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Agricultural value chain in a turbulent environment

Adebowale Adeyeye, Oluwaseun Kolade, Demola Obembe & Adekunle Ogunsade

Abstract

The development of agricultural value chains is typically associated with strong institutions, supporting infrastructures and stable political and policy environment. In developing countries characterized by environmental turbulence, smallholder farmers in particular, grapple with a wide range of obstacles and challenges that hinder them from full participation and optimisation of agricultural value chain by smallholder farmers. These factors include regulatory, market, competitive, weather, economic and political turbulence factors. This paper reviews the extant literature on agricultural value chain in the context of a turbulent environment. Drawing insights from the empirical context of Nigeria, where agricultural and other economic activities have been severely disrupted by terrorist violence, political instability and derelict infrastructure, we propose a conceptual framework that maps the impact of environmental turbulence on agricultural production, and discusses the technological and strategic options for smallholders to overcome these challenges in order to benefit optimally from agricultural value chain.

Keywords: Value chain, Agricultural value chain, Value chain optimization, Smallholder farmers.

Introduction

The performance of the agricultural sector and its associated value chain has important implications for the achievement of macroeconomic policy objectives (Dlamini et al., 2015). Some of the macroeconomic policies on the agricultural sector adopted in Nigeria from the 1970s include the financial policy where credit to the sector was given at a concessionary interest rate between 1970 and 1985; financial market reforms, which led to the total deregulation of the economy; and the establishment of the Nigerian Agricultural Commerce and Rural Development Bank in 2000 (Evbuomwan et al., 2003). As part of the comprehensive reforms in the financial system and in line with its developmental role, the Central Bank of Nigeria launched the National Micro Finance Policy in 2006. In addition, the Agricultural Credit Support Scheme was established through the

initiative of the Federal Government and the Central Bank of Nigeria, with the active support and participation of the Bankers' Committee. In 2013, an attempt to put an end to institutional problems militating against sustainable growth in the agricultural sector led to the introduction of the Agricultural Transformation Agenda by the Goodluck Jonathan administration. Specifically, the plan aimed to add about 20 million tons of food to domestic supply and create 3.5 million jobs by 2015 (Muftaudeen and Abdullahi, 2014). Value chain studies have gained considerable importance in recent years. Although many definitions are applied, value chains essentially represent enterprises in which different producers and marketing companies work within their respective businesses to pursue one or more end-markets. The United Nations Industrial Development Organization (2009) defined value chain as the entire range of efforts undertaken to bring products from the initial input-supply stage, through various phases of processing, to its final market destination, and it includes its disposal after use.

Environmental Turbulence

Environment of a value chain is a pattern of all conditions and external influences that affect the life and development of the smallholder farmer value chain process. Environmental turbulence is a phenomenon that is difficult to predict and understand when it occurs and often in various sectors (even though business and public) cannot catch it and even rarely (Deng & Zhang, 2018; Deng et al., 2020). In line with Dost et al. (2019), environmental turbulence is often seen as a distinct, prominent and unpredictable environmental event such as significant technological changes and significant changes in the economy. In addition, various literatures that explain environmental turbulence (Kraus et al., 2020) are the most important features of the contemporary business environment and not just a dynamic environment because the rate of change is unpredictable. Thus, the bigger the unexpected change, the greater the negative impact and its effect on company performance. Regarding the discussion of environmental turbulence, various literatures highlight the frequently used market and technology and turbulence factors in the business sector, especially SMEs (Deng et al., 2019; Dost et al., 2019). However, with the current conditions (the impact of the Covid-19 pandemic, Fulani herdsmen crisis, banditry and secessionist in the south east and west), several studies attribute it to turbulence (Ilinova et al., 2021; Kraus et al., 2020; Micheli et al., 2020) because it has been proven to disrupt the stability of the performance of the business sector. Meanwhile, market turbulence refers to continuous changes in customer preferences /

demands, in the price / cost structure, and in the composition of competitors (Ojha et al., 2020). Furthermore, technology turbulence implies the rate of change of products and / or process technology used to convert inputs into outputs (Ojha et al., 2020).

In the context of the turbulence currently occurring due to the Covid-19 pandemic; farmer-herder clashes; banditry and kidnapping; bokoharam and ISWAP; and secessionist agitations in the south eastern and western part of Nigeria, many smallholder farmers are experiencing difficulties in responding and acting (Zheng et al., 2021). There are smallholder farmers who experienced losses as a result of the turbulent (Dimson et al., 2020; Baum & Hai, 2020). This condition, of course, for smallholders who have weaknesses in knowledge management will soon close their farms and business (Breier et al., 2021; Clark et al., 2020). However, there are still many farmers that must survive in a more open way to receive knowledge which is then processed to make changes and adjustments (Craven et al., 2020; Hock-Doepgen et al., 2020; Ritter & Pedersen, 2020). Both developed and developing countries have launched programs to overcome these problems for economic stabilization (Albaz et al., 2020a; 2020b). Even in developing countries, especially Nigeria, smallholder farmers make a major contribution to the Nigerian economy. So that the turbulence that is happening right now is good in terms of technology, market, and environment (which is correlated with the Covid-19 pandemic and other crisis being experienced) smallholder farmers are tested and required to open innovation (Kraus et al., 2020; Micheli et al., 2020). The goal is to be able to make changes by creating products and through marketing innovation as a step to transition from offline to online. Due to changes in market behavior under the pretext of the environmental turbulence, customers are reluctant to make offline purchases (Craven et al., 2020; Lee and Trimi, 2021). By utilizing technology and the internet of things, customers prefer shopping online rather than offline (Craven et al., 2020). Of course, this will have a big effect on farmers to make changes.(Cheah et al., 2020; Ghahremanpour et al., 2020; Turulja & Bajgoric, 2019).

According to Nashirudin (2014), the dimensions of environmental turbulence measurement consist of: Regulatory environment, Technology environment, Competitive environment and Customer environment. Considering that e-commerce businesses are information technology based, which are of the same characteristics as that of cellular business (Nashirudin, 2014), the constructs developed in the present research adopted the researches by Nashirudin (2014), consisting of: 1) Market environment turbulence, 2) Technology Environment Turbulence, 3) Competitive environment turbulence, and 4) Regulatory environment turbulence.

In response to these challenges associated with environmental turbulence, smallholder farmers have employed a wide range of resources and coping strategies. For example, scenario planning can help farmer to anticipate and assess whether a business context is beginning to become or has already become turbulent, or provide guidance and strategic options to firms experiencing turbulence (Ramírez and Selsky, 2016). Firms also mobilise social capital from informal and formal networks to overcome constraints and gain access to required complementary resources from the external environment (Lin et al., 2006). Furthermore, firms with higher levels of human and intellectual capital are usually better able to cope with changing including challenges associated with nascent and high-tech entrepreneurs (Marvel, 2013).

Market environmental turbulence

Market turbulence refers to the rate of changes in customer preferences. When the stock market goes up and down unpredictably, then it creates market turbulence. It is said that market turbulence takes place when there is a rate of change in the number of buyers and their purchasing preferences (Chen et al., 2016). Market turbulence is usually created when there is a changing trend in the climate of the economy, changes in needs and demands of buyers, and continuous advancement in technology. The two major causes of market turbulence are the driving forces: one is the consumer, and the second is the new technology (De Clercq et al., 2018). While the extant literature suggests that customers are stronger drivers of innovation among SMEs than among large firms (Prajogo and McDermott 2014), the recent Innobarometer 2016 shows that larger firms are more likely to respond to customer requests than smaller firms (European Commission 2016). There is empirical evidence that market turbulence positively affects SMEs' innovation activities (Prajogo and McDermott 2014).

Technological environmental turbulence

Technological turbulence means the change in the rate of technology in the industry. It is the most influential change in the companies, as this external factor greatly influences the production of the whole company (Roggemann and Welsh, 2018). When some new technology is introduced, or a new product is formed by restructuring the existing technology, then it impacts the other competitors of the same industry. Some firms become able to accept that challenge due to their enriched resources, while some firms face a downturn due to their limited resources and inappropriate strategies (Lisi et al., 2019). Technological turbulence can be explained as an

external environment factor of the firm, and it depicts the modification in the means of production in the company and the development of innovative products (Wardi et al., 2018).

Competitive environmental turbulence

Competitive turbulence refers to the resources, the behavior, and the ability of the competitors to differentiate. Two opposite views can be found in the literature. The first view follows Schumpeter's theory, which argues that competition negatively affects innovation. According to Schumpeter, firms are more stimulated to innovate in markets with high levels of industry concentration and entry barriers because such conditions yield higher profits, which in turn can provide the necessary funds. By contrast, intense competition and overall unfavorable business conditions motivate firms to select more defensive strategies and lower risk innovation (Prajogo and McDermott 2014). The opposite view holds that competition drives innovation efforts. When the competition is high, customers have many alternative options to satisfy their needs and wants, hence, firms have to constantly search for new ideas for how to deliver and communicate superior value to their target markets. SMEs have to be proactive regarding market opportunities, receptive of innovation, and take the lead in innovation in order to succeed in an intensely competitive environment (Mateja and Barbara 2018). Strong competition increases the importance of environmental scanning and the faster adoption of innovation. Hence, smaller firms operating in competitive environments are expected to be more innovative than firms operating in oligopolistic markets.

Conflicts and its impact on agricultural value chains

Conflict in the form of insurgency is a religious or political battle launched among an organized, sponsored and aggrieved set of people in order to change the order of government in an attempt to enforce or instill a certain principle or ideology that is contrary to the will of government and the people usually using high caliber ammunitions to launch attacks and defend themselves mostly using the guerrilla warfare approach of hide and seek (attack and retreat) (Chukwurah, Eme and Ogbeje, 2015).

Nigeria is a country in West Africa with great potential to increase its agricultural production. However, it has also recently experienced severe episodes of internal conflict, which have negatively influenced agricultural productivity and investment. Conflict can adversely affect agriculture in several ways. For example, conflict can disrupt the supply and distribution of inputs and outputs, create price shocks and cause massive displacement of labor. Several studies have

analyzed the impact of conflict on the broader economy, at both the macro and micro levels. Macro-level studies emphasize the impact of conflict on growth.

The reverse causal relationship between growth and conflict has also been examined. Mounting evidence suggests that shocks to growth due to extreme climate events (such as deviations in normal precipitation and temperature) may increase the risk of insecurity. For example, in a global study of human conflict from 10,000 BCE to the present day, Hsiang, Burke and Miguel (2013) find that for each standard deviation change in average precipitation and temperatures, the frequency of interpersonal violence increases by 4 percent and intergroup conflict by 14 percent. In sub-Saharan Africa specifically, a proportional change in rainfall (from the previous year) of 5 percent increases the likelihood of a civil war the following year by 50 percent (Miguel, Satyanath and Sergenti 2004). While climate shocks alone are not necessary or sufficient causes of conflict, the above research findings are useful in understanding the relationship between growth in the agricultural sector and conflict, especially considering the projected effects of climate change on global rainfall and temperature over the next century.

In the study of Temesgen, Pugliese and Westbury (2014) four common challenges were experienced by all segments of the crop, livestock and agricultural services value chains during insurgency/violent conflict in Nigeria: first is the reduced human mobility, people across all value chains feared movement outside protected areas because of attacks by insurgents. Farm workers and herders feared attacks when in the field or grazing animals. Input suppliers had difficulty reaching their customers. Processors dealt with a reduced amount of workers available to operate machinery. Both traders and consumers limited their movements to markets due to intermittent attacks. In some cases, the fear of attack displaced people outside the conflict zone, further reducing the labor pools.

Secondly, reduced access to inputs and markets, as a result of reduced mobility, the various actors in the agricultural value chain experienced a reduction in both the supply of inputs (fertilizer, herbicides, gasoline and seeds) and in access to consumers (demand). Thirdly, with the increased theft of cash, products and equipment, the agricultural sector became a target for insurgents in need of cash and food. Each segment of the sector saw increased theft. Markets were prime targets for the theft of agricultural products and large amounts of cash. Lastly, the

increased prices for transportation, inputs and products, the reduction in the mobility of all value chain members and the decrease in supply, increased the prices for transportation and farm inputs, and in turn of agricultural products.

Value chain optimisation in turbulent environments

Oginni and Adesanya (2013) averred that organisations face an increasingly dynamic, complex, and unpredictable environment, where technology, globalisation, resource shortages, wide swings in the business cycle, changing social values, competitors, customers, suppliers, and a multitude of other dynamic forces impact on overall performance of these organisations. Environmental turbulence, according to Anggraini and Sudhartio (2019), is defined as environmental conditions with high level of uncertainty and risk. Environmental turbulence is an important construct that captures volatility in the corporate environment. It is made up of a competitive business environment and risks that come up from the company, and the complexity and heterogeneity of the supply chain within and outside the domain of the industry (Rimita, 2019). Turbulent environments are the environments characterised by the following characteristics: high levels of inter-period change that creates uncertainty and unpredictability, heterogeneity, dynamism and hostility, high level of competitive intensity and uncertainty. Increasing environmental turbulence requires firms to continuously adapt to changes in their business environments and questions the ability of traditional supply chain management models to manage it (Christopher and Holweg 2011). In the Nigeria AVCs environment there are high levels of inter-period change and the future environmental conditions cannot be accurately predicted due to the high levels of uncertainty (Galanopoulos, Karantininis, Mattas and Karelakis 2011).

The main changes in the Nigeria AVCs environment are the following: policies changing consumer attitudes and concerns, technological innovations, power imbalance in the chain, socio-economic factors, climate change (i.e. sustainable development and limited natural resources), trade liberation and globalisation. Thus, the Nigeria AVC environment can be characterised as a highly turbulent environment.

Smallholder participation in the Nigerian agricultural value chain

Nigeria's value chain is characterised by 80% of smallholder farmers and a few commercial processors plagued by inadequate inputs, obsolete technology, lack of knowledge/information about high value/growth products, limited exposure to high productivity practices, weak market linkages, inefficient supply chains with high levels of food wastage, an acute dependence on rainfall and poor financing to say the least. In order to create an income revolution in the agricultural sector, we need to capture the entire value chain right from research to the stage where farmers are able to realise money in their pockets. Smallholder farmers are the suppliers of food to the tables of Nigerians. In fact, a report has it that more than 80% of the total farmers, including medium and large ones, are smallholder farmers and they still account for more than 90 percent of the agricultural outputs of the nation. (CGAP, 2017). They are the backbone of the Nigerian agriculture sector and deserve every support to produce more food, grow more raw materials for the agro-industrial sector and contribute in ending a food supply deficit that costs the country US\$10 million in food import annually. Dambatta (2012) reports that the agricultural transformation component of the transformation agenda of the administration of President Goodluck Ebele Jonathan is expected to generate at least 3.5 million jobs through the value chains of various commodities and turn agriculture into business that can create wealth for farmers. They operate at subsistence, smallholder level, with intensive agriculture being uncommon. A characteristic feature of the agricultural production system in Nigeria is that a disproportionately large fraction of the agricultural output is in the hands of these smallholder farmers whose average holding is about 1.0-3.0 hectares. According to Federal Office of Statistics (1999), smallholder farmers are farmers whose production capacity falls between 0.1 and 4.99 hectares holding.

In recent decades, agricultural systems have continued to change due to rising incomes, demographic shifts, urbanisation and globalisation (Meilin and Richard, 2020). These changes affect not only modern agricultural value chains (AVCs) but also traditional ones employed by the majority of smallholders. With the ongoing efforts to raise productivity and promote commercialisation (Meilin and Richard, 2020), smallholder farmers are increasingly integrated in AVCs (through input and output markets), in activities such as the procurement of inputs, crop production, post-harvest handling and selling of products. Integration in AVCs through the participation of smallholders in various AVC activities is seen as a potential pathway to raising the food security and value chain optimisation of farmers (Bellemare 2012; Fischer and Qaim 2012). Such benefits are realized through increased productivity, market access, and reduced

transaction costs, among other factors (Meilin and Richard, 2020). However, risks such as exclusion from the value chains and exploitative relationships among smallholder farmers and other participants in the value chain may undermine the agricultural value chain optimisation by smallholders (Wiggins et al.2010). However, several factors inhibit the effective optimisation of smallholders

AVCs. These include limited households' productive assets (such as land, livestock and labour), inadequate production technologies, geographical constraints, and institutional constraints such as inadequate access to credit and insecure land rights (Meilin and Richard, 2020). Consequently, low productivity and less marketable surplus impair effective smallholder optimisation of AVCs.

Smallholder farmers and the challenge of value chain optimisation

In agricultural value chain, optimizing/upgrading refers to the acquisition of technological capabilities and market linkages that enable firms to improve their competitiveness and move into higher-value activities. Upgrading in firms can take place in the form: process upgrading (increasing the efficiency of internal processes such that these are significantly better than those of rivals, both within individual links in the chain, and between the links in the chain), product upgrading (introducing new products or improving old products). This involves changing new product development processes both within individual links in the value chain and in the relationship between different chain links. There is also functional upgrading in which value added is increased by changing the mix of activities conducted within the firm or moving activities from its position to different links in the value chain. In a study, Mgbenka and Mbah (2016) explains that one of the most important issues in Nigeria agricultural value chain is that development policies must consider integration into global markets opportunity that has to be maximized through explicit effort and investments. To optimize value chain in Nigeria's agricultural sector, a multifaceted approach is needed. Such approach would offer the enablers of agricultural value added chains development with innovation, cooperation, market power, governance and required intervention, especially for private small holders (scale) farmers.

Smallholder farmers are different in many ways such as in their resources and capabilities. The household economic status provides a description between smallholder's resource levels and their abilities to participate in new market opportunities. Those with critical resource limitations may not participate for not meeting up the minimum requirements. Resource limitations, such as land

food security, climate change, labour shortages, access to capital assets for sustainable and adequate food production, poor road network, storage, and marketing facilities, less competition and land fragmentation, all can serve to limit the ability of smallholder farmers from establishing connections with more viable markets.

Nigerian agricultural sector has undergone transformation over the past decades following a number of interventions. Despite these initiatives, several challenges remain in the optimisation of agricultural value chains. Some of these challenges are:

- Traders have little control on production and quality
- Quality enforced through price
- Loose and indirect chain coordination
- Profit lies in volume, not margins
- Chain governed by mostly internationally operated traders
- Low level of integration
- Production carried out in small plantations
- Traders outsource production by contract farming
- Lack of innovations in packaging and processing
- Profit mostly from primary production but not from value added generated

Conceptual framework

In this paper, we set out the broad argument that environmental factors play significant, and often decisive, roles in the agricultural value chain. In particular, smallholders face bigger challenges and obstacles, relative to big agro-allied companies, in the drive to take their produce beyond the farm gate to high-valued markets. Thus, in order to optimise value chain opportunities, smallholder farmers need to adopt a mix of technological innovations and strategies to overcome challenges in the value chain. Bringing together scholarly insights from value chain, institutional theory and strategy literatures, we therefore propose as follows:

Proposition 1: Conflict exacerbates human resources challenges and risks in the agricultural value chain.

The conflict will cause a sharp and substantial increase in prices for key agricultural crop exports within Nigeria and to the neighboring countries like Niger and Cameroon. This rise in prices is mainly due to a decrease in agricultural output, uncertainties at markets and an increase in transportation costs. This reduction in the output of crops is due to a combination of factors. First, there has been reduction in the availability of labor due to the threat of attacks on farmers on their way to their fields. Both farmers and farm laborers are afraid of attacks on the farms or bombs planted on the roads to farms. The lack of labor has caused inadequate and improperly timed weeding and harvesting.

Proposition 2: Multidimensional health crisis, such as Covid-19 pandemic has a negative impact on demand and local and domestic market opportunities for high valued agricultural products.

The COVID-19 pandemic affects the entire food system. It exerts a symmetric, but asynchronous shock on the global food system (Schmidhuber et al. 2020). It will affect all elements of the food system, from primary supply, to processing, to trade as well as national and international logistics systems, to intermediate and final demand. For developing countries, the rural dwellers which represent the local food system actors have been adversely affected by the impact of the pandemic as restrictions on movement are curbing farmers' access to markets to buy inputs and sell products which leads to accumulation of fresh produce at farms, resulting in food loss.

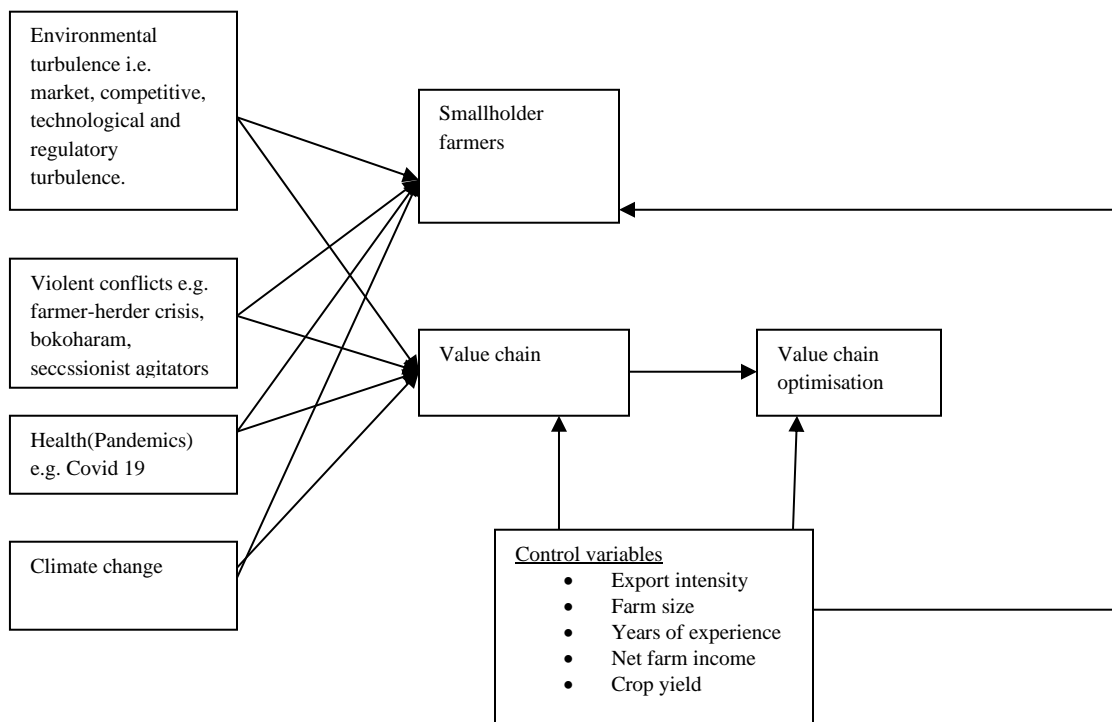


Figure 1: Conceptual model

Conclusion

This paper sought to explain process of optimising value chain in a turbulent environment by smallholder farmers in Nigeria. Value chains are key framework necessary for understanding how a product moves from the producer and value created before getting to the customer. Optimizing rural enterprise value chain requires inter-related and inter connected efforts. These relationships must be understood in order to introduce innovation, upgrade the value chain, meet market demand, and increase competitiveness. At the heart of value chain optimisation also is the effort to strengthen mutually beneficial linkages among firms and get smallholder farmers involved in order to capture existing and potential market opportunities. In essence, working within value chain requires establishing relationships that will benefit all stakeholders. The existing value chain for Nigeria reveals that some enablers are lacking and perhaps this is way substantial impacts have not been made.

This paper creates awareness about the different environmental turbulence that are existent in the Nigeria agricultural value chain hence smallholder farmers and other agricultural value chain actors could consider collaborating with different stakeholders in order to manage more efficiently and effectively environmental turbulence. Agricultural value chain actors need to improve their value chains transparency and increase market visibility at the producers point as well. Policy makers may enable that by increasing the traceability requirements in the value chain.

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