Research Article

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An assessment of broiler value chain in Nigeria

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Abstract: Livestock sub-sector of agriculture plays a vital role in the development of emerging economies in terms of provision of high quality protein and employment generation through its value chain activities. Yet, little is known about value chain development in this important sub-sector of the Nigeria economy. Hence, this study assessed Broiler Value Chain (BVC) in Nigeria. Primary data were collected from various actors along the value chain between November 2017 and March, 2018. Nigeria BVC is relatively simple with only five main actors. Grandparent Stock (GPS) farmers supply breeder Day Old Chicks (DOCs) to Parent Stock (PS) farmers. PS farmers supply commercial DOCs to commercial broiler farmers. Commercial farmers sell mature broilers to mature live broiler marketers (63%) and processors (37%). Processors sell processed meat to household consumers (12%) and 88% to fast food outlets, hotels, restaurants, and supermarkets with no export who in turn sell to individual and household consumers. High cost of feed, lack of credit facilities, and weak infrastructure were the major constraints facing production, marketing, and processing of broilers, respectively. Policies aiming at the development of BVC should focus on low/no export of broiler meat and high import of materials as well as other constraints.

Keywords: value chain, mapping, constraints, broilers, Nigeria

1 Introduction

Agriculture remains an important sector in many developing economies. Its contribution to provision of food, generation of employment, and poverty reduction attribute cannot be overemphasized. In Nigeria, agriculture is the most important non-oil economic activity as it contributes 24% of National GDP. The sector grew at a rate of 4.1% in 2016 and accounts for 75% of non-oil exports. The sector is made up of several sub-sectors which offer prospects for an enormous number of different enterprises. This makes it possible for a large number of the labour force (70%) to be engaged in various agricultural enterprises (National Bureau of Statistics (NBS) 2019; Food and Agricultural Organization (FAO) 2019). The four main sub-sectors of the agricultural sector are: crop, livestock, forestry, and fishery, of which the crop and livestock subsectors are the drivers of the agricultural sector with their respective growth share of 73.73 and 17.74%, respectively (NBS 2015).

Animal protein market trends are rising globally, and the sector is expected to be one of the fastest growing agricultural sectors in the coming decades. Consumers in emerging economies are moving away from spending on basic foodstuffs in favour of higher-value items including dairy, eggs, and meat (OECD/FAO 2016). According to World Bank (2017), in Nigeria, the growth rate of the livestock sub-sector (12.7%) was higher than that of the agricultural sector (6.8%) in 2017. The higher growth rate in the livestock sub-sector was a result of increase in consumer demand orchestrated by growing populations, a shift toward urban living, and increasing incomes. The socio-economic development and nutritional security of the country hinge on the sub-sector as it provides about 37% of the total protein intake of Nigerians (World Bank 2017). Protein products such as poultry and fish are increasingly capturing market share from red meat driven by fast food expansion, consumer preferences, competitiveness, and health concerns over the safety of red meat.

The poultry industry is growing rapidly across sub-Saharan Africa and offers a multitude of potential economic and health benefits to these economies and their

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populations (Shaw et al. 2019). The poultry enterprise with about 180 million birds is the most dynamic and fastest growing of the livestock sub-sector in Nigeria (FAOSTAT 2017). In 2016, poultry meat in Nigeria from about 180 million birds stood at 45,000 metric tonnes. The improvement was largely due to increase in the number of broilers which produced more meat per bird. The growth in the industry can remain inclusive and create opportunities for small-scale and emerging producers in the value chain.

As noted by Africa Sustainable Livestock 2050 (2018), the majority of the birds (44.44%) are reared with extensive system of management, about one-third are reared with semi-intensive system, while the remaining 22% are reared using intensive system of management. This points to the fact that the intensive system of management (where raising of broiler belongs) is underdeveloped in Nigeria. Though most popular, the extensive and semi-intensive systems of management are characterized with low level of productivity. However, the enterprise contributes between 30 and 50% to total household income and its potential to improve household income can be enhanced. The poultry industry is now a huge business that is split into several operations including grandparent stock (GPS) and parent stock (PS) farm, hatcheries, broiler and cockerel farms for meat production, and pullet farms for table egg production. Meat and egg production in Nigeria stood at 650,000 and 300,000 tonnes, respectively, in 2013 and it is the second largest chicken producer in Africa after South Africa (FAOSTAT 2017; United States Department of Agriculture (USDA 2013). Heise (2015) reported that the consumption of poultry meat will increase by 200% between 2010 and 2020 in Nigeria. This is expected to grow between 6 and 10% year-on-year between 2020 and 2025 (Nan-Dirk 2017).

Nonetheless, livestock productivity in Nigeria is low. The low productivity has negative implication on the economy. For instance, the country is unable to meet its domestic demand and had to rely on illegal importation of 70% of its poultry needs. The difference between domestic demand and supply is projected to widen in future (World Bank 2017). Also, it leads to low income levels of households engaged in livestock production and perpetuates vicious poverty cycle. The low productivity of livestock could be attributed to constraints, such as lack of high yielding local breeds, high cost of feed and feed products, poor infrastructural facilities, and inadequate market integration and value chain. Therefore, modernization of the sector and improving the productivity of livestock by addressing the constraints associated with poultry value chains becomes non-negotiable (World Bank 2017). It is widely believed that some of the production and financial markets constraints that smallholder livestock farmers faced can be alleviated using value chain approach that brings chain actors, such as, producers, marketers, processors, and other service providers together to gain control over activities at each node of the chain in order to reduce transaction costs and boost the competitiveness of the whole chain (Trienekens 2011).

The USAID defines value chain as the full range of undertakings which are required to bring a good or service from its outset to its end use, including all the distribution channels available to all businesses. Kuwornu et al. (2013) define a value chain as the series of events which are required to bring a good or service from production to the final consumers in the desired form and their utmost disposal after use. An agricultural value chain can be defined as a "structure of production, marketing and processing which brings each actor together to partake in organized activities to add value to a given product or service, from its production till it gets to the final consumer" (KIT, Agri-ProFocus and IIRR 2012). Various actors in broiler value chain (BVC) do value-adding activities until the meat produced gets to the final consumer.

Generally, the key actors in BVC are: input suppliers; farmers, marketers, processors, and final consumers. Both vertical (backward and forward) and horizontal integration exist among the actors in the value chain for the aim of ensuring effective flow of goods to satisfy their clients, create healthy competition, and enhance productivity that results in profit maximization for the value chain actors and overall development of the chain. The activities of the key actors in a given value chain can be categorized into three stages such as production, marketing, and processing, with each of the stages adding value to the produce (Nguyen 2010). Value chain analysis involves a methodical way of identifying, describing, and estimating the functions and associations of persons and establishments that exist in multifarious and dynamic settings and systems (Haggblade et al. 2020). It comprises knowing the movements of resources, goods, and value-adding activities among the different actors in the value chain. The broiler enterprise found in Nigeria qualifies as a value chain because it consists of input suppliers, broiler (breeders and commercial) farmers, marketers of mature live broilers, and processors. The chain is poorly developed due to weak linkages between the actors.

Few studies have been conducted on BVC in developed and developing countries. Joubert (2017) examined South African BVC. The focus of the study was on quantitative and qualitative analysis of South Africa broiler industry. The results show that the industry was complex

and made up of several role players interacting with each other through the system. The key actors identified as shown in the value chain map include: breeder farmers; commercial broiler farmers; and processors who dressed the chicken for local consumption and export. Irvine (2015) employed value chain analysis to assess veterinary surveillance system for poultry in Great Britain. He found that the main actors along the chain include the input supplier, producer, trader, processors, and consumers.

Ncube (2018) analysed BVC in Southern African and focused on linkages between corporate strategies, investments, and agro-industrial policies. The results of BVC mapping in Zambia and Zimbabwe identified GPS farmers, PS farmers, hatchery operators, broiler growers, processors, retailers, and consumers as the main actors in BVC. Likewise, Carron et al. (2017) explored value chain framework to study animal and product flows, governance, and sanitary risks on broiler meat system in Kenya. The main participants identified in BVC as indicated in the map were hatchery operators, veterinary service providers, broiler farmers, processors, brokers, retailers, and consumers. Mensah-Bonsu et al. (2019) examined BVC in Ghana based on gender. The study identified farmers and traders as the main actors in BVC and that, while male dominated the production stage, trading stage was dominated by women. Also, while the highest value was added by producers, the male actors added the highest value compared to their female counterparts.

From the foregoing, it is to be noted that differences exist in the identified participants in BVC across countries in the reviewed articles. That said, most value chain analyses are location- and commodity-specific (Mani et al. 2017). To the authors' best knowledge, little or nothing is known about BVC analysis in Nigeria. Such evidence becomes necessary for identification of challenges hindering the development of the broiler industry. It will allow for adequate planning for the industry so as to contribute to the reduction in the high rate of unemployment and support national food security policies of the government. Hence, this research focused on mapping of the BVC and constraints encountered by each of the actors along the value chain.

2 Materials and methods

2.1 Study area

The study was carried out in Nigeria. Bordered by the Niger Republic and the Republic of Chad to the north, the Republic of Cameroon to the east, and the Republic of Benin to the west, Nigeria has approximately 850 km of coastline on the Gulf of Guinea to the south. It is divided into 36 states, plus the Federal Capital Territory of Abuja. For ease of administration, each of the States is divided into three senatorial districts. The states are further grouped into six distinct Geopolitical Zones (GPZs) – North Central (NC), North East (NE), North West (NW), South East (SE), South South (SS), and South West (SW).

2.2 Research design

The survey design for this research was cross-sectional, where data from participants in the BVC were collected at a single point in time without repetition from the sample. The design is appropriate in descriptive study and for determination of the relationships between and among each participant's characteristics. It is also economical in terms of time and financial resources (Waziri 2013; Saqiba et al. 2018).

2.3 Sampling techniques and sample size

Multi-stage sampling techniques and snowball method were adopted for this research. At the first stage, SW and NC from the six GPZs were purposely selected. At the second stage, Oyo and Ogun States from SW, as well as Kwara and Benue States from NC, were purposely selected. The choice of the zones and states was based on the intensity of commercial broiler production in the areas. The third stage involved the purposive selection of two local government areas with high intensity of commercial broiler enterprise from each of the 12 senatorial districts. The lists of the commercial broiler farmers were obtained from the States' Poultry Association of Nigeria (PAN). The enumerators with the help of mature broilers market leaders assisted in compiling the list of their members in various markets that were into marketing of broilers. The fourth and final stage was the random selection of commercial farmers and traders. The GPS farmers, PS farmers, and processors were contacted using snowball method. This method was also adopted by Lubandi et al. (2019), where all the contacted actors throughout the selected states were interviewed.

Different pretested and well-structured questionnaires as well as focused group discussions were used to collect information from each of the five main actors in the chain. Information were gathered on quantity of

Table 1: Questionnaires distributed and response rate of each participant in the BVC

Participant	Copies of questionnaires distributed	Copies of questionnaires returned with useful information	Response rate (%)
Grand parent stock farmer	12	5	41.67
Parent stock farmer	50	35	70.00
Commercial broiler farmer	1,000	646	64.60
Traders	700	598	85.43
Processor	20	12	60.00
Total	1,782	1,296	72.73

Source: Authors' computation based on field survey (2017/2018) data.

inputs and their costs, quantity of outputs and their prices, relationships among actors as well as constraints faced at each node of the chain. The data were collected between November 2017 and March 2018. In total, one thousand, seven hundred and eighty-two copies of questionnaires were distributed, but only one thousand, two hundred and ninety-six contained useful information for the analysis (72.73% response rate) as shown in Table 1. The key issues that this research addressed are mapping of the value chain and constraints at each node of the value chain.

2.4 Analytical techniques

Information collected were coded into Microsoft Excel spreadsheet and analysed with descriptive statistics and value chain mapping.

3 Results and discussion

3.1 Characteristics of the sampled actors in the chain

The demographic characteristics of the respondents are presented in Tables 2 and 3. The mean age of GPS farmers, PS farmers, commercial farmers, mature broiler marketers, and processors stood at about 55, 46, 44, 43, and 49 years, respectively. The GPS farmers were relatively older on the average than other actors. This might be because of high level of experience required for the activity in the chain. Average household size of each of the actors was 6 persons. This is, however, higher than the recommended national household size of 4. Mean years of schooling was highest for GPS farmers (15 years), while the traders had the least (about 10 years). This signifies that they could read instructions on products purchased and keep adequate records. While the GPS farmers had the highest average years (14.6) of experience in the enterprise, the commercial farmers had the least (6.9) of experience. The participants are expected to use the experience gathered over the years to improve on the performance of the chain.

While the production activities as well as processing were dominated by males, females were more prominent at the marketing node of the chain. This might not be unconnected with the perception that commercial broiler production and processing is a strenuous occupation which can only be handled by males, in addition to the high start-up capital at these nodes of the chain which females may not have. The results corroborate the submission of Tuyttens et al. (2014), Mbuza et al. (2017), and Mensah-Bonsu et al. (2019). The proportion of producers who operated hatchery and feed mill and have processing unit was very low. The low level of integration of each of these actors may affect their level of competitive advantage which may also result in inadequacy of supply of inputs from them. Access to credit was quite low among the actors in the BVC except for the GPS farmers. The low access to credit by operators in agriculture-related activities in the country has been a major challenge. This perhaps may be as a result of high risks associated with the sector. Similar observation was made by Adeyonu et al. (2017) and Mensah-Bonsu et al. (2019). All the GPS farmers were members of association and above one-third of other producers were members of PAN. Membership of association will make it easy for actors to receive support from one another and may increase their access to information as well as opportunity to learn from one another and share risk in the value chain (Jitmun et al. 2019; Jitmun and Kuwornu 2019; Sathapatyanon and Kuwornu 2019). Also, over one-third of the actors except GPS had other means of livelihood. The involvement of the

Table 2: Demographic characteristics of main participants along the stages of the chain (continuous variables)

Variable	Production (breeder farmer)		Production (commercial farmer)	Marketing (marketers)	Processing (processor)
	GPS	PS			
Age (years)					
Mean	55.4	46.0	43.76	42.74	49.17
Std. dev.	3.13	7.90	8.71	9.25	3.41
Minimum	52	33	22	18	44
Maximum	58	62	66	80	57
Household size					
Mean	5.6	5.5	5.60	5.76	5.8
Std. dev.	0.89	2.6	2.05	2.82	1.53
Minimum	4	3	1	1	4
Maximum	6	13	15	18	9
Education (years)					
Mean	15	14.31	13.44	10.3	12.25
Std. dev.	0.00	1.28	2.89	4.71	4.14
Minimum	15	12	0	0	0
Maximum	15	15	15	15	15
Years of experience					
Mean	14.6	9.26	6.90	10.30	13.58
Std. dev.	6.43	6.29	4.61	7.15	6.17
Minimum	7	3	2	1	3
Maximum	24	32	35	35	25

Source: Authors' computation based on field survey (2017/2018) data.

actors in other income earning activities may be attributed to the high risk associated with production and the seasonality in the demand and supply of both mature live broilers and processed chicken. The demand for broiler meat is only high during festivities in the country.

3.2 BVC mapping (1$ = ₦500 at parallel market as at the time of survey)

Value chain mapping for broilers refers to making a pictorial illustration of the links between actors and various enterprises in the value chain. The map shows the movement of broilers from producers (farmers) to final consumers and the interrelationship among various actors in the broiler industry in graphic terms. Figure 1 shows the main actors involved in BVC. This study focused on actors that are highlighted orange in the map. As shown in the figure, five main actors (highlighted orange) considered are: GPS farmers, PS farmers, commercial broiler farmers, marketers, and processors. This result is tandem to the report of Oloso et al. (2019). These main actors receive supportive services from feed suppliers, veterinary personnel, hatchery operators as well as processing plant suppliers which are also indicated on the map.

3.2.1 Grandparent stock farmers

The farmers import grandparent day old chicks (DOCs) and/or eggs from Europe due to lack of genetically viable local breed, purchase feed and/or feed ingredients, feeders and drinkers, drugs and vaccines, and other inputs from suppliers. The grandparent DOCs are reared for about 22–24 weeks when they start laying eggs under the supervision of a Veterinary Doctor. About four weeks after, the eggs are sold to PS farmers and/or sent to the hatchery for 21 days. For those who imported grandparent eggs, the eggs are sent to hatchery for 21 days and the grandparent DOCs produced are reared till when they start laying and the eggs are sold to PS farmers. Importation of genetically viable DOCs is a constraint in the development of the chain in addition to the pressure it puts on the exchange rate, thereby influencing the economy negatively. The importation of grandparent DOCs is contrary to the submission of Carron et al. (2017) who reported that selection of GPS was done locally in Kenya.

Table 3: Demographic characteristics of main participants along the stages of the chain (categorical variables)

Variable	Production (breeder farmer)		Production (commercial farmer)	Marketing (trader)	Processing (processor)
	GPS	PS			
Sex					
Male	100	82.86	75.85	29.93	83.33
Female	0	17.14	24.15	70.07	16.67
Marital status					
Married	100	100	90.40	89.63	83.33
Single	0	0	9.60	10.37	16.67
Operate hatchery					
Yes	20	35.42	NA	NA	NA
No	80	64.58			
Operate feed mill					
Yes	0	14.29	10.99	NA	NA
No	100	85.71	89.01		
Process broiler					
Yes	0	22.86	5.57	24.75	100
No	100	77.14	94.43	75.25	0
Access to extension services					
Yes	0	14.29	26.93	NA	NA
No	100	85.71	73.07		
Access to credit					
Yes	100	31.43	39.16	33.44	8.33
No	0	68.57	60.84	66.56	91.67
Membership of cooperative society					
Yes	100	25.71	60.06	67.22	58.33
No	0	74.29	39.94	32.78	41.67
Membership of poultry association of Nigeria					
Yes	100	42.86	38.08	NA	NA
No	0	57.14	61.92		
Possess Nigerian agricultural insurance commission's certificate					
Yes	20	42.86	10.84	NA	NA
No	80	57.14	89.16		
Other means of livelihood					
Yes	0	40.00	36.69	40.64	33.33
No	100	60.00	63.31	59.36	69.67

Note: NA implies Not Applicable.
The figures indicated are the percentages of each category of variables for each participant.
Source: Authors' computation based on field survey (2017/2018) data.

3.2.2 Parent stock farmers

These set of farmers purchase PS DOCs from GPS farmers or also import DOCs from Europe and purchase feed and/or ingredients, feeders and drinkers, drugs and vaccines, and other inputs from their suppliers. The parent DOCs are reared for about 22–24 weeks when they start laying eggs under the supervision of a Veterinary Doctor. About four weeks after, the eggs are sent to hatchery for 21 days and the commercial DOCs produced are sold to local commercial farmers and DOCs distributors with no export.

3.2.3 Commercial broiler farmers

Commercial broiler farmers: The farmers purchase commercial DOCs from PS farmers and/or distributors and other inputs as in the case of GPS and PS farmers. Birds are reared for about 6–10 weeks with or without the services of a Veterinary Doctor and then sold to local consumers, live broiler marketers, and processors. While weighing of broilers to local consumers and live broiler marketers was not popular, birds were sold to processors/kg at the rate of ₦500–₦1,300 with the average selling price of ₦856.72. The high price recorded may not be unconnected with the

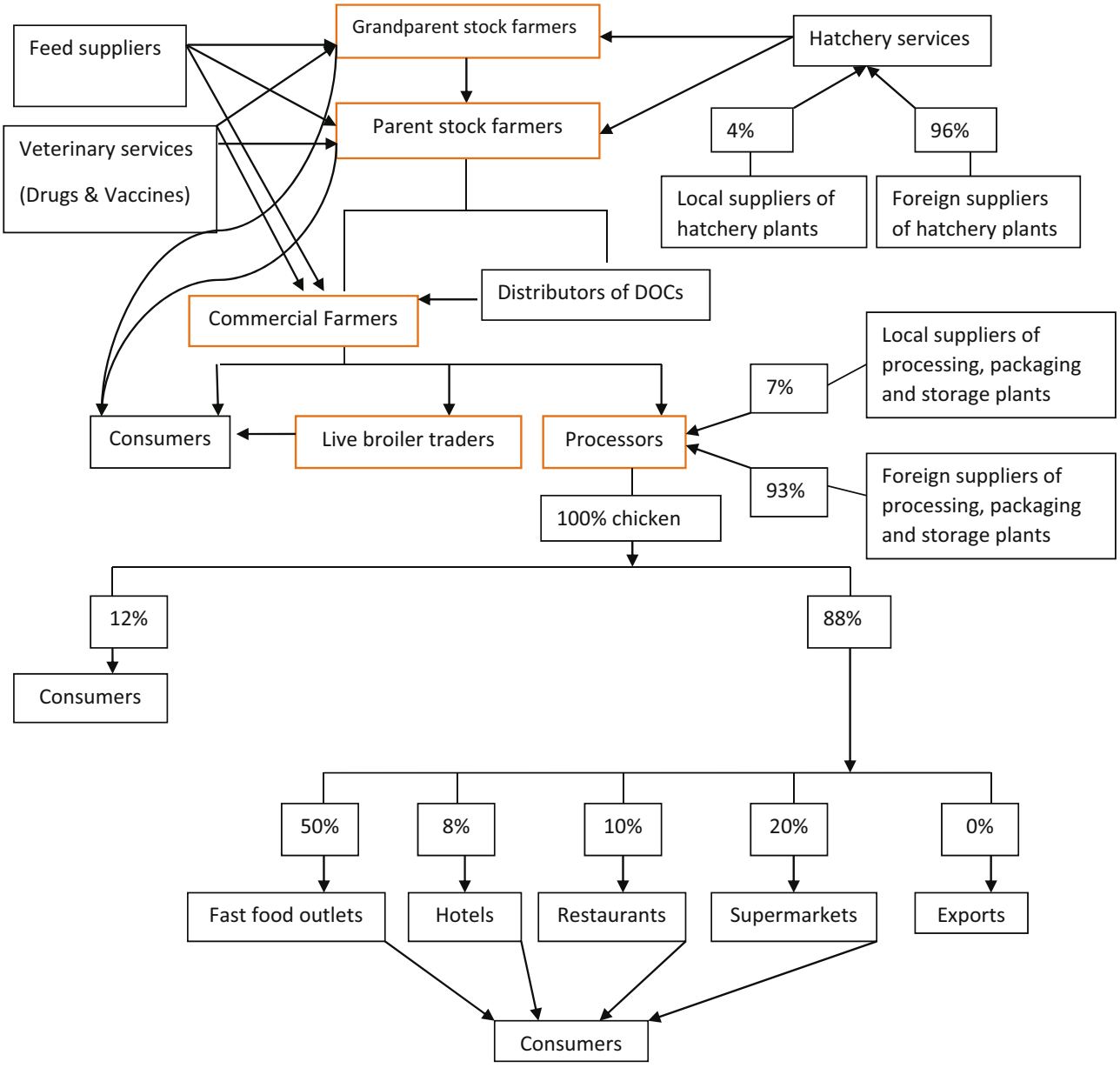

Figure 1: BVC mapping in Nigeria. Only the actors highlighted orange were considered for this study. Source: Adapted from Irvine (2015); Carron et al. (2017); Ncube (2018); Mensah-Bonsu et al. (2019) and modified.

fact that Nigeria economy went into recession between 2016 and 2017 and this survey was conducted during the last quarter of 2017 and first quarter of 2018.

3.2.4 Live broiler marketers

These actors buy mature live broilers (from 8 weeks old) from commercial broiler farmers in bulk and sell in small quantity to household consumers and occasionally in large quantity to group of people for the purpose of one celebration or the other. The birds are neither weighed before purchasing from the farmers, nor were they weighed before selling to each of the consumer categories. Prices were fixed based on the size of the birds and the season of the year. Average price range/bird as at the time of the survey was ₦1,700–₦3,500.

3.2.5 Processors

They purchase mature live broilers from commercial farmers; purchase and install processing and packaging plants from marketers; purchase and install storage plants and other processing and packaging equipment from their suppliers. The birds are then processed, packaged and weighed as whole chicken, cut chicken, gizzard, as well as heads and legs. The packaged chicken are sold at between ₦870–₦1,100 per kilogram with the mean price of ₦955.83 per kilogram. The sales of processed chickens are done to household consumers (12%) and others (88%). Others here refer to fast food outlets (50%), hotels (8%), restaurants (10%), and supermarkets (20%) who in turn sell to either individual or household consumers with no export. Gizzard and heads/legs are also sold to both household consumers and other outlets.

The results showed that the chain was fairly short with moderate number of participants and low level of coordination among them. The commercial farmers are the most coordinated of all the actors involved in the chain. They were able to achieve this by adequately managing the key inputs used in the production of mature live broilers and keeping adequate record of the same. The commercial actors are said to be efficient due to their ability to produce relatively consistent quality at a large scale for large customers (Ncube 2018).

3.3 Internal and external governance in BVC

The BVC in the country is largely informal in structure and this has great effect on the governance in the value chain. Our findings show that there is free entry into the value chain and free exist at any of the nodes. The majority of the farmers (breeders and commercial) are independent producers, and as such, linkages in the value chain are market-oriented. As shown in Figure 1, most of the GPS, PS, and commercial farmers sell directly to consumers, thus bypassing live broiler marketers and processors. Given the several elements and actors with little or no coordination in BVC, it is a bit difficult to establish who chain leader is, and as such, maintenance of ethics and rules is difficult. Determination of prices is subject of nexus of demand and supply. That said, it is worthy of note that in some of the mature live broiler markets, the market leaders do control number of broilers to be brought to the market on any market day, especially during festivals. This they do to prevent glut, thereby ensuring relatively high price. Our result of the informal nature of the BVC is similar to what Ncube (2018) reported on BVC in Zambia and Zimbabwe.

Concerning institutional drivers, due to non-availability of genetically viable local breed of broilers, farmers are allowed to import grandparent and parent DOCs and/or eggs as well as commercial DOCs from Europe. In the same vein, government of Nigeria placed ban on importation of frozen chickens since 2002 to reduce competition from foreign producers. Despite the ban on importation of frozen chickens, illegal importation of frozen chickens into the country mainly from Benin Republic is still on. This is because the imported products were cheaper than locally processed ones. Also, there is no state regulation on the quality of processed meat sold to consumers.

From the foregoing, while it is clear that no singular actor can be said to be the chain driver, the role of government is having little impact on BVC in the country.

3.4 Constraints in BVC

In analysing the constraints along the stages of BVC, the various activities performed by the actors were grouped into three. The activities are: production (performed by GPS, PS, and commercial farmers), marketing (performed by mature live broiler marketers), and processing (performed by processors). The constraints are presented in Tables 4–6.

3.4.1 Constraints in broiler production

Table 4 shows that the majority of the actors in production reported that high cost of DOCs, (33.97%), high cost of feed (54.66%), and outbreak of diseases (33.82%) were the extremely important constraints in broiler production. Reduction in productivity as a result of disease outbreak could have effect on food security. This is consistent with the submission of Rana et al. (2012), Anang et al. (2013), Ocholi and Ayila (2018), and Mensah-Bonsu et al. (2019). The least of the constraints in broiler production as indicated by the actors were high interest rate (29.15%), theft (13.27%), and poor road network (11.66%). The result on road network contradicted the opinion of Mensah-Bonsu et al. (2019) who revealed that poor road network was a major constraint in broiler production in Ghana.

Table 4: Constraints in broiler production (GPS, PS, and commercial; $n = 686$)

Constraint	Not at all important	Moderately important	Important	Very important	Extremely important
High cost of day old chicks	35 (5.10)	72 (10.50)	153 (22.30)	193 (28.13)	233 (33.97)
High cost of feed	17 (2.48)	18 (2.62)	78 (11.37)	198 (28.86)	375 (54.66)
Unavailability of high quality chicks	47 (6.85)	71 (10.35)	196 (28.57)	233 (33.97)	139 (20.26)
High chicks mortality rate	42 (6.12)	76 (11.08)	104 (15.16)	303 (44.17)	161 (23.47)
Lack of credit facilities	30 (4.37)	81 (11.81)	182 (26.53)	289 (42.13)	104 (15.16)
Unreliable market	27 (3.94)	79 (11.52)	139 (20.26)	320 (46.65)	121 (17.64)
Heat stress	54 (7.87)	69 (10.06)	153 (22.30)	292 (42.57)	118 (17.20)
Outbreak of diseases	72 (10.50)	53 (7.73)	128 (18.66)	201 (29.30)	232 (33.82)
Inadequate availability of vaccines/ vaccine failure	74 (10.79)	83 (12.10)	210 (30.61)	256 (37.32)	63 (9.18)
Poor road network	80 (11.66)	105 (15.31)	206 (30.03)	226 (32.94)	69 (10.06)
Theft	91 (13.27)	78 (11.37)	162 (23.62)	225 (32.80)	130 (18.95)
Lack of agripreneurial training	70 (10.20)	92 (13.41)	209 (30.47)	242 (35.28)	73 (10.64)
High interest rate	200 (29.15)	94 (13.70)	169 (24.64)	151 (22.01)	72 (10.50)

Note: Figures in parenthesis are percentages.
Source: Authors' computation based on field survey (2017/2018) data.

Table 5: Constraints in broiler marketing

Constraint	Not at all important	Moderately important	Important	Very important	Extremely important
High cost of broilers	15 (2.51)	77 (12.88)	204 (34.11)	133 (22.24)	169 (28.26)
Lack of credit facilities	58 (9.70)	86 (14.38)	162 (27.09)	231 (38.63)	61 (10.20)
High interest rate	45 (7.53)	141 (23.58)	171 (28.60)	180 (30.10)	61 (10.20)
High mortality rate	41 (6.86)	90 (15.05)	157 (26.25)	184 (30.77)	126 (21.07)
High market levy	53 (8.86)	107 (17.89)	204 (34.11)	177 (29.60)	57 (9.53)
Seasonality of demand	30 (5.02)	69 (11.54)	133 (22.24)	224 (37.46)	142 (23.75)
Seasonality of supply	29 (4.85)	67 (11.20)	161 (26.92)	220 (36.79)	121 (20.23)
Weak infrastructure (roads)	27 (4.52)	72 (12.04)	170 (28.43)	215 (35.95)	114 (19.06)

Note: Figures in parenthesis are percentages.
Source: Authors' computation based on field survey (2017/2018) data.

Table 6: Constraints in broiler processing

Constraint	Not at all important	Moderately important	Important	Very important	Extremely important
High cost of mature broilers	3 (25.00)	0 (0.00)	1 (8.33)	1 (8.33)	7 (58.33)
Unavailability of high quality live broilers	4 (33.33)	2 (16.67)	3 (25.00)	3 (25.00)	0 (0.00)
Lack of credit facilities	0 (0.00)	1 (8.33)	3 (25.00)	4 (33.33)	4 (33.33)
High interest rate	0 (0.00)	1 (8.33)	7 (58.33)	2 (16.67)	2 (16.67)
High mortality rate	0 (0.00)	1 (8.33)	4 (33.33)	2 (16.67)	5 (41.67)
High cost of processing plant and equipment	0 (0.00)	0 (0.00)	1 (8.33)	7 (58.33)	4 (33.33)
Seasonality of demand	4 (33.33)	0 (0.00)	2 (16.67)	0 (0.00)	6 (50.00)
Weak infrastructure (electricity and roads)	0 (0.00)	1 (8.33)	0 (0.00)	1 (8.33)	10 (83.33)
High cost of storage facilities	0 (0.00)	1 (8.33)	0 (0.00)	2 (16.67)	9 (75.00)
Lack of training	2 (16.67)	2 (16.67)	5 (41.67)	1 (8.33)	2 (16.67)
Lack of competent mechanic	4 (33.33)	4 (33.33)	2 (16.67)	1 (8.33)	1 (8.33)

Note: Figures in parenthesis are percentages.
Source: Authors' computation based on field survey (2017/2018) data.

3.4.2 Constraints in marketing of live broilers

Table 5 shows that the reported prominent constraints were lack of credit facilities, seasonality in demand for live birds and supply of live birds as well as poor road networks as indicated by over 35% of the actors. This observation concurs with the submission of Shaw et al. (2019). The seasonality in demand and supply implies that a majority of the marketers were on and off business depending on the nexus of demand and supply. The poor road network prevented them from reaching farms located in remote areas and served with poor road networks. The finding on lack of access to credit is in agreement with the submission of Mbuza et al. (2017). The least of the constraints in marketing of live broilers is high interest rate as reported by about 24% of the respondents.

3.4.3 Constraints in broiler processing

Table 6 shows that high cost of mature broilers (58.33%), weak infrastructure (electricity and road) (83.33%) as well as high cost of storage facilities ranked among the first three extremely important constraints confronting broiler processing in the study area. The identified constraints will impact negatively the efficiency of broiler processing and the entire BVC. Unavailability of high quality broilers and lack of competent mechanics were the two factors reported not to be detrimental to broiler processing enterprise as indicated by 16.66 and 33.33% of the actors at the processing node of the chain, respectively.

4 Conclusions

This study has examined BVC in Nigeria by mapping BVC and identifying the constraints at every node of the chain. The study identified five main actors in BVC and the level of integration among the actors in the country. Other supporting actors are also shown in the map. BVC in the country is still at informal stage with little or no level of coordination among the actors. Each node of the chain is plagued with numerous constraints which have been hindering the development of the BVC in the country. Broiler farmers showed that high cost of feed, unreliable market, and disease outbreak are the foremost constraints; marketers indicated that lack of credit facilities, seasonality in demand and supply as well as poor road networks are the most pressing constraints; while the processors fingered at weak infrastructure, high cost of storage facilities, and high cost of mature broilers as the most worrisome of the constraints.

To improve BVC in the country, the following recommendations were made:

- There should be improvement on the level of coordination among the actors. This will help in the development of the value chain, thereby addressing the lack of poultry meat export in the country.
- Stakeholders in the feed industry should work on production of high quality and cheap feed to lower the cost of producing broiler.
- National Animal Production Institute and National Veterinary Research Institute should collaborate with other related research institutes to develop improved and disease-resistant breed of broilers. This will go a long way to solve the challenge of high cost of DOCs and disease outbreak.
- Investment in infrastructural facilities will benefit all the actors in BVC either directly or otherwise.
- Agricultural engineers and other related stakeholders should focus more on production of simple processing and storage facilities which will reduce dependence on imported ones that are out of reach of processors.
- Bank of Agriculture and other financial institutions should make credit accessible to actors in BVC.
- Ministry of Agricultural Resources and Rural Development in collaboration with NBS should embark on comprehensive national survey on BVC in the country without further delay. This will ensure availability of data that will guide formulation of policies that will enhance the development of BVC in the country.
- Government should enforce the ban on importation of frozen chicken to promote local production and ensure quality control of processed chicken by relevant authority.

This study has limitations, notable among which are:

- The study was restricted to one zone each from the northern and southern parts of the country. The zones are south west and north central due to the concentration of broiler farms in the zones. Future research can extend the study to other parts of the country to provide a more generalizable conclusion.
- This research focused on five main actors (GPS farmers, PS farmers, commercial broiler farmers, marketers, and processors), while other actors indicated on the map were omitted. Hence, future study can push the frontiers of knowledge by including the omitted actors.
- Furthermore, this study was only able to map the actors and their activities along the chain with constraints encountered at each node of the chain. Hence, further studies for estimating the value added by each actor as

well as the level of employment generated at each node are required.

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