
Threshing and winnowing of paddy	4.98	4,620,000	230,000		
Transportation of paddy from farm to home	0.23	4,390,000	10,000		
Drying of paddy	0.23	4,380,000	10,000		
Storage of dried paddy	1.37	4,370,000	60,000		
Transportation of dried paddy to the market	0.23	4,310,000	10,000		
Damaged during parboiling	1.16	4,300,000	50,000		
Parboiled paddy while drying	3.53	4,250,000	150,000		
Parboiled paddy during storage	0.49	4,100,000	20,000		
Transport of parboiled rice to processing	2.45	4,080,000	100,000		
Sub-Total	17.6	4,830,000	850,000		
Transport of milled rice from processing to home	0.36	2,786,000*	10,000	113,420	6.8 billion (EUR 31.8 Million)
Milled rice during storage	1.08	2,776,000	30,000		
Transportation of milled rice to market	0.73	2,746,000	20,000		
Sub-Total	2.2	2,786,000	60,000		
Transport from market to shop	2.20	2,726,000	60,000	113,420	15.9 billion (EUR 74.2 Mio)
In storage	3.00	2,666,000	80,000		
Sub-Total	5.1	2,726,000	140,000		
Total	**24.9**	**4,830,000** (paddy at begin of value chain) 2,580,000 (milled rice at shop)			**56.7 billion** (EUR 265 Million)

The estimates above indicate that a total of 600,000 tonnes of milled rice worth NGN 216 billion (using current market price of NGN320,00 per ton) would be lost during transportation and storage before the rice got into the hands of marketers (wholesalers and retailers). In addition, 850,000 tonnes of paddy valued at NGN 119 billion (using current market price of NGN 140,000) would have been lost by the time processing of paddy into milled rice was completed. This adds up to a net loss of NGN 335 billion.

It is therefore clear that the critical path to achieving food security and improving the income of smallholder farmers in Nigeria is beyond increasing production, and that much of this path lies in improving capability and capacity of Nigeria's last mile agricultural logistics, which will also result in a reduction of the costs of waste management and production of greenhouse gases (GHG).

The path to agricultural self-reliance also lies in utilizing digital technology to generate data and create produce and service virtualization for awareness of critical farm produce elements (availability, weight, location, and owner), as well as required logistics services (a combination and integration of type, capacity, location and owner of vehicle; and type, capacity, capability and location of warehouse). Digitization will improve visibility, transparency, accessibility and efficiency of existing logistics assets and their pricing; and encourage private sector investment in new ones.

Given a post-harvest loss rates of up to 60% for perishable crops4, Nigeria will not exploit its homegrown food security potential and food export opportunity by focusing solely on activities that support increasing production without adequate attention to reducing food losses at the last mile, relying on optimal yields alone does not provide for market wholesomeness and availability.

The consensus based on AgroMall's experience, field research and peer review of variants of models is that integrating farm production with aggregation points and logistics services, all enhanced by digitization and use of data will support improvement in logistics delivery that will result in minimal food loss from farm gate to the processing centers and up to the market. It will also deliver multiplier benefit of reduced logistics cost and improved financing of smallholder agriculture through access to credit.

Table 2: Select Agricultural Transformation Agenda (ATA)'s Challenges (2011 – 2015) and Production Gaps by Value Chain Stage.

Areas	Illustrative Shortcomings
Input Supply	Sharp rise in indebtedness to banks. The system has many leakages from farmer registration and data capture to supply and distribution mechanism Insufficient access to improved variety
Financing	Credit access particularly for small holders remains weak Backlog of unpaid input loans (estimated at N39B) Of ~$8 billion in domestic and foreign investor commitments often cited, only limited volumes moved from idea to reality
Infrastructure and Logistics	Investment inflows into infrastructure and midstream logistics e.g. warehouses, storage, processing systems remains rudimentary Staple crop processing zone (SCPZ) strategy has not yielded results. For example, Kogi SCPZ has not taken off due to withdrawal of Cargill-the anchor investor, from the project
Production	Growth in food production remains limited due to gaps in input supplies e.g. rice; hence rice imports still exceed $1 billion/annum.
Market Access	Post-harvest losses still an issue

Source: Federal Ministry of Agriculture and Rural Development, Nigeria.

From Table 2, the post-harvest handling of agricultural produce is captured as a critical component of value chain development, and still considered a catalyst for "progressive and sustainable expansion of agribusiness at the last mile, through investment in logistics and agro-processing activities, to achieve waste minimization that will result in improved import substitution, food security, wealth creation, employment generation, and improved human development index.

Case Review: Produce Aggregation under the Anchor Borrowers Programme – A good starting point, but riddled with deficiencies (How poor logistics hinders repayment of smallholder agricultural credit)

The Anchor Borrowers Programme (ABP), an intervention fund of the Federal Government of Nigeria, through the Central Bank of Nigeria (CBN) has, with limited success attempted to solve the problem of post-harvest losses, which has contributed to the high default rate in loan repayment by smallholder farmers. The aggregation approach being implemented under ABP involves creating Aggregation Points and Storage Centres in designated Local Government Areas of each State. It requires smallholder farmers under the Commodity Associations/Cooperatives to bring in their yields to such designated Aggregation Points. This aims to cluster aggregate yields from smallholder farmers who benefited from the intervention fund at a central location, after which the farmers are paid on successful reconciliation.

Table 3: Select Produce Aggregation Points and Produce Gaps based on States under the Anchor Borrowers Programme (ABP).

State	LGA	Warehouse	Aggregated Qty (MT)	Expected Qty (MT)
Bauchi	Toro	Toro Warehouse	2.73	1,480
	Zaki	Zaki Warehouse	32.72	
	Gamawa	Gamawa Warehouse	0.86	
	Tafawa Belewa	Tafawa Belewa Warehouse	4.43	
	Darazo	Darazo	0.57	
	Kirfi	Kirfi	1.61	
	Ganjuwa	Ganjuwa	2.87	
	Bauchi	Bauchi	0.89	
	Bauchi Actual Aggregated Qty (MT)		**46.57**	
Gombe	Gombe	Gombe	3.66	8,326
	Yamaltu/Deba	Yamaltu/Deba	0.26	
	Akko	Akko	5.75	
	Kwami	Kwami	2.30	
	Balanga	Balanga	0.41	
	Chikanda	Chikanda	1.67	
	Kaltungo	Kaltungo	0.16	
	Gombe Actual Aggregated Qty (MT)		**14.21**	
Kastina	Malumfashi	Malumfashi Warehouse	8.58	3,876
	Musawa	Musawa Warehouse	14.04	
	Funtua	Funtua Warehouse	9.87	
	Bakori	Bakori Warehouse	8.38	
	Kafur	Kafur Warehouse	11.92	
	Dutsinma	Dutsinma Warehouse	10.62	
	Katsina Actual Aggregated Qty (MT)		**63.41**	

State	LGA	Warehouse	Aggregated Qty (MT)	Expected Qty (MT)
Kano	Nassarawa	Nassarawa Warehouse	42.36	53,252
	Wudil	Wudil Warehouse	16.38	
	Gwarzo	Gwarzo Warehouse	79.24	
	Kano Actual Aggregated Qty (MT)		**137.78**	
Kwara	Baruten	Gure Warehouse	79.87	1.368
		Karongi Warehouse	89.96	
	Kwara Actual Aggregated Qty (MT)		**169.83**	
Kano	Tambuwal	Sanyinna Warehouse	3.30	49.56
	Gwadabawa	Gigani Warehouse	5.56	
	Isa	Ganjuwa Warehouse	1.28	
		NACOTAN Warehouse	0.80	
	Sokoto Actual Aggregated Qty (MT)		**10.93**	

In Table 3, there are huge disparities between yield expected and actual yield turned-in at the Aggregation Centres by the smallholder farmers. This is attributed to the following challenges:

1. Most rural communities lack the infrastructure and logistics services needed for the conveyance of their yield to the Aggregation Points. With AgroMall's understanding of the rural communities and working with the smallholder farmers, the high cost of logistics services and fragmented distribution of aggregation and storage centres, sometimes hundreds of kilometers from the heart of rural communities are critical reasons for the gap between aggregated quantities and expected quantities based on yield prediction.

2. In places where the logistics services are available, farmers are not able to afford the services particularly due to fragmented delivery and unstructured pricing, especially where payment for delivery are demanded upfront even before reconciliation at the aggregation points.

3. As each farmer is responsible for bringing in their yields to the designated Aggregation Points, farmers are unable to benefit from possible efficiency of pooling resources for their logistics requirement.

4. Due to past experiences, the farmers do not trust that payments for their produce would be made after submission and reconciliation. This is because the farmers do not trust that the system is efficient and effective enough to offtake their produce and effect payment afterwards. The fact is that the farmers could have received their payment at the point of aggregation if only the entire value chain is digitally integrated to drive online-real time of reconciliation of all activities.

The above analysis of the identified challenges listed above, is indicative of why there is high default rate in repayment amongst smallholder farmers-especially with repayment still sitting within 15% and 20% for the over 1 million farmers supported thus far by the Anchor Borrowers Programme.

Our Approach Shortens Distance and Pools Requests to Reduce Cost and Price

To sustainably reduce post-harvest loss towards improving food supply, farmer incomes and the rural economy; deliberate efforts must be applied to digitize aggregation for improved utilization and efficiency of existing logistics assets and encouragement of new investment in logistics.

AgroMall has tested innovative ways of applying data collected on farm and farmer profiles and their production to support primary and secondary logistics in rural areas across 23 states in Nigeria and 5 value chains. AgroMall is creating a digitally enhanced and integrated transportation and warehouse logistics platform; which improves visibility and efficiently allocates logistics assets, while also structuring pricing in such a way that farmers, transporters and warehouse owners can have transparent and fair deals. AgroMall's offering provides support for collection and last mile transportation of agricultural produce through well-coordinated logistics planning and implementation. Our proprietary technology has been applied to enhanced asset discovery and resource allocation, with considerations for the appropriate conditions for moving and storing produce, with a view to guaranteeing quality and improving farmers economic outcomes. AgroMall's logistics outlook is essential for the preservation of produce quality and optimization of farmers income through market acceptance, competitive market pricing and optimization of logistics cost.

Ours is a new thinking for improved smallholder farmer situation through post-harvest loss reduction, it is a sustainable solution based on market system, capable of crowding in private investments into the rural economy to deepen overall logistics and infrastructure footprint, creating options for farmers and other value chain actors.

Table 4: Analysis of Capabilities and Features of AgroMall Digital Logistics Application (ADLA)

AgroMall Logistics Digital Application					
State	**Key Features**				
Onboarding	**Farmer Registration:** • Know Your Customer details • Location • Farm size • Crop type • Yield	**Know-Your-Vehicle and Know-Your-Warehouse Information:** • Driver Registration • Fleet /Vehicle Registration • Warehouse Manager KYC	**Approved Insurers:** • Insurance Company Registration • Partnering Insurance Company (ies) • Products and prices	Input Supplier Registration	Ancillary services provider registration
Service Fee & Revenue Configuration Service RequestReal-Time Trip Monitoring	**Base Charge:** minimum fee that would be charged for using the service	**Logistics Charge:** haulage cost of moving the goods and warehouse cost per square meters including tariffs and taxes based on weight, distance, time of the day and prevailing conditions	Insurance fee: insurance premium while the goods are in the warehouse and in transit	Add-on services: • loading and unloading • security escort services	
Service Request	Pickup request	Add-on services	Pickup share request	Rating and feed back	Help menu
Real-Time Trip Monitoring	Delivery in transit	Real time inventory management and location tracking of the driver/vehicle	Manifest/ Bill of Lading	Real-time monitoring of produce in the warehouse and in-transit	Vehicle tracking for fleet management
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Payment Integration	Bank cards	Bank transfers	E-wallet		

Source: AgroMall analysis

The AgroMall approach delivers two critical benefits to smallholder farmers. First, as much as 25% savings in their logistics cost driven by structured and transparent pricing using volume, weight and distance as parameters for computation, and secondly, the smallholder farmers stand to enjoy the price premium associated with market speculation by holding their produce for longer periods in warehouses as their produce can be stored under safe and good conditions. In this case, the smallholder farmers can receive both payment for the market value of their produce but also benefit from the arbitrage opportunities in the market.

The Unit Economics of our Approach and Resultant Cost and Price Efficiency.

AgroMall's approach would deliver an efficient and sustainable ecosystem of integrated logistics – where costs are affordable based on generated economies of scale and optimal capacity utilization. These can create strong links to the rest of the rural economy through multiplier effects of economic activities at AgroMall's evolving 2,322 aggregation hubs and 774 central warehouses. Use of digital financial services for payment of logistics services – transportation by 6,966 vehicles and storage facilities will also add to the multiplier benefits that will help reduce prices as logistics assets are but to more efficient use.

Table 5: Analysis of Transportation Cost: Current farmer spend on logistics vs. AgroMall targets

State	Pick Up Location	Delivery Location	Distance (Km)	Current Cost/Bag (NGN)	AgroMall Target Cost /Bag (NGN)	Current Daily Warehouse Cost/Bag (NGN)	Target Daily Warehouse Cost/Bag (NGN)
Katsina	Kafur	Malumfashi	23	200	150	34	25.5
	Malumfashi	Funtua	50	275	206	36	27
Bauchi	Gaji Village	Alkaleri	160	250	188	29	21.75
Ondo	Itapaji	Ikole Ekiti	23	200	150	74	55.5
Niger	Kpenya	Babanna	69	460	345	53	39.75
	Gbenji	Babanna	57	580	435	53	39.75
	Edozighi, Gbako	Farm Centre Bida	30	150	113	78	58.5
Kwara	Karongi	Gure	35	500	375	65	48.75
Gombe	Lawanti	Kumo	50	500	375	53	39.75
Taraba	Bali	Jalingo	148	300	225	53	39.75
	Wukari	Jalingo	254	500	375	33	24.75
	Mutum Biyu	Jalingo	78	200	150	48	36
Adamawa	Numan	Yola	70	100	75	37	27.75
	Mayo Belwa	Yola	62	175	131	41	30.75
Abuja	Dobi Farms Settlement	Maitama food Market	77	300	225	122	91.5
Kano	Gwarzo	Dawano Market	71	300	225	66	49.5
Kaduna	Kakangi	Giwa Market	110	200	150	62	46.5
	Kaya	Giwa Market	22	100	75	68	51

Source: AgroMall Field Research

The table above shows cost of transportation a bag of grain from rural farm settlements to food markets , and daily warehousing cost per bag across 11 States in Nigeria. The shortest distance between two points indicates 22km (Kaya Farm Community in Kaduna State to Giwa Food Market in Kaduna State). The long distance between farm communities and the food markets, and the cost of storage facilities when compared to the income of the smallholder farmers typifies the struggles of an average smallholder farmer in Nigeria, who cannot afford to pay for warehousing costs and travels such a long distance with associated cost of transportation in order to have access to the market for the produce.

In contrast, our approach will deliver an average of 25% price reduction on the current market prices of warehousing/storage and transportation by using farm data to locate aggregation hubs in close proximity of the farms-thereby enable the warehouses to operate in full capacity, and reduce farmgate distance to aggregation hubs and cost of transportation and pooling requests for vehicles. This will decrease unit price as volume grows because assets are used more efficiently, and achieved by digitizing the interacting components of the logistics areas of the value chain.

Digitization also provides the needed virtualization of both farmers and logistics service providers, which addresses the challenge imposed by the dispersed distribution of farmers, and then make it possible to consolidate load to meet the minimum volume requirement for warehouses, truckload or vanload (by connecting different farmers that ordinarily would not be visible to the logistics service provider). This helps farmers pay for only what they use, a departure from the current situation where farmers pay for full capacity, even when they don't use it. This arrangement also creates substantial economies of scale from higher volume of operations to achieve reduced unit costs.

A Route to Market that Integrates all Interacting Components and Driven by Data

Expanding Logistics to Processing: Using Modular and Mobile Processing Capability

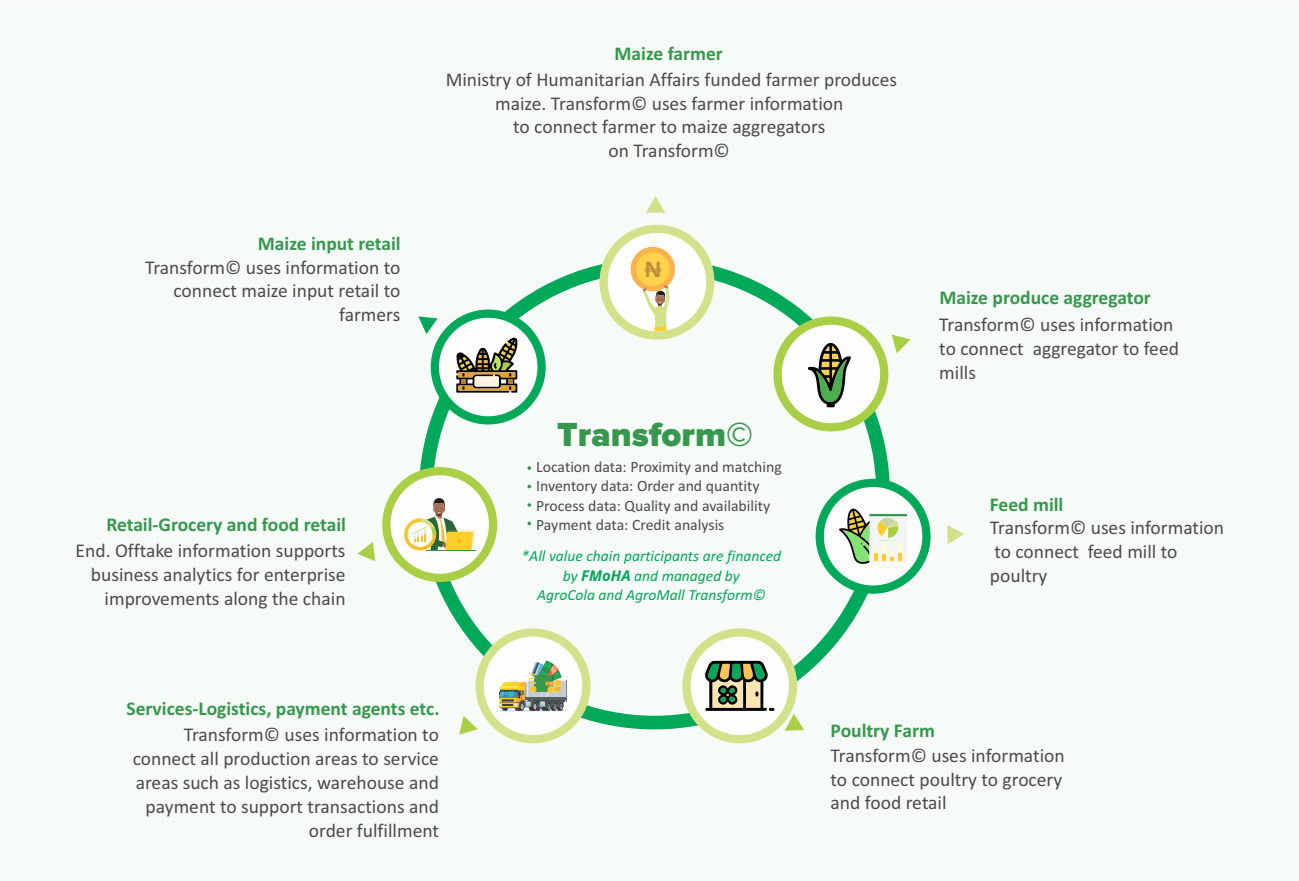
All primary agricultural production should ideally end in processing and consumption – the gold standard is a situation where post-harvest loss is below 5% of primary production – South Africa, Botswana and Namibia have all made progressive strides in this direction. To support this outcome, agricultural logistics ordinarily should move produce from farm to processing and in some instances hold produce in good conditions before moving to processing. Where this process is inadequately structured, planned and resourced, there will be a high incidence of post-harvest loss-most of which is attributable to inadequate farm to mill logistics.

Addressing this situation requires that value chain actors think differently, and in doing so, one of the questions to be asked is: what if processing capacity can be made mobile and modular like transportation logistics, and moved to the farm when required-therefore expanding the scope of logistics and delivering just-in-time and just-where-required precision processing solutions. Modular and mobile processing holds the promise of increasing the efficiency of produce to product transformation in agriculture. There is a potential for huge gains in accessibility, time and cost efficiency and a combination of these will reduce post-harvest loss and better economic outcomes for farmers-especially in perishable value chains like cassava and fruits, where there is need to stabilize decomposition of produce immediately after harvest. Layering digital technology on mobile and modular processing for the use of data for visibility of farm production and matching them with mobile processing capacity and other downstream logistics assets will support further efficiency gains, better sector data, and overall value chain improvement.

Linkage with Other AgroMall Service Areas for Wholistic Benefits

AgroMall's logistics support starts early in the farmers production cycle. With its farm and farmer management offering, at the beginning of a cropping cycle, AgroMall collects data on elements such as farm size, farm location, crop type, input and farmer identity. AgroMall's production support offering delivers agronomy, extension, yield prediction, harvest support and aggregation services to farmers. The farmer, location and yield data available to us affords us to plan for logistics requirement of farmers and deploy resources accordingly, even before they are needed. It removes urgency that usually results in price increase and adds requirement aggregation and pooling, which comes with efficiency gains and price reduction. With its Transform capability, AgroMall is able to extend this integrated offering to other actors in the value chain beyond farmers and logistics providers; by linking actors at various levels such as credit providers, input suppliers, food and grocery retailers, thereby further deepening its impact towards reduction in post-harvest loss and value chain efficiency.

Figure 1: AgroMall's Transform capability uses activity data to support interaction between value chain actors



An Opportunity to Deepen Credit to Farmers and Improve Engagement Terms with Off takers

In collaboration with Mercy Corp's AgriFin, AgroMall has developed credit frameworks that apply a combination of data on agronomy practices, yield and logistics activity (transportation usage and warehouse inventory) to create a credit scoring model that will support farmers to access credit. This credit is designed mainly to fund their consumption and production activities, while they hold off pressure to sell their produce at low prices during period of glut that immediately follows harvest. Dubbed "The Transform Score"-as it holds the potential to transform the smallholder farmers' economic outlook, it takes into consideration both qualitative and quantitative elements of the farmers production to create risk models that will help lenders determine how much to lend and at what rates. It supports departure from the one-size-fits all approach of credit, and rewards farmers with good practices and reliable supply with accessible credit at low cost. Furthermore, the Transform Score will help put farmers into categories depending on the quantity and quality of their yield, this will help put a premium on good farmers and support them in engaging with off takers on better terms-also, creates a reward system that encourages good agricultural practice and diligence beyond market price and yield.

A Role for Agricultural Development Efforts

Being saddled with development finance initiatives; the formulation and implementation of various policies; innovation of appropriate products and creation of enabling environment for financial institutions to deliver services in an effective, efficient and sustainable manner to the agricultural sector; rural development and micro; small and medium enterprises.

Development efforts can adopt and mainstream this logistics delivery model for implementation in delivery models. It will provide the required end-to-end situational awareness and virtualization of intervention programmes. It will also aid the implementation of payment of farmers at the aggregation centres, and reinforce their faith and confidence in such programme; serve as the repository of participant and activity data which can form part of the key component of credit scoring for smallholder farmers.

Beyond developmental interventions, the adoption of this model will also catalyze the adoption of this model of rural agricultural logistics for wider adoption and mainstreaming in Nigeria.

Conclusion

Smallholder farmers around rural communities in Nigeria remain dispersed and disaggregated and face poor marketing linkages. While the nation's strategy to meet increasing food demand has mainly been directed towards increasing food production, our field research and experience working closely with smallholder farmers across rural communities in Nigeria have shown that scaling up post-harvest losses interventions through the market systems remain an important pathway to increase food supply and alleviate poverty. Developing a reliable supply chain, which relies on private sector actors to provide logistics infrastructure and services to smallholder farmers using technology remains the needed game-changer. More fundamental is the affordability of the solution, by offering up to 25% cost reduction in logistics costs and the opportunity it offers to smallholder farmers to maximize the benefits of market speculation becomes a sustainable path to improving their incomes and livelihoods. With this, smallholder farmers can transform the rural landscape and unleash a new and sustainable agricultural revolution

Attributions:

1. African Union Commission
2. Federal Ministry of Agriculture and Rural Development, Nigeria
3. AgroMall Field Research and Analysis
4. Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)
5. Food and Agricultural Organization (FAO)
6. The Nigeria Agriculture Promotion Policy (2016 – 2020)
7. World Food Programme
8. AgroMall research
9. The Competitive African Rice Initiative (CARI) project

Table 1 presents the estimates of the quantities and values of post-harvest loss incurred by rice farmers and millers in Nigeria-the annual production of 4.83 million tonnes of paddy for the year 2012 was used as a basis for extrapolation. By adopting current market price (NGN 140,000 per tonne of paddy and NGN 360,000 per ton of milled rice), and available milled rice estimate of 2.78 million tonnes based on 4.08 million tonnes of paddy transported to the processing centres;

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