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# Grain Storage and Marketplace Characteristics in Kebbi State, Nigeria

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## ABSTRACT

While there are many aspects to agricultural market modernization that are linked and mutually affect and reinforce each other, we argue in this paper that investment in Nigeria in physical market infrastructure, such as storage units, remains relatively neglected, especially in rural areas. That this is the case undermines successful agricultural development in the country. We examine the transactions cost, spatial market equilibrium, and industrial policy literatures to provide a conceptual context for understanding how and why investments in physical market infrastructure can lower transactions costs for traders and for farmers, and, thus, increase market participation.

We also implemented a marketplace characteristics survey in Kebbi state, an agriculture-based state in northwestern Nigeria, to determine whether further investments in marketplace infrastructure are needed. We found that some markets, especially those in rural areas, lacked storage units and communications technologies. Hence, traders and farmers in those markets operate in a challenging environment. We argue that investments such as these are likely to be more successful in the long-run and have more immediate effects on local agricultural development than would national initiatives. Local governments have better knowledge of local conditions and can better design initial investments to strengthen markets and then implement follow-on initiatives required to meet needs that arise as market conditions evolve.

**Keywords:** grain markets, market participation, infrastructure, local government, Kebbi state, Nigeria

## 1. INTRODUCTION

In its World Development Report 2008, the World Bank argued that development of the agricultural sector has led to greater economic development, higher incomes, and improved food security, nutrition, and health in many countries (World Bank 2007). In making its argument, the World Bank provided a thorough description of the experiences of sets of developing countries globally over the past half-century. A point that stands out in these descriptions is that sub-Saharan African (SSA) countries have lagged other developing country groups, e.g., those in South Asia and Latin America, and that their lack of growth regarding the use of improved technologies and inputs and farm management best practices have persisted over an extended period (World Bank 2007).

The results of these trends are that in many parts of SSA, the current state of agricultural development is far from its potential. Other empirical studies describe similar conditions of a general tendency for SSA countries to have many subsistence farmers and relatively few profitable surplus-producing farms and agribusinesses. Barrett (2008), for example, describes how most farm households in Eastern and Southern Africa who grow certain crops do not participate in the markets for those crops. The reasons suggested to account for this lack of market participation, which is both a cause and a symptom of low agricultural development, include factors such as a general lack of household assets and wealth, inadequate community and regional infrastructure, and not having the necessary incentives in place to make market participation profitable. If just one of those elements is missing, then farmers are unlikely to participate in markets.

These stylized facts for what accounts for current conditions of low agricultural development for the continent broadly apply to our focus country, Nigeria, and most especially its rural areas. However, there has been a notable shift in policymaker attention over the past decade whereby now greater emphasis is placed on the potential for the agricultural sector to generate broad economic growth in Nigeria. For instance, the Agricultural Transformation Agenda (ATA) outlined by the Federal Ministry of Agriculture and Rural Development (FMARD) in 2011, and its successor policy document, the Agriculture Promotion Policy (APP) of 2016, both have emphasized the need and potential for agriculture to make up a greater share of the production of the Nigerian economy and to become an increasingly important source of foreign exchange in the future (FMARD 2016).

While these are noble goals, agricultural development cannot be achieved through national scale initiatives alone. The experience of the potato value chain development in Anding county, China, described by Zhang and Hu (2011), shows that local government investments are plausibly more effective than national level initiatives in developing specific industries and supply chains, since national initiatives commonly do not fit well in larger countries with varying climates and production patterns, such as Nigeria, and because local governments have greater expertise on the conditions in their regions. This is particularly important for the ability to both successfully implement programs, but also to design and execute follow-on projects that become necessary as the economy evolves over time.

In this paper, we focus on determining and describing a potential key role for state and local governments and their partners in the agricultural development process in Nigeria that can plausibly have near-immediate positive impacts. Specifically, we propose that greater attention and resources are needed to be placed on investment in the physical infrastructure of marketplaces, especially those structures related to storage and marketing. Having such infrastructure in place will reduce transactions costs and, thus, allow for greater on-farm and business investments. We chose an agricultural-based state, Kebbi, in far northwestern Nigeria for our analysis because it has only one primary growing season annually, and, therefore, allows for the close examination of the storage and marketing decisions of traders and farmers over time. For this study, we implemented a marketplace characteristics survey in the state. The survey

results show that there is significant opportunity for local governments to invest in local market infrastructure to greatly improve the general business environment. Since these markets are attended by almost all residents in the surrounding areas, the benefits from such investments would be widely shared.

## 2. REVIEW OF LITERATURE: MARKET SYSTEM DESIGN, TRANSACTIONS COSTS, AND GOVERNMENT INDUSTRIAL POLICY

Previous theoretical studies on market design and transactions costs and empirical studies on market participation and government industrial policy are described in this section to provide insights into how the market environment and the behavior of market actors is theoretically and observationally important for explaining market outcomes, such as price levels and trends. This background will provide the conceptual context in which to frame our issue of focus, which is to describe in detail the quality of agricultural marketplaces in Kebbi state, Nigeria, with the goal of prescribing interventions that can improve marketing conditions and increase local market participation.

### 2.1. Marketplaces, markets, and market structure

Roth (2018) examines market formation and factors that can cause changes in market behavior after their inception and provides some definitions useful for this Kebbi study. He describes *marketplaces* as the actual physical infrastructure, institutional frameworks, and social customs that provide the environment in which information is shared and trade occurs. If the physical infrastructure, rules, and customs are not in place or are not functioning at their optimal level, then information transmission and trade in goods are inhibited. Such a situation is more generally known as a *marketplace failure*.

These definitions are similar to those of Shaffer et al. (1983), who describe a *market system* as an entity within which there is trade of inputs and outputs, and institutional structures that facilitate both the production of these inputs and outputs and their distribution to the intended actors. They also characterize traditional agricultural markets in developing countries as having generally low trade volumes and infrequent transactions and being supported by poorly developed transportation infrastructure and communication networks. In such systems, the average food retailer is small and highly specialized, which results in higher transactions costs than would be the case if retailers were larger and more diversified. Thus, developing country agricultural market systems are generally characterized by high transactions costs and low efficiency.

The structure-conduct-performance (SCP) paradigm in the industrial organization literature provides more detail as to how the elements of a market system are related and how actions by agents who are part of the market system lead to certain outcomes that are observable over time, e.g., prices and wages. Shaffer (1980) describes the SCP paradigm as being composed of three types of variables with regards to market systems. Market structure concerns the number and sizes of firms in the market and barriers to entry. Market conduct relates to pricing strategies and advertising activities of individual firms. Market performance involves measurements of allocative and technical efficiency and equity within the market. In their critique of the SCP paradigm, Sheldon and Sperling (2003) assert that market structure and market performance determine each other, and, hence, are endogenous. They also provide some specific examples in international food markets of situations in which the market structure, in their case the degree of industry concentration, is associated with certain market outcomes, such as the extent of market power as observed in price and cost spreads. In empirical examinations of industrial organization, the level of profits obtained by firms in markets with few, large firms are argued to be measures of their market power. The association of marketing margins with market power is seen especially to be applicable to agricultural commodities, since they are generally homogeneous products that would otherwise not obtain a price premium (Sheldon and Sperling 2003).

## 2.2. Transactions costs and market participation

These definitions and characterizations of traditional agricultural markets and this general description of the SCP paradigm provide the background needed to contextualize grain markets in rural Nigeria. General expectations based on these theoretical and empirical observations is that rural grain markets in Kebbi state likely have some marketplace failures and associated high transactions costs, all of which reduce the extent of information transmission, discourage trade, and reduce market efficiency. Since transactions cost data are typically prohibitively costly to gather (Delgado 1986), we continue to rely on insights in the theoretical literature and empirical studies that describe the conditions associated with implementing transactions in SSA food markets.

The transactions costs literature, as described in Williamson (1981), emphasizes that the actual exchange of a good or service can be the unit of analysis. A transaction occurs when any good or service is transmitted from one actor to another within an environment in which the physical and infrastructural environment is agreed to mutually. Within food systems, there are transactions between entities within vertical supply chains, such that goods and services move from producer to wholesaler to processor to retailer, and horizontal supply chains as goods and services move across space, for example, from retailer to retailer. There are costs to implementing transactions at each of the junctures within both the vertical and horizontal supply chains, and the extent of these costs are related to the physical and institutional environment of the market being analyzed.

Transactions costs do not stay constant over time since the environment and behavior of actors in the markets evolve. This implies that market outcomes, e.g., prices, also commonly fluctuate as well. In the context of SSA food markets, Stephens and Barrett (2011) found evidence that farmers and traders implemented transactions in agricultural markets at certain times to obtain cash to meet other household needs that were transacted in other markets, e.g., those for health care and education. Since such needs are exogenous to agricultural commodity markets and rural commodity markets are generally thinly traded, these intermittent trade activities can have substantial effects on prices. The uncertainty regarding both transactions costs and commodity prices increases the complexity of agricultural commodity marketing choices by traders and farmers. This uncertainty and the adjustments in demand for agricultural commodities over time provides incentives for commodity storage. Indeed, storage allows for carryover of production from the previous period for use in the current one (Wright and Williams 1982). It follows, then, that improved storage infrastructure would help improve market efficiency by providing market participants with increased opportunities to implement transactions at the lowest cost.

The association of high (low) transactions costs with poor (good) storage infrastructure is consistent with empirical observations in SSA food markets. Shaffer et al. (1983) and Jayne (1994) observed that most storage and processing facilities are concentrated in urban areas, due to the existence of other infrastructural development, e.g., roads and electricity, needed for operation. This concentration of infrastructural development in urban areas means that it is costlier to implement trade between urban and rural areas than between urban areas. Additionally, these differences in infrastructural development can influence market structure, such that natural monopolies can emerge as firms join together to accommodate these high trade facilitation costs (Barrett 1996).

The stylized facts of high transactions costs in SSA food markets help explain some of the differences in food market behavior there relative to other parts of the developing world. Poor transportation infrastructure throughout SSA and associated higher marketing risk were cited by Delgado (1995) as key differentiating factors between SSA food markets and those elsewhere. The relative conditions in transportation infrastructure have not changed much since the Delgado (1995) paper was published, as SSA markets still have substantially higher transportation costs (Porteous 2015) relative to other food markets globally.

The transportation and general infrastructural deficits in SSA relative to other parts of the developing world, and in rural areas relative to urban areas within SSA, explain much of the current state of market development because they influence the extent to which farmers and traders participate in markets. In his review of empirical studies on market participation in Southern and Eastern Africa, Barrett (2008) found evidence of a strong association between high (low) transaction costs and greater (poorer) market participation. Additionally, interventions by government and donors that reduce transportation costs were found by Heltberg and Tarp (2002) to increase market participation, and, hence, the extent and frequency of transactions within and between agents in agricultural supply chains.

### 2.3. Government industrial policy

Given the theoretical results and empirical findings that:

- i. Removing marketplace failures that relate to market inefficiencies, especially those related to transaction facilitation, can enhance market participation and improve livelihoods;
- ii. Transactions costs, especially transportation-related, are higher in SSA than elsewhere in the world; and,
- iii. Government interventions in SSA that have been targeted to reducing transportation costs have resulted in the expected improved outcomes,

it is argued that more urgency is needed in designing and implementing market transaction facilitation interventions. Since these issues were discussed by Shaffer et al. (1983) over 35 years ago but remain applicable implies that satisfactory progress in facilitating market transactions has not been made in many parts of SSA, especially in rural areas. This is in part due to the attention donors have placed on building assets at the household level, such as through provision of improved technologies or livestock, with the expectation that doing so would lead to production surpluses at the household level, and, thus, increased market participation to earn cash from crop sales (Barrett 2008). Less attention has been placed on making improvements to the market environment into which those production surpluses are expected to flow, even though the evidence that these are less effective in strengthening household livelihoods than household level interventions is not definitive (Barrett 2008).

To illustrate how government interventions may be helpful for improving market conditions, we describe the experience of the development of the potato sector in Anding County, China (Zhang and Hu 2011). The first lesson from this study is that industrial policy interventions were localized and implemented at the county level. These were more effective than interventions designed at the national level because there are large differences in productivity and production across space, which means policies at a national level may not fit well for individual counties. Moreover, county level governments have greater information on local conditions than national governments. This means that if industrial policy is to be undertaken, it is better done at the local level.

Second, the process of interventions in sector development does not stop after one program is instituted, but rather evolves over time. As such, interventions are commonly needed to address new bottlenecks that emerge as the system evolves. Zhang and Hu (2011) describe a situation in which local policymakers were attentive and responsive to continually address the needs of potato producers as those needs changed over time. These iterative interventions eventually led to success.

Lastly, the interventions undertaken to achieve sector wide success were many, including such things as providing land preparation services, providing land and buildings for potato storage, building a new, expanded wholesale market, establishment of research centers for new varieties, and extension services for delivery of advice on production and marketing to farmers. This comprehensive approach was needed because producers faced new challenges at the farm, wholesale, and retail levels as the supply chain developed and new issues emerged during the development process. That these interventions as an

entire package led to massive expansion of Anding county potato production and producer incomes after the first year of interventions is a sign that local industrial policy, if implemented well, can be effective in a relatively short amount of time (Zhang and Hu 2011). While the Kebbi state government and local governments within the state and elsewhere in Nigeria may have more binding resource constraints than those of Anding county, it is plausibly the case that there are some interventions that local governments in Kebbi state and elsewhere in Nigeria can afford that can improve the functioning of local grain markets in the near term.

### 3. THEORETICAL FRAMEWORK: ROLE OF PUBLIC INVESTMENT TO FACILITATE MARKET PARTICIPATION

The market participation choice of a household within a spatial market equilibrium framework outlined in Barrett (2008) is a useful benchmark to describe the market participation choices made by farm households and traders who trade in grain markets in Kebbi state. We adapt the notation and elements of the framework slightly to emphasize how changes in public and private goods can influence the market participation decision and other variables. For simplicity, we focus in isolation on the market for a single grain crop, e.g., rice. We define the farm price for the crop as  $p^f$  and the rural market price as  $p^m$ . The difference between these prices is the transactions costs involved with facilitating the sale of the crop within the market. These transactions costs, as in Barrett (2008), are defined as  $t$ , and are a function of  $Z$ , which are household characteristics, e.g., education or experience;  $A$ , which is cash from the sale of household assets, e.g., livestock<sup>1</sup>;  $G$ , which are public goods and services provided by the state or local government;  $W$ , which is cash from non-farm employment, remittances, or other sources; and,  $S$ , which is cash from net sales of the crop. Encompassing the farm price in the spatial market equilibrium framework yields the following relationships:

$$p^f = p^m - t(Z, A, G, W, S), \quad (1)$$

$$p^m = p^h - t^o(G, Q), \quad (2)$$

where market equilibrium prices are determined by  $p^h$ , the price in a linked commercial hub market, and  $t^o$ , which are a function of government goods and services and the aggregate supply in the market,  $Q$ .

We next suppose that the transactions costs term in equation 1 has the following form, and assume that that  $Z$  is greater than zero and all the other variables are greater than or equal to zero:

$$t = [Z * (A + W + S)] + G. \quad (3)$$

While household characteristics do not plausibly adjust very often over time, the other variables can and do change within and across crop years. For example, as described by Delgado (1986) for grain markets in Katsina and Zamfara states, which are in the same Northwest Nigeria geopolitical zone as Kebbi, transportation costs are observed to increase during the wet season, since road quality deteriorates, and intermittent flooding may cause traders to take longer, alternative routes. In such a case, when  $t$  increases, there may be a few scenarios that could occur to influence the decision of the trader or farmer to participate in the market:

- If  $G$  stays constant (or decreases), then  $A$ ,  $W$ , and/or  $S$  need to increase.
- If  $G$  increases, then  $A$ ,  $W$ , and/or  $S$  may not need to increase.

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<sup>1</sup> Barrett (2008) defines these as household assets, which is slightly different than our definition. We emphasize the cash receipts from different activities of the households rather than physical assets since it is clearer for our theoretical scenarios outlined later in the section.

Regarding the first scenario, unless cash is saved from previous crop sales, then the household would need to work off-farm or liquidate some household assets to participate in the market. Accommodating this increase in transactions costs, therefore, plausibly results in lower investment in on-farm or business activities. Additionally, if there is an intention to sell the crop in the market, then there must be on-farm storage or storage in the market. However, lower investment in on-farm activities means that it is less likely that there is enough on-farm storage in the case of high transactions costs. Regarding the second scenario, increases in government provisions to cover the higher transactions costs mean that private household assets do not need to be used to cover the higher transactions costs. In this framework, this could be a subsidy provided by the government to the household to cover increased transportation costs, but it may also be such things as expenditures on storage infrastructure in the marketplaces. Thus, in the second scenario, there is a higher likelihood that farmers and traders invest in on-farm or business activities, since they do not need to use their cash earnings to cover the higher transactions costs.

The main takeaway from this theoretical framework is that investments by state and local governments or their donor partners in public goods that reduce transactions costs can plausibly increase market participation, on-farm investment, and trader business investment. We argue in this paper that there is much to be gained in the near term, e.g., in a year or two, from investment in the actual physical infrastructure in rural marketplaces, such as the number and sizes of storage units and communications technology facilities. To investigate whether there is a need for such investments in Kebbi state, we implemented a marketplace characteristics survey, which placed particular emphasis on determining the qualities of the general market environment in which traders and farmers exchange grain.

#### 4. GRAIN MARKETS AND THE SURVEY

We chose Kebbi state for this study because it is in northern Nigeria and so experiences a sharp difference in growing conditions between the dry and wet seasons. This increases the need for storage. Moreover, we believe that such an analysis is best done at the state level, so that state and local government and donor funds can be targeted toward useful local investments based on local knowledge. Additionally, the grain price seasonality analysis by Hatzenbuehler et al. (2018) showed that there are substantial differences in grain price behavior across markets in Kebbi state, especially between those in urban and rural areas. We expect that some of these disparities are explained at least in part by variation in the quality of marketplace infrastructure and the general marketing environment due to the above discussed relationships between market infrastructure, transactions costs, and market participation. Our marketplace characteristics survey helped us determine whether our expectations are consistent with conditions on the ground.

Preparation for the market survey included identifying all markets within the state using local experts, determining which day of the week each market held its “market day”<sup>2</sup>, and developing a questionnaire to administer a knowledgeable trader in each market. The questionnaire had modules on infrastructure for grain storage; general infrastructure, such as for transportation; sources of grain supply; main trade costs; market amenities, e.g., storage units and banks, that improve the general marketing environment; and trader perceptions of the main things that are needed to improve both the quality of grain storage and general market conditions.

The survey team implemented the survey in 17 of the 41 Kebbi state markets that were identified by local experts. The markets that were surveyed were chosen randomly, although there was some imposed preference to implement surveys in each of the local government areas of the state. Each market

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<sup>2</sup> The “market day” is the day during a week in which a rural or urban community has its market open for business. In the case of Kebbi state, all the markets are only operational one day a week, except for that in Birnin Kebbi, the commercial and administrative capital, for which the market is open daily. While transactions can be done in a marketplace on days that are different than the market day, it is not common since there are both few traders and few customers in the market.

was visited on its market day, and the interviewed trader was generally the chairman of the market trader’s organization or a deputy who was approved by the chairman. The survey was implemented in 2018 in both the dry season (February) and the wet season (late June/early July). Implementation in both seasons was done to determine whether the characteristics of individual markets, such as the availability of grain for sale, changed during the crop year. It is plausibly the case that market characteristics adjust over time due to the general tendency for higher transportation costs during the wet season, which can discourage market participation. Moreover, the wet season is the growing season for grain, such as millet, rice, and sorghum. Consequently, farmers are busy with crop activities during this period and are less active in the local market.

Figure 4.1 shows the markets that were visited for the survey. Not only are these markets distributed geographically in all parts of the state, but there is also a mix of urban and rural markets. For example, Birnin Kebbi, which is the commercial and administrative hub for the state, is an urban market, while Marafa, located in southern Kebbi is a rural, fairly isolated market.

**Figure 4.1. Map of markets visited for marketplace characteristics surveys**



Sources: Local experts consulted by the authors, DIVA-GIS, and Google Maps.

## 5. SURVEY RESULTS

In discussion of the results of our survey of chairmen of the trader organizations in the visited markets in Kebbi state, we emphasize differences in physical infrastructure across markets and differences in the same market over the course of the crop year, i.e., from dry to wet season, and the mechanisms that traders

identified to both improve the quality of grain storage and the general market environment. On their weekly market day, these markets are vibrant places that draw in many people from the surrounding areas to buy and sell food and other consumption items. The number of people who attend a market on a market day commonly far exceeds the population of the town in which the market is held.

Each of the visited markets had their own unique characteristics. The results tables are organized to show both the ways in which some markets are like others and how they differ. However, much of the individual marketplace characteristics are lost in averaging across markets. Thus, we provide more comprehensive descriptions of the characteristics of each of the visited markets in the Appendix. Additionally, while there was variation in the extent of development of the markets, there were also some desirable traits regarding food availability and nutrition that were observed across markets. For instance, all markets had a wide variety of foods available for purchase, including several grain types, i.e., maize, millet, rice (both local and imported), and sorghum; cowpeas and other beans; and five or more types of fruits and vegetables.

Table 5.1 shows some of the general socioeconomic characteristics of the interviewed traders, who were commonly the chairmen of the market trader’s association, and if not, people who were recognized by others in the market as knowledgeable traders. It is observed that the interviewed traders varied in age, but that all traders interviewed had over ten years of trading experience. Nearly all the interviewed traders stated that trading was their primary profession, but most were also involved in farming. This implies that, especially during periods such as planting and harvest, the traders need to manage both their trading and their farming activities. Most of the traders reside in communities immediately surrounding the markets. All the interviewed traders reported paying local government taxes, with some also reporting paying state taxes. It can be inferred that these traders are quite active and productive members of their communities.

**Table 5.1. General socioeconomic characteristics of the interviewed Kebbi state grain traders**

Age, years	Average:	47.4
	Range:	30 to 70
Trading experience, years	Average:	16
	Range:	11 to over 30
Trading as primary occupation		82% (14 of 17)
Farming as secondary occupation		71% (12 of 17)
Travel distance from trader’s home to the market, km	Average:	7.8
	Range:	1 to 54

Source: Authors.

### 5.1. Differences in physical infrastructure across markets

Despite observed similarities among the interviewed traders regarding trading experience and proximity to the market, there are some wide differences in the physical infrastructure that exists in the markets in which they conduct their trading businesses. Table 5.2 shows that the number of storage units for grain in the markets visited ranges from 0 to 300, which means that there are some markets with well-established and very large buildings for storage of grain, while others have none.<sup>3</sup> Typically, the storage units were built with cinder block walls and had metal roofs to keep rain out. The difference in market size is also seen in the disparity of available day laborers to load and off-load bags onto and off lorries and other transportation vehicles. A few of the markets were relatively small with less than 100 laborers available for loading/off-loading, while at others there were seemingly more than a thousand laborers.

<sup>3</sup> There were two markets that had no cinder block walled, metal roofed storage units, and there were two additional markets that had 10 or less of them.

**Table 5.2. Storage and physical infrastructure related marketplace characteristics**

Storage units, number	Average: 85.8 Range: 0 to 300
Day laborers available for hire to load and off-load bags, number	Average: 266 Range: 30 to 2,000
Mobile network connectivity – markets for which was very poor or not present	24% (4 of 17)
Road infrastructure	
Average quality of roads near the market	Fair to good
Markets reporting more roads than ten years ago	100% (17 of 17)
Markets reporting roads nearby in better condition than they were ten years ago	88% (15 of 17)
Market amenities	
Fuel station near market	76% (13 of 17)
Bank near the market	59% (10 of 17)
Automotive repair near the market	100% (17 of 17)
Marketing supplies (e.g., bags) available for sale in market	100% (17 of 17)
Prayer room in the market	88% (15 of 17)
Public toilet in the market	76% (13 of 17)
Security in the market	82% (14 of 17)

Source: Authors.

One positive sign for the Kebbi state and local governments, as reported in Table 5.2, is that traders in most markets stated that the general road conditions for roads near the market ranged on average from fair to good. Additionally, all traders reported that there are more roads now than there were ten years ago, and that the roads are generally of better quality than they were then.

However, some of the amenities, such as banking facilities, that we thought would improve the general business environment were missing in some markets. While all markets had an automotive repair mechanic in the market and stores or salespeople that sold marketing supplies, such as bags, some of the markets were missing banking facilities, security, public toilets, and fuel stations. The absence of these amenities not only makes it more difficult to operate a trading business for an entire market day, but also raises marketing costs and risks. The absence of both security and banking facilities in some markets, for example, means that traders must hire more employees than they would otherwise to carry, store, and secure substantial amounts of cash within and outside of the market. This is not only risky in that the cash obtained from sales could easily be lost or stolen, but it also raises expenditures on wages. While there are plausibly alternative cash management methods that could be used, such as mobile banking, these technologies are unlikely to replace standard cash transactions, particularly in rural markets. And, as also reported in Table 5.2, four of the markets we visited had either very poor or no mobile networks at all, thus making it impossible to do mobile banking at those sites.

## 5.2. Differences over time for individual markets

The markets not only varied in terms of size and existing physical infrastructure, but also the same markets had different market environments within the crop year. Table 5.3 shows the share of markets surveyed for which it was reported that conditions differed between the wet and dry seasons in terms of market participants, grain bags available for sale, day laborers available, and the presence of flooded areas. More than half of the visited markets reported having less grain available for sale in the wet than in the dry season, which is generally what is expected since the dry season follows the current crop year harvest and the wet season immediately precedes the next crop year harvest. A bit less than half of the traders interviewed reported that there were fewer people who attended the market during the wet than the dry

season.<sup>4</sup> The availability of labor did not vary much across the seasons. In less than half of the markets it was observed or reported that substantial flooding within the market area occurred in the rainy season, which posed problems for storage and transportation of grain within and out of the market.

**Table 5.3. Changes in market conditions between the dry and wet season 2018**

Number of markets with...	
• fewer people attending the market in wet season than dry season	41% (7 of 17)
• fewer bags of grain available for sale in the wet season than the dry season	59% (10 of 17)
• fewer day laborers (e.g., for loading and off-loading bags) available for hire in the wet season than in the dry season	18% (3 of 17)
• noticeable issues with flooding in the market or on roads near the market	29% (5 of 17)

Source: Authors.

### 5.3. Mechanisms to improve grain storage quality and the market environment

While there were only a few markets for which there were no cinder block, metal roofed storage units, and many of the markets had most of the amenities, e.g., banks and a fuel station, that we considered beneficial for the environment near the market, traders stated that there were some other things that could improve the quality of grain storage in the market, in particular. The responses to questions on storage related infrastructure are presented in Table 5.4.

**Table 5.4. Needs identified by traders to improve quality of grain storage**

Number of traders who identified the following factors as being important for improving the quality of grain storage in their market:	
• More and larger storage units for bags of grain	83% (14 of 17)
• Pesticides and other tools for pest management in storage units	41% (7 of 17)
• More trees and other built apparatuses to provide shade from the sun	29% (5 of 17)
• Larger land area for the grain market, e.g., to allow lorries to park inside or near the grain market	29% (5 of 17)
• More hermetic storage bags (e.g., Purdue Improved Crop Storage (PICS)) for sale in the market	12% (2 of 17)

Source: Authors.

Even for those markets which had storage units within the market, these were viewed as being insufficient in size and number. Additionally, it was somewhat common for traders to mention that there was insufficient access to tools and chemicals for pest management within the storage units, which led to storage losses as insects and rodents created holes in the grain bags and ate the stored grain. In a couple cases, traders mentioned that there was insufficient access to hermetic storage bags, such as the Purdue Improved Crop Storage (PICS) bags. In addition to larger and more physical storage units within the market, the traders interviewed also reported a need for more trees and other built apparatuses that would block the sun to allow the traders to operate their businesses in a more comfortable environment. Lastly, a few traders mentioned that it would be beneficial to expand the actual market area, which would reduce general market congestion. Some market areas were so congested that there was insufficient space to place grain on the ground while leaving enough room for people to pass by.

Traders also provided their thoughts on ways in which the general marketing environment could be improved (Table 5.5). Nearly all traders mentioned that drainage facilities would make it easier to move grain in and out of the markets during the rainy season and reduce the possibility for grain bags to become wet, potentially causing spoilage. More than a third of the traders mentioned that banking and credit

<sup>4</sup> Both the number of market participants and bags of grain for sale are difficult to estimate. We observed during the survey that there were noticeably fewer people in the markets during the wet season than the dry season, and the difference was especially clear for rural markets.

facilities would be helpful for operating their businesses. A couple of traders emphasized strongly that the absence of mobile networks in the market area was one of the principal challenges in successfully implementing their trading activities.

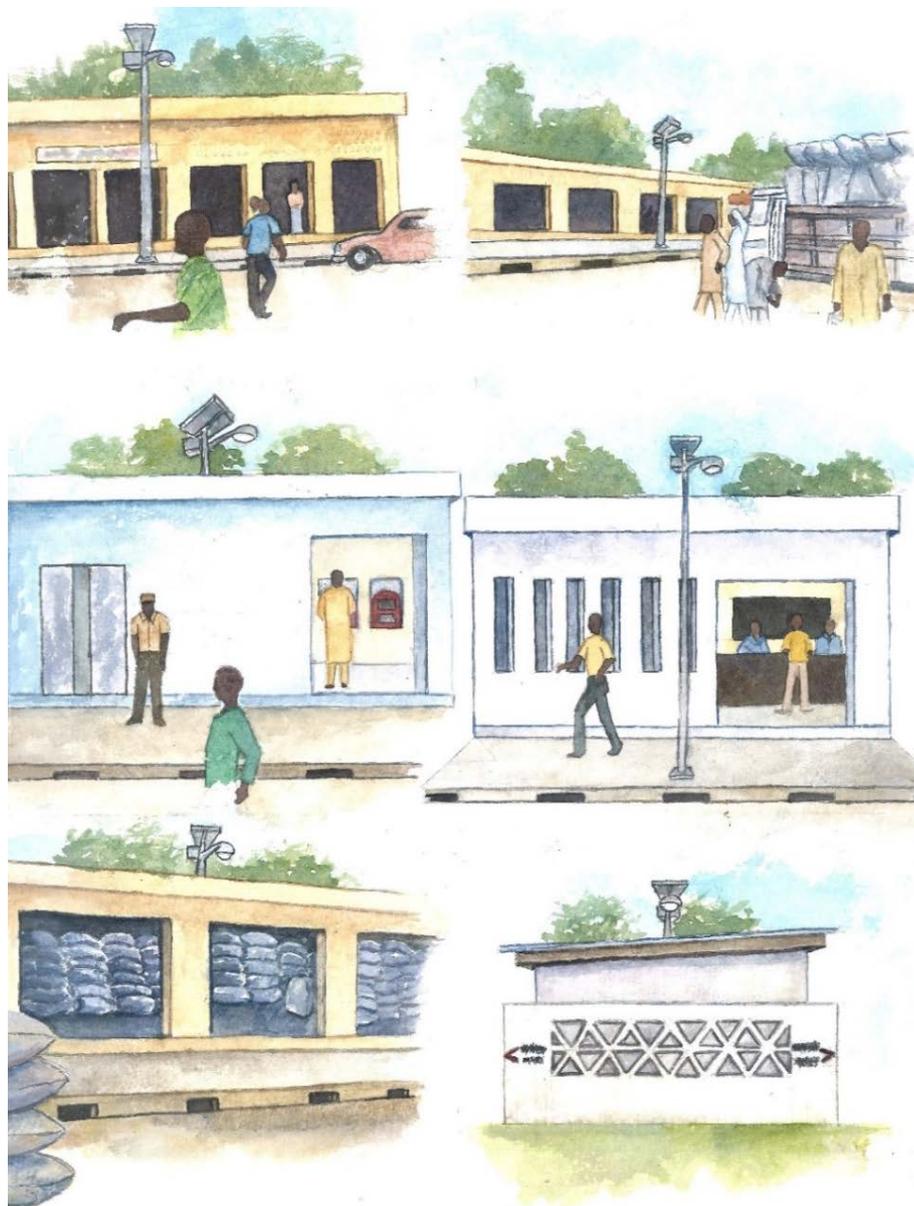
**Table 5.5. Needs identified by traders to improve the general marketing environment**

Number of traders who identified the following factors as being important for improving the general marketing environment in their market:

• Drainage infrastructure to prevent flooding inside the grain marketing area	83% (14 of 17)
• Banks and/or banking facilities	35% (6 of 17)
• Credit facilities	35% (6 of 17)
• Better roads and parking facilities in the market	18% (3 of 17)
• More security personnel and improved market security	18% (3 of 17)
• Better roads nearby the market	18% (3 of 17)
• Improved mobile networks	12% (2 of 17)

Source: Authors.

**Figure 5.1. Artistic rendering of elements of an “Ideal rural marketplace”**



List of elements (clockwise from top left):

- Covered stores with exterior drainages;
- Sufficient space for cars and lorries to enter and park for easy loading and off-loading;
- Security post;
- Toilet with women's and men's facilities;
- Covered grain storage units; and
- Banking facilities.

Artist: Hassan Roda, Abuja, Nigeria

Given these ideas and responses from traders for improving the quality of grain storage and the general market environment, we thought it would be helpful for readers and stakeholders to have a visual representation of what an “ideal” rural grain marketplace in northwestern Nigeria might look like and the types of amenities it may have. Such a visual representation is presented in Figure 5.1.

The market environment would be improved if there were well-organized and solid structures for storing grain and other products or for conducting trade-related negotiations. The top two images in the Figure 5.1 show a market area that is not congested, in which there is plenty of room for people to walk and interact, and cars and lorries can drive within the market and park inside. The market also has sufficient drainage along roads and walkways, which allows for easier passage of cars, lorries, and pedestrians during rainy periods and provides more space for temporary storage of grain bags on the ground. Each of the panels shows a solar light, which permits traders and consumers to implement their business activities when the sun is down and improves security. The bank, security post, and bathrooms are examples of things that allow traders to conduct business in a lower risk, less costly, and healthier environment. While these amenities are by no means comprehensive, nor universally needed in every market in Kebbi state, our market survey shows that at least some of these types of investments by local government are needed in virtually every market and can have a positive and immediate impact on the businesses of traders and farmers, and, hence the broader agricultural economy in Kebbi state.

## 6. DISCUSSION AND POLICY IMPLICATIONS

The focus of this paper is on describing how the quality of the physical infrastructure and general environment of marketplaces can have a substantial impact on the economic vibrancy of the local agricultural sector and to provide insights into potential investments that could be implemented by state and local governments and donor partners to improve the ability for traders to store grain and conduct business in markets in Kebbi state, Nigeria. To obtain additional understanding and information on the status of physical infrastructure in markets, we implemented a marketplace characteristics survey, which provided an opportunity for us to observe activities in the markets and for traders to share their own perspectives on initiatives that could help their businesses. While Kebbi was our focus state, we expect that the results would not be different in other Northern Nigerian states or other countries in West Africa. One clear takeaway message is that some rural markets are relatively isolated from others, both in terms of road and communications infrastructure. Notably, there were multiple markets for which there was no mobile network at all. Given that we only visited a sample of markets in the state and that each market had thousands of people attend the market, investments in market infrastructure would plausibly have a near immediate, positive impact on the livelihoods of many people.

We do not discourage ongoing or planned efforts to improve agricultural development in other ways, such as the use of public funds for research into new agricultural technologies and extension activities, and indeed view them as fundamental to a systematic approach to agricultural development. However, we think the issue of public investment in physical market infrastructure has been a relatively neglected part of the agricultural development portfolio, even though this exact point was made decades ago by Shaffer et al. (1983) and others. This is for two reasons primarily.

- i. While any government or donor intervention will naturally evolve, and the system will face follow-on bottlenecks, as was experienced in the potato value chain in Anding county, China, as demonstrated by Zhang and Hu (2011), the timing of implementation and the outcomes and duration of benefits derived from the interventions vary. Investments in physical market infrastructure are likely to provide immediate benefits, and these benefits are likely to endure.
- ii. Investments in market infrastructure by local governments or their partners are more likely to be successful, in general, since they will be more informed by local conditions than would broader

state or national government initiatives. Thus, they will plausibly better meet the specific needs of local markets and communities. The success of these investments is particularly likely in cases where local stakeholders, such as the chairmen of the trader's associations whom we interviewed, are actively engaged, listened to, and consulted throughout the investment and intervention process.

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## APPENDIX: DESCRIPTIONS OF VISITED MARKETS

**Argungu** – Argungu is a traditional commercial capital for the region. The marketplace is accessible right at the entry from a main road into the city. The market was recently refurbished and has many metal-roofed concrete storage facilities. The main market is located down the road from the grain market area, so there is less foot traffic in the grain trading area. There is substantial amount of room between the storage facilities, which allows lorries to drive up to the storage facilities for easy loading and unloading. There were some issues of flooding in the marketing area during the rainy season. This was also the only market of those visited that had electricity in some of the storage facilities, which allows the traders to conduct storage and marketing activities at night.

**Bagudo** – This is a very large market that is in a small town in the interior of Kebbi state. The roads are generally in good condition in the surrounding areas. The grain marketing area comprises a large portion of the market. The market has a concrete block wall on the perimeter, and there are several shops constructed with concrete block walls. Most of the shops have metal roofs that were put together in a piecemeal fashion by the traders who built them. There are relatively few thatched or metal roof shades to shield the traders and grain from sunlight. The grain marketing area is not too congested, but lorries cannot pull up to the grain trading area.

**Birnin Kebbi** – This is the market in the administrative and commercial capital of Kebbi state. The market was established around 2000, and the local government provided the land and built the shops for the traders. The grain marketing area is set apart across the road from and is less congested than the main market. There is less foot traffic in the grain market since it is set apart from the main market. The shops are in good condition, and cars and lorries can pull up right next to the shops for easy loading and unloading. Traders pay a relatively small fee to the local government to rent the shops. Unlike the other markets that were visited and are open only one day per week, this market is open daily.

**Dakingari** – This is a relatively small market in a rural town that has grown rapidly in recent years. A former governor is from this town and implemented many infrastructure products, including the refurbishment of the market area. There are some metal roofed concrete block storage facilities in the market, which form the perimeter of the market. However, there are few shades or trees, so traders stand or sit in the sun or have simple shades built from thatched wood or tarps. The market area is wide open, and lorries can enter into the market for easy loading and unloading. There were some issues with poor mobile telephone network connectivity.

**Dirin Daji** – This is a large market in a relatively big town that is linked by road to a regional commercial center (Zuru) and many other smaller towns. Roads leading to the city are average to poor, but within the town the roads are poor and congested. There is ongoing construction on the main road outside the marketplace to put in culverts to help with drainage. There are no grain storage facilities in the grain marketing area. Rather, there is a concrete block wall at the perimeter of the market and traders place their bags of grain that are for sale on tarps and plastic sheets against the wall. The traders also mentioned that they pay night watchmen to look after their lorries or piles of grain if they arrive early or stay late.

**Dodoru** – This is a very large market that is located on the border of Kebbi and Sokoto states. There is not a major urban area in the immediate vicinity – Jega, a city of about 200,000 persons, is about 50 kilometers away. However, Dodoru is on one of the main roads that links Sokoto city with Kebbi state. This road was recently updated and is of high quality. The market has some metal roofed concrete block storage facilities, which were built twelve years ago. There are many temporary shades under which traders stand, sit, and place bags of grain. These shades have thatched and metal roofs. The grain market is not too congested, but lorries cannot drive up to the main marketing area.

**Gunki** – This is a relatively small market that is in the western part of Kebbi state. The market is in a rural town on the border with the Republic of Niger. There is one main paved road that leads to the town, but the direct road to the market is a dirt road that extends about 10 kilometers from the main road. The roads near the marketplace can become flooded during the rainy season. There are only a few metal-roofed concrete block storage facilities, which were built about thirty years ago and are showing clear signs of wear. Mobile network coverage is poor. Traders from Gunki recommended that they be called on weekends when they go to larger markets where they can receive calls, since they did not have network coverage in Gunki market.

**Jega** – This is a large urban market in one of the biggest cities in the state located at a key road junction that links Sokoto to Birnin Kebbi. There is not a substantial amount of parking in the market area, and few lorries are able to make it into the grain marketing area. The market is very congested. Grain traders operate among traders of many other products. There are many metal-roofed concrete block storage facilities within the market, as well as many metal roofed shades and trees that provide some relief from the sun and rain. Passageways within the market are very small, and so only push carts and motorcycles can carry grain bags within the marketplace.

**Kalgo** – This is a peri-urban market on the outskirts of Birnin Kebbi at a junction of roads to several large cities. The roads leading to the market are in good condition, and there is construction to put in culverts on the roads immediately outside of the market area. There are many metal-roofed concrete storage facilities in the marketplace. These storage facilities form the perimeter of the market and commonly have shops that face the street on the opposite side of the grain storage rooms. There are also many metal-roofed shades in the marketing area where people can sit, stand, and stack their grain and not be exposed fully to sun and rain.

**Kamba** – This is a very large rural market on the border with the Republic of Niger. The roads are in good condition within the town and in the surrounding areas. Culverts were recently installed on the roads that border the market, which help manage drainage issues. The grain market area is large, and there are many metal-roofed concrete storage facilities. There are also some large, mature trees, which provide shade for traders. The grain market is wide open, which allows lorries to pull into the area for easy loading and unloading of grain bags.

**Koko** – This is a large, urban market in a city that is on the major corridor that links Kebbi with Sokoto state. The road leading up to the market is in average condition, but other roads leading to the marketplace are very poor. There are some metal roofed concrete block storage facilities on the perimeter of the market. Few trees or shades are found in the central trading areas. The storage facilities commonly have other businesses, e.g., auto parts, on the sides of the buildings that face the streets. While there are storage facilities in the market, the traders mentioned that it was not uncommon that they would store grain in the nearby middle school due to insufficient storage space. The large open area for grain trading allows cars and trucks to enter into the market area.

**Lolo** – This is a very large rural market that is separated from the rest of the state by the Niger River and is located close to the borders with the Republic of Niger, the Republic of Benin, and Niger state. The market is accessible by boat during the dry season, when many people from the northern part of Kebbi state go to the market. This is generally not possible during the wet season since the river is too high to safely navigate for most boats. The nearest road bridge in Nigeria across the Niger River is located 70 km downstream in the central part of the state, so it is quite a long diversion to reach the market by motorized vehicle after crossing the bridge from areas of Kebbi state on the north side of the river. There are considerably fewer people at the Lolo market in the wet season than in the dry season. The market is not near a major urban area and is surrounded by farmland. Mobile network coverage is generally poor. The market is very

congested, and the grain trading area is nearby the marketplace for other products. The congestion in the market makes it difficult to load and unload grain bags.

**Marafa** – This is a rural market that is relatively small and located in between two relatively larger towns, Koko and Zuru. The roads leading up to the market are in average to poor condition. The actual market area barely has any infrastructure. There are a few dated temporary walls on the perimeter of the market, but there are no metal-roofed concrete block storage facilities. The traders generally store their grain on tarps and plastic sheets, and a few have thatched roof shades to sit and store their grain under. Mobile network coverage was generally poor, even though the market is within 100 kilometers Koko and Zuru.

**Suru** – This is a large rural market that is in the center of the state, but is a considerable distance from the nearest urban area. The road leading to the market is generally in good condition. Roads outside of the marketplace have culverts to manage drainage. However, roads within the market can get flooded during the rainy season. There is a relatively restricted area for lorries to park in the market, so there are many camels and small trucks for carrying grain bags into the market area. There are a few metal-roofed concrete block storage facilities, but the grain marketing area is congested.

**Yauri** – This is a large, urban market at the very southern tip of the state located on the Niger River. Many market participants access the market by boat, which is easier than doing so by car or truck, because the market is very congested. The grain market area is an isolated area near the Niger River and is somewhat isolated from the traders of other products, such as fish. The congestion in the market means that it is difficult to pass within the market in any other vehicle than a push cart or a motorcycle. The market can become very muddy and flooded during the rainy season. There are only a handful of metal roofed concrete block storage facilities in the market. Many traders stack their bags of grain on tarps and plastic sheets.

**Zariya Kalakala** – This is a relatively small rural market that is not on a main road and is a considerable distance from any major urban area. However, the roads leading up to the town and within the town are generally of good quality. There are some culverts that were built recently in the town on the roads that are on the outskirts of the market. Metal-roofed concrete block storage facilities form the perimeter of the market. The passageways from the road to the grain market area are generally narrow, so lorries cannot enter directly into the grain market area. There was no mobile network coverage in the market, and traders mentioned that this is one of the principle difficulties facing them as they conduct their trading activities.

**Zuru** – This is a large urban market in the eastern part of the state near Niger state. While the city is of substantial size and has a university, stakeholders there mentioned that they had not had electricity through the power grid in over six months. All businesses that used electricity were operating off generator power. There are many metal-roofed cinder block storage facilities and shades throughout the market. The grain trading area is in a peripheral area of the market, but still within the market and near the trading areas for other products. Cars can pass through the market area, but the paths are not large enough for lorries to do so.

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