



Ministry of Foreign Affairs

POULTRY SECTOR STUDY NIGERIA

Commissioned by the Netherlands Enterprise Agency

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International.*

POULTRY SECTOR STUDY NIGERIA



Executive Summary

Nigeria's poultry production has grown steadily this century, despite the myriad of challenges faced. According to Rabobank's 2017 report (A Time for Africa), the four West African countries of Ghana, Nigeria, Côte d'Ivoire and Benin show the most potential for poultry sector development, in terms of increasing local demand and the incentives available, both fiscal and non-fiscal.

As part of its response to the prospects presented by that information, the Dutch Government is showing increasing interest in West Africa's poultry sector, with a view to stimulating entrepreneurship, agricultural development and innovation in the sub-region. It is in this vein that the Dutch Government commissioned this study.

This study was commissioned to provide deeper insight into Nigeria's poultry industry; to understand the needs of both the public and private sectors, and to understand how these needs can be met by Dutch private sector capabilities, knowledge sharing, technologies and skills.

Agriculture accounts for 35% of Nigeria's GDP. Before the ascendancy of oil, agriculture was the country's major earner of foreign currency. Now that oil is on the decline, there is great clamour for diversification of the Nigerian economy. This has redirected attention to agriculture and now the government of Nigeria is paying unprecedented attention to agricultural development – both as an instrument for reducing the nation's import bill and as a potential leading source of foreign currency.

The Nigerian poultry industry contributes approximately 25% to agricultural GDP. Since about 2008, there has been a deliberate national drive to promote agriculture as business. The federal government encouraged farmers to upgrade from subsistence to commercial agriculture. In fact, a financial intervention scheme was launched in this regard, the Commercial Agriculture Credit Scheme (CACS). The Nigerian poultry industry, being the most well-organised sub-sector in the agriculture sector and contributing 25% of the total agricultural contribution to GDP, was well positioned to benefit from this and other measures. The poultry industry has also witnessed tremendous technical improvement over the last decade and continues to contribute to achieving Nigeria's food sufficiency and economic growth.

This study covers Production systems and processes; Policy and Regulatory environment; Capacity, knowledge, technology, training and education gaps, and Markets for poultry products and by-products. It also examines how Nigeria's agricultural policies in recent times have affected the poultry business. The importation of poultry meat and table eggs into Nigeria has been banned for at least two decades, but the enforcement has only become effective over the past four years. This has had a major positive impact on poultry production in the local market.

With an ever-growing urban population, an expanding middle class and an improving rural economy, demand for meat is sure to increase over the years. Poultry production offers a very fast and healthy approach to meeting the growing demand for animal protein. With government protection for the local producers against unfair international competition, the Nigerian poultry industry is likely to maintain a positive trajectory. Thus,

35%

of Nigeria's GDP's is from Agriculture.

25%

of Nigeria's poultry business contribution to GDP



Poultry production offers a very fast and healthy approach to meeting the growing demand for animal protein.



numerous new investments are appearing in the poultry value chain.

Enthusiasm regarding economic opportunities in the poultry sector must, however, be balanced with an awareness of the challenges. A major source of concern to stakeholders in Nigeria is the sourcing and structuring of credit finance for the poultry business in Nigeria. Within a short period, many commercial farms have started with enthusiasm but soon collapsed, for reasons that are more financial than technical.

The size, cost and repayment structure of the financing made available to poultry farmers often do not suit the schedule / cycle of the business, so farmers end up defaulting on payments and losing their investments. In this report, we identify five key issues that would need to be addressed to secure continued growth for Nigeria's poultry industry.

Improved access to finance, especially for medium- and small-holder farmers, with better financing costs and structures for all poultry farmers. Work on financial training for banks working with the agriculture sector.

Stabilise the policy and regulatory environment to encourage long-term planning and investments while boosting investor confidence. In addition, make room for refurbished poultry equipment.

Develop local markets to further incentivise production and minimise fluctuations caused by speculator activities.

Encourage / Promote all-year round availability of good quality and cost-efficient inputs and / or raw materials for feed manufacturing; veterinary inputs; good quality DOCs, technology and equipment.

More sector-specific training and education, especially at lowest (poultry attendant / secondary school leaver) and highest (expert / specialist) levels. Develop practical training courses / curriculum for farm hands and farm managers.

Dutch companies are already active in Nigeria and it is the Dutch Government's desire that their investments and those of other Dutch companies not yet active in Nigeria will contribute to continued growth of the sector.



Disclaimer COVID 19

The whole content of this report is based on information collected before the outbreak of the COVID 19 pandemic. Although the potential of the poultry sector in Nigeria remains high, it is likely that the measures against the virus will bring structural changes in the market predictions and market structure in the country and the global economy. The influence of the COVID 19 outbreak and corresponding measures are however not cooperated in the report.

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List of Acronyms

CACS	Commercial Agriculture Credit Scheme
DAPP	Dutch Africa Poultry Platform
DOC	Day Old Chicks
EUR	Euro
FAO	Food and Agriculture Organization
FIPAMAT	Funtuna Institute of Poultry and Aquaculture Management Technology
FMARD	Federal Ministry of Agriculture and Rural Development;
FUNAAB	Federal University of Agriculture Abeokuta
GDP	Gross Domestic Product
IAR&T	Institute of Agricultural Research and Training
LBM	Live Bird Market
L-MIRA	Livestock and Micro reforms in Agribusiness
MMT	Million Metric Tonnes
NABC	Netherlands Africa Business Council
NAFDAC	National Agency for Food and Drug Control
NGOs	Non-Governmental Organisations
NIAS	National Institute of Animal Science
NIRSAL	Nigeria Incentive-Based Risk Sharing Scheme for Agricultural Lending
PAN	Poultry Association of Nigeria
PPP	Private Public Partnerships
PS	Parent Stock
RVO	Netherlands Enterprise Agency
SON	Standards Organisation of Nigeria
USA	United States of America
VCN	Veterinary Council of Nigeria

1. Introduction

7bn People

The world population is increasing, with already more than 7 billion people on the planet. The population is expected to increase to 9.7 billion people by 2050. A large part of that worldwide growth will take place in Africa, where the population in sub-Saharan Africa is expected to double by 2050.



Nigeria is seen as one of the nine countries where the increase in the world population will be concentrated. It is expected that the population there will double from 201 million in 2019 to 401 million in 2050.

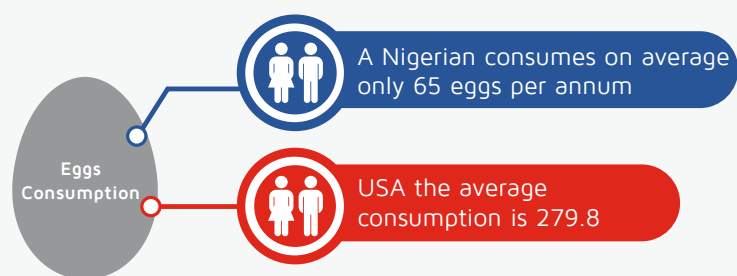
Table 1: Nigeria's Population

Year	2000	2005	2010	2015	2020	2025	2030
Nigerian population (millions)	122.28	138.87	158.5	181.14	206.14	233.34	262.98
Urban (%)	38%	41%	43%	48%	52%	57%	61%
Rural (%)	62%	59%	57%	52%	48%	43%	39%
Annual Growth Rate	2.54%	2.64%	2.67%	2.59%	2.48%	2.39%	**1

Source: <https://tradingeconomics.com/nigeria/urban-population-wb-data.html>



This population growth is also accompanied by rapid rural-urban drift and an expansion of the middle class. This has meant an increasing demand for meat which has outstripped supply. In addition, the contradictions surrounding the production, movement and supply of other sources of protein, such as beef, have further awakened interest in poultry as a convenient source of animal protein. Consequently, many traditional backyard-based poultry farms have given way across Nigeria to medium-sized integrations and a sizeable number of commercial farms. In fact, the poultry industry in Nigeria is reputed to be the most organised Industry group in the animal production sector.



whereas in the. The situation is similar with poultry meat, as Nigerians consume on average only 1.9 kg per capita, compared to 49.3 kg for the USA, 32.98 kg for South Africa and 7.67 for Ghana.



Despite these low per capita consumption rates, there is currently a supply deficit. Meanwhile, with economic growth among both urban and rural populations, the demand for poultry products is going to rise as a natural consequence of improved purchasing powers.



To safeguard the economy, the Nigerian government has put in place several policies to promote local food production (including poultry). The ban on the smuggling / importation of poultry products has been increasingly enforced over the past few years.

The government has also rolled out several stimulus packages for the poultry sector. It was no surprise, therefore, to see Nigeria was listed in Rabobank's report of 2017 as one of the countries set to grow its poultry sector by 6-10% year-on-year between 2015 and 2025 (Time for Africa, Rabobank 2017).

More recently, there has also been more emphasis on educating stakeholders to look beyond mere production and to focus rather on developing or upgrading the entire poultry value chain.

Though it is agreed that there is knowledge and experience deficit, more resources are now being deployed by government and non-governmental organisations to develop capacity across the poultry value chain. All these measures can only lead to improved fortunes for the industry and all the stakeholders.

The Netherlands is very active in poultry development in Africa. Private companies, educational and research institutes, NGOs and the Dutch government are all involved in various aspects of developing the poultry sector in many countries across the continent. The private sector works together through the Dutch Poultry Centre (<http://www.dutchpoultrycentre.nl/>) and is strongly represented in Africa by the activities of the Netherlands Africa Business Council (NABC) through the DAPP (Dutch Africa Poultry Platform).

" The Netherlands is very active in poultry development in Africa. Private companies, educational and research institutes, NGOs and the Dutch government are all involved in various aspects of developing the poultry sector..."

1.1 Background to the study

The aim of this study is to gain better insight into one of the focus sectors of the Embassy of the Kingdom of the Netherlands in Nigeria; to understand the needs of both the public and private sectors, and to understand how these needs can be met by Dutch private sector capabilities, knowledge sharing, technologies and skills. As such the main objectives of this study are to:

- analyse the Nigerian poultry subsector;
- identify ways to strengthen the local private sector with Dutch knowledge, technology and expertise;
- identify potential market opportunities for Dutch businesses; and
- map opportunities for bilateral collaboration between the Dutch and Nigerian governments.

To realise those objectives, sub-themes have been identified to support the research methodology and report structure, as shown in Table 2 below.

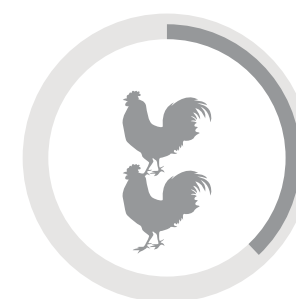
Table 2: Detailed description of the sub-themes selected.

No.	Theme	Description
1.	Production systems and processes	The objective here is to identify current practice and how it would relate to the technology and knowledge available in the Netherlands. It includes the identification of the location of all major stakeholders in Nigeria's poultry-related products production.
2.	Policy and Regulatory environment	This question extends to import regulations and all duties due on any imported goods required for production and processing of poultry products. The challenge is to identify also what regulations exist and how they are enforced in Nigeria. At the national and regional levels, such regulations play a significant role, as they can make or break a business.
3.	Capacity, knowledge, technology, training and education gaps	Better insights into these issues, i.e. available capacity, levels of skills across the value chain, technology currently in use, etc., would give a good indication of market maturity and the opportunities for developing the sector.
4.	Market	The question regarding markets was limited to inputs for production and market prices for the finished products.

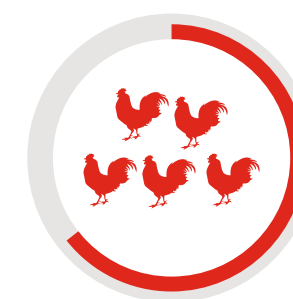
1.2 Methodology

This data collection was undertaken over a period of two months and consisted of two main lines of activity. The first activity was data gathering, carried out from November to December 2019. It started with selection and training of enumerators, who then went into the field for data gathering. Data on production and major players was gathered in five out of the six geo-political zones of the country (excluding North-East Nigeria, which is affected by the Boko Haram crisis and where there is no significant poultry activity).

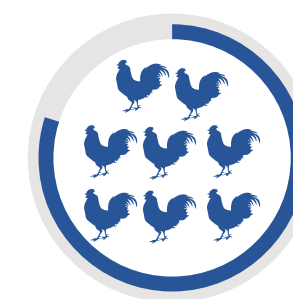
The second activity was a field visit conducted in December 2019 by a combined team of one Dutch and two Nigerian team members. The team visited private and public poultry sector stakeholders, whose comments and opinions are reflected in this report. We applied the following classification for farmers in this study:



Small-scale farms:
capacity of
1 to 2,500 birds



Medium-scale farms:
capacity of 2,501 to 10,000
birds



Large-scale farms:
capacity of over 10,000 birds

The study was carried out in the three broad regions of Nigeria namely South West, South East / South South and North West / North Central. Farmers were sampled from 25 states across the country. The visits can be categorised / enumerated as follows:

Table 3: Sample size and Geographical scope of the respondents













Zone	States Sampled	Layer Farms	Broiler Farms	Total
South West	Oyo, Osun, Ogun, Ondo, Ekiti and Lagos	90	60	150
South East & S/South	Abia, Akwa Ibom, Rivers, Anambra, Bayelsa, Ebonyi, Edo, Delta, Imo and Enugu States	45	30	75
North West & N/Central	Benue, FCT, Kaduna, Kogi, Kwara, Narawa, Niger, Plateau and Sokoto	45	30	75
Total		180	120	300















2. Nigeria Poultry sector

Nigeria's population is currently estimated to be approximately 200 million people, while the nation has a land mass of 910,770 km². Of that population, 49.52% live in urban areas, with 50.48% living in rural areas. Lagos, the commercial nerve centre of the nation and Nigeria's mega-city, is home to about 20 million people; most of them live in urban settlements. The meaning of this is that at least 20% of Nigeria's urban population is domiciled in the Lagos area.

Table 4: Nigerian States

No.	State	Population per state (2016)	% share of total
	Kano	 13,076,900	7%
	Lagos	 12,550,600	6%
	Kaduna	 8,252,400	4%
	Oyo	 7,840,900	4%
	Katsina	 7,831,300	4%
	Rivers	 7,303,900	4%
	Bauchi	 6,537,300	3%
	Borno	 5,860,200	3%
	Jigawa	 5,828,200	3%
	Benue	 5,741,800	3%
	Delta	 5,663,400	3%
	Niger	 5,556,200	3%
	Anambra	5,527,800	3%
	Akwa Ibom	5,482,200	3%
	Imo	5,408,800	3%
	Ogun	5,217,700	3%
	Sokoto	4,998,100	3%
	Osun	4,705,600	2%
	Ondo	4,671,700	2%
	Zamfara	4,515,400	2%
	Kogi	4,473,500	2%
	Kebbi	4,440,000	2%
	Enugu	4,411,100	2%
	Adamawa	4,248,400	2%
	Edo	4,235,600	2%
	Plateau	4,200,400	2%

Cross River		3,866,300	2%
Abia		3,727,300	2%
Federal Capital Territory		3,564,100	2%
Yobe		3,294,100	2%
Ekiti		3,270,800	2%
Gombe		3,257,000	2%
Kwara		3,192,900	2%
Taraba		3,066,800	2%
Ebonyi		2,880,400	1%
Nasarawa		2,523,400	1%
Bayelsa		2,278,000	1%
Total		193,500,500	

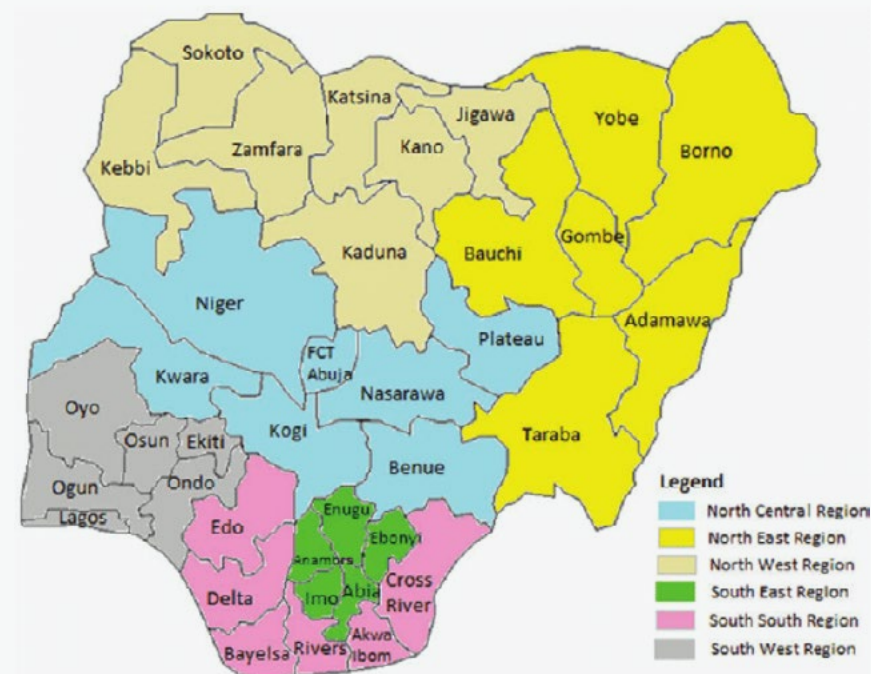


46.5%

Nigeria has a large youthful population (42.54% between ages 0 to 14) spread across 36 states. Though Nigeria's poverty rate is estimated at more than 46.5% (a majority of which are young people and women), the demographics of poverty in Nigeria suggest that poverty is more prevalent in the North West and North East.

Figure 1: Nigeria's 36 States

Source: Sunnewsonline



Agriculture is a major economic preoccupation in Nigeria. Agriculture accounts for 35% of Nigeria's GDP. The Nigerian Poultry sub-sector contributes about 25% of the total livestock and fisheries contribution to GDP. The poultry sub-sector employs about 14 million Nigerians in direct and indirect employment. Commercial poultry production is more developed in the south-western part of the nation, but with rapidly increasing investments in the North West and North Central geo-political zones.

Table 5: Nigeria's GDP growth (USD)

Year	GDP (Billion USD)	GDP Real growth rate (USD)	GDP per capita (USD)
2000	46.39	5.3%	379
2005	112.20	3.4%	808
2010	363.36	7.8%	2,292
2015	464.28	2.7%	2,563
2020	492.29	*2	2,388
2025	559.70	*	2,399
2030	636.34	*	2,420

Source: https://www.google.com/publicdata/explore?ds=d5bncppjof8f9_&met_y=ny_gdp_mkt_p_cd&idim=country:NGA:ZAF&hl=nl&dl=nl

Nigeria currently has the second largest chicken population in Africa, with a standing stock of about 180 million birds. Annually, 454,000 tonnes of meat and more than 14 billion eggs are produced. The poultry sector contributes 6-8% of GDP, which is about 30% of the total agriculture contribution³. Over 13 million households keep livestock at their homes and receive (at least part of) their income from it.

2.1 Development of the poultry sector

The Nigerian poultry industry has a long history. Commercial poultry farms sprang up in Nigeria in the early post-independence years. In fact, a few modern farms existed before Nigeria gained independence. In the oil boom days, Nigeria witnessed an expansion of her poultry and dairy industries, but this progress was reversed during the economic depression of the 1980s.

After the restoration of democracy in 1999, a new wave of renewed efforts to develop agriculture (including poultry) began in Nigeria. One of the major incentives for growth was the ban on importation of poultry products. From about 2005, several intervention agencies and funds for the development of agriculture were introduced. Notable among them was the Commercial Agriculture Credit Scheme (CACS), which enabled many of the leading commercial poultry producers to expand dramatically from 2008 to about 2013.

Another innovative scheme of note was the NIRSAL (Nigeria Incentive-Based Risk Sharing Scheme for Agricultural Lending), which aimed to de-risk agricultural lending and thus make commercial banks more willing to lend to the agricultural sector. The NIRSAL scheme was particularly helpful to the Poultry Sector because the bird flu scares of 2005 / 2006 and 2009 heightened their perception of risks associated with the poultry business, thereby discouraging banks from lending to poultry farmers.

Nigeria's current political leadership expressed a desire to reduce importation and promote local production in 2015. Against this background, the government further strengthened the enforcement of the ban on smuggling. With improved control of smuggling, broiler farmers were able to penetrate the market and expand their production. The government also strengthened the Anchor Borrowers Programme, which enabled small- and medium-scale farmers to participate in agricultural lending schemes by being linked to off-takers whose guarantee enabled small farmers to access funding.

The consumption of poultry in Nigeria is relatively low compared to other countries. It is estimated that on average Nigerians eat 1.9 kg of chicken meat per capita in a year, whereas in South Africa and Ghana the figures are 32.98 and 7.67, respectively. Although demand for poultry had been increasing yearly, there was a decline in the last couple of years. This decline has been linked to the economic crisis in the country caused by low oil prices^{4,5,6}. The economy seems to have been recovering recently and it is assumed that economic growth in Nigeria will cause an increase in the consumption of chicken meat per capita⁷.

Although it is expected that the demand for poultry products will increase fast, the Nigerian government has kept the ban on imported poultry products in place⁸. Further, it tries to discourage the export of poultry products. It is said that these regulations will protect Nigeria's foreign currency balance. It should also encourage the domestic poultry sector to develop so it can contribute to feeding the growing Nigerian population in the coming years⁹.

2.2 Stakeholders in the poultry sector

The Federal Ministry of Agriculture and Rural Development is the main organ of government responsible for overseeing the poultry industry in Nigeria. In addition, there are other government organisations or parastatals which regulate various aspects of the poultry value chain.

2.2.1 Government Institutions

The Federal Ministry of Agriculture and Rural Development is organised into six service and eleven technical departments.

Table 6: Government Institutions

No.	Department	Names
	Service	Finance and Account Planning & Policy Coordination Human Resources General Services Procurements Reform Coordination & Services Improvement
	Technical	AgriBusiness & Marketing Agricultural Land & Climate Change Federal Department of Agriculture Farm Input Support Services Fisheries and Aquaculture Animal Husbandry Services Rural Department Agriculture Extension Services Cooperative Food and Strategic Reserve Veterinary & Pest Control Services

NAFDAC: NAFDAC (National Agency for Food and Drug Administration and Control) is the main government institution responsible for the enforcement of standards in food production in Nigeria. NAFDAC maintains a close relationship with Nigeria's Standards Organisation, the agency responsible for setting the standards which NAFDAC enforces.

⁴ Evaluation of Poultry egg marketing in Ikwuano local government area of Aiba State, Nse-Nelson et al, 2018

⁵ Financial times, Nigeria economy suffers first annual contradiction in 25 years

⁶ Country economy, Nigeria GDP

⁷ Sahel, An assessment of the Nigerian Poultry sector

⁸ Rabobank, Time for Africa, capturing the African poultry investment opportunity

⁹ Zootechnica international, Outlook of Nigeria's poultry feed market

2.2.2 Private Sector Players

The poultry industry in Nigeria is private sector driven, with sizeable numbers of players across the various categories. In the past few years, the private sector has been growing rapidly in terms of diversity, maturity and the number of players setting up to provide very specific products and or services, i.e. branded eggs and chickens, breeding, feed, vaccines, machinery, etc. The more the sector develops, the more businesses will increase in specialisation to ensure that they serve a specific niche in the market. In table 7a the stakeholders of Nigeria are listed. These are the stakeholders that came up during the interviews and the validation workshop and were mentioned by the participating companies. Table 7b shows an overview of the NABC members of the poultry sector active in Nigeria and the African continent.

Table 7a: Sector stakeholders

No.	Category	Stakeholders
1.	Veterinary products	Animal Care Adamore Turner Wright Diversay Solutions Zygosis Thlala Kolo Jubaili FDH Pharma FTN Standard Agrited Soptimal
2.	Feed producers	Topfeeds Olam Grand Cereal Animal Care Amo Byng Hybrid Livestock Feeds Breedwell New Hope Terattiga
3.	Equipment suppliers	Vencomatic Big Dutchman Facco Petersime / CHI Priority Poultry Farm Support Agriprojects
4.	Service Providers	Premier Agribusiness Academy World Farmers Centre GlobalWyse Limited SOA Vet AgroInfotech Africa African Harvesters

 **1.9kg**
on average Nigerians eat
chicken meat per capita in
a year

5.	Processors	Zartech CHI Obasanjo Farms Natnudo Chicken NPG Farms Lakatabu Farms Green Pasture Taghini Valentine Big Sam / Globus
6.	Hatcheries	CHI Amo Sieberer Zartech Olam Yammfy Farm Support Agrited NPG Farms Tosam / Supreme Obasanjo Farms Sunchicks Globus Folhope PC Onuhuoha
7.	Laboratories	Animal Care Zoetis / CHI Zoetis / Vetco Diversay Solutions Zygosis
8.	Premix/Feed Additives producers	HiNutrients enterprises Ltd. Terattiga Agro bar Magen Farm Support Turner Wright Novus / Norgem Agrited Rostal Resources Nutrivitas Ltd. Bio-Nutrients systems Ltd. Animal care Agro-BarMagen DSL Pharma
9.	Higher education institutions	9.1. Federal university of Skure 9.2. Uthman Dan Fodia university Sokoto

PAN: PAN (Poultry Association of Nigeria), the umbrella body for poultry industry stakeholders in Nigeria, was formed to mobilise farmers to act together for poultry sector growth. Its main objective is to act as a lobby group to advance and defend the interests of poultry industry stakeholders in the polity. The Association also spearheads several cooperative activities that promote / support the industry, while working to ensure that the sector takes full advantage of opportunities to grow the industry and the respective businesses of its members. The Poultry Association of Nigeria has several sub-associations that are active in the poultry sector. They include:

HON (Hatchery Operators of Nigeria)
DOCMAN (Day Old Chicks Marketers Association of Nigeria)
CEPAN (Commercial Eggs Producers Association of Nigeria)
TEPAN (Table Egg Producers Association of Nigeria)
FEPAN (Feed Producers Association of Nigeria)
ANVAI (Association of Nigerian Veterinary and Allied Industry)

Table 7b: Dutch poultry network of NABC active in Nigeria and the African continent.

No.	Category	Stakeholders
1.	Veterinary products / laboratories	Pas Reform Hatchery Technologies Royal GD
2.	Feed/Additives/concentrate/premix producers	Agraplän B.V. Cagemax Champrix B.V. Darling ingredients (Sonac & PRO Ingredients) Koudijs Animal Nutrition B.V. Trouw Nutrition
3.	Parent stock and genetic improvement	Hendrix Genetics B.V. Verbeek Hatchery Holland
4.	Housing equipment	Impex Barneveld B.V. Jansen Poultry Equipment (JPE) VDL Agrotech Vencomatic group
5.	Processing equipment	Foodmate B.V. Geerlofs Refridgeration GI-OVO B.V. Marel Stork Poultry Processing B.V. MOBA Group Ottevanger Milling Engineerings TransNational Agri Projects B.V. Celtic Coolings
6.	Management software	I Grow Chicken (EBIT+)
7.	Training	Aeres Training Centre International (ATCI) & Aeres University of Applied Sciences

3. Inputs

Nigeria prohibits the import of poultry products. Even though there is an unspecified volume of illegal poultry products smuggled in through Benin every year, the population is predominantly dependent on local production¹⁰. The main concerns for the majority of the farmers interviewed and for the industry in general with regards to inputs were availability and price. In view of the border closure and the government's plans to promote local production for eventual self-sufficiency in both poultry meat and egg production, some of the required inputs have to be produced locally.

The government plans to incentivise the production of soya, maize and other raw materials for feed production to ensure sufficient supply for the industry, but this must be coupled with disincentives for imports, so the right balance is needed between imports to compliment local production and outright protectionism. To this end the Nigerian government has, for instance, strict agreements with importers to ensure that imports compliment local production rather than being the norm when it comes to soya, for instance.

That is also the case for all the other inputs the industry needs for efficient and cost-effective production, so the government needs to work very closely with the entire industry to ensure it aligns its regulatory agenda with the industry's demands.

3.1 Feed

Feed is the most important input in production, accounting for over 70%¹¹ of the total cost of production. The essence of the poultry sector is to transfer a lower and cheaper grade of protein into a higher, more valuable, grade of protein. The feed which is the lower grade of protein will have a large impact on the quality of the end-products - the meat and eggs. A better quality of feed will give a better end-product and the amount of feed produced can limit production in the poultry sector.

The costs for feed strongly depend on the ingredient prices, which can fluctuate throughout the year. The most economically efficient way for production in the poultry sector is, therefore, a balance between the following factors: feed, housing, breed and climate (as all these factors contribute to the FCR – Feed Conversion Ratio). In 2017, approximately 5.3 million tonnes of animal feed was produced in Nigeria; 80% of which was for the poultry sector¹². As no poultry feed is imported, the sector depends entirely on local production¹³. Most of the small-scale farmers use commercial feeds. Some of the medium-sized farms produce their own feed and almost all of the large-scale farms produce their own feed.

Due to the Nigerian poultry sector's economic prospects, the feed industry is under development. In 2016, OLAM international commissioned a new, modern milling operation that will be able to produce 720,000 MT annually. Both mash and pelleted feeds can be produced. It is expected that more feed mills will be needed to manage the growth of the poultry sector.

More accessibility to higher quality feeds can also lower the FCR and reduce the production cost¹⁴. Nigeria has made remarkable progress towards local sourcing of inputs for poultry production, especially in respect of bulk feed ingredients like maize and soya bean. Most feed-mills in Nigeria use locally produced bulk raw materials, but specialty ingredients, such as lysine, vitamins, toxin binders and other additives are not produced locally and need to be imported. There are several commercial feed producers (some with integrations in the poultry value chain) that produce commercial poultry feed in the country. There are also several local producers of premixes and concentrates, but imported premixes and concentrates are often preferred for reasons of quality.

¹⁰ Rabobank, Time for Africa, capturing the African poultry investment opportunity

¹¹ Feed formulation problem in Nigerian poultry farms: a mathematical programming approach oladokun, 2012

¹² USDA, Nigeria animal feed sector

¹³ The Nigerian aquafeed industry potentials for commercial feed production

¹⁴ Feed formulation problem in Nigerian poultry farms: a mathematical programming approach oladokun, 2012

3.1.1 Feed ingredients

Poultry feeds need to have enough protein, fat, carbohydrates, vitamins and minerals for optimal production. A formulation of the feed ingredients is made so they can be mixed in a feed with an optimal content. During this formulation, the price and quality of the ingredients are important factors to take in account, as is the number of hectares used for cultivation¹⁵. Maize is a major source of energy for animal feed. Across Africa, maize is the main crop grown predominantly for human consumption (see Table 8 below). Despite the amount of its land under cultivation, Africa is still a net importer of maize.

Table 8: Major crops grown in Africa

No.	Crop	Area (ha)	Production (t)	% of total production
	Maize	34,075,972	70,076,591	43%
	Millet	19,998,008	16,008,838	10%
	Rice, paddy	11,206,813	28,798,202	18%
	Sorghum	23,142,595	23,350,064	14%
	Wheat	10,224,952	24,704,201	15%
	Total	98,648,340	162,937,896	100%

Source: FAO stats, FAO Statistics Division, 04 October 2015

Nigeria has scope for producing sufficient amounts of maize, but, due to its price compared with other commodities, such as soya, most farmers would rather not grow it. The main ingredients for poultry feed can be found in Table 9 below, together with their estimated current production levels and land use.

Table 9: Cultivation of main ingredient poultry feed in Nigeria

No.	Crop	Surface used (Ha)	Production (MT)
	Soybean ³	952,381	1,000,000
	Maize (corn) ⁴	5,564,223	10,700,000
	Wheat ⁵	60,000	60,000
	Cassava ⁶	3,700,000	50,000,000

These figures require some further clarification. About 60% of all soybean production is currently used for poultry feeds. Nigeria is currently the largest soybean producer in Africa. The yield on average is 1.05 MT/ha, which is low compared to other countries, where the yield can reach up to 5 MT/ha, although it is not clear what the maximum yield in Nigeria is¹⁶. About 60% of all Nigerian maize is processed into animal feeds. Another 800,000 MT is imported and 200,000 MT is exported. The current average yield is 1.69 MT/ha. It is possible to reach yields up to 4 MT/ha, as is achieved in southern Nigeria¹⁷.

Most of the wheat supply in Nigeria comes from imports, with approximately 5,200,000 MT imported annually. The yield of domestic production is around 1 MT/ha. It is reported that wheat can be harvested with a yield of over 4 MT/ha, but it is unclear what the maximum yield in Nigeria currently is¹⁸. Table 10 below gives a summary of other cereals currently produced in Nigeria.

¹⁵ Feed formulation problem in Nigerian poultry farms: a mathematical programming approach oladokun, 2012

¹⁶ Ad Lewisraylaw, Current price of Maize per ton in Nigeria 2019

¹⁷ The Nigerian aquafeed industry potentials for commercial feed production

¹⁸ Trading economics Nigeria wheat yield

Table 10: Nigerian Cereal Production

Cereal	2014 2018 Average	2018	2019 Forecast	% of total cereal production
Maize	10,431,000	11,034,000	11,000,000	40.27%
Rice (Paddy)	7,762,000	8,899,000	8,000,000	29.29%
Sorghum	6,158,000	6,026,000	6,300,000	23.07%
Others	1,775,000	2,263,000	2,013,000	7.37%
Total	26,126,000	28,222,000	27,313,000	100%

Source: FAO GIEWS Cereal Country balance Sheet <http://www.fao.org/giews/countrybrief/country.jsp?code=NGA>

Nigeria's cassava industry is more developed and currently the biggest in the world. The national average yield of cassava is estimated at 13.63 Mt/Ha. The amount of agricultural land has increased rapidly in recent years, with the area used for farming doubling in the last 38 years. Currently 77.7% of the land in Nigeria is being used for agricultural purposes¹⁹. Although no exact data was found, it is clear that the local production for premix in Nigeria is developing fast. Premix contains all the essential vitamins and minerals for animal feeds. A lack of crucial vitamins can cause early mortality and slow growth in animals, causing extra costs for farmers. Local producer Hi Nutrients recently received an investment from French company Neovia. With this joint venture they want to increase the production of premix in Nigeria²⁰.

3.1.2 Quality of feed

The quality of feed can strongly influence the production time for broilers and the quantity of eggs produced. A longer production time means more costs for housing and labour for the farmer. The quality of feed also has a strong impact on the feed conversion ratio (FCR). Feed with a high FCR means that the farmer needs more feed to produce 1 kg of meat or eggs than feed with a lower FCR.

The Nigerian Standard Council approved new standards for poultry feeds in 2018. The previous standards had been set in 2003. The renewed Nigerian Industrial standards pay more attention to nutrient balances in the feed, quality assurance, the right methods of testing and ingredient selection. In Nigeria, feed quality is regulated / monitored by NAFDAC. A few years ago, commercial feed manufacturers were mandated to state expiry dates on the labels accompanying feed bags. There has been remarkable compliance with that regulation.

The new standards include a list of which testing methods should be used. All these methods in accordance with the international Organisation for Standardisation guidelines. Further guidelines for nutrient requirements for both layers and broilers are given in different life stages. These guidelines can help feed manufacturers produce better quality feeds with better digestibility. These feeds can increase yield while lowering production costs²¹.

The Nigerian Standard council further demands that every feed mill in the country have an animal scientist. It has also implemented strict regulations on the storage and record keeping of raw materials. In this way the quality of feed can be improved together with poultry production in Nigeria²².

A Standard Operating Procedure manual for feed millers was developed by the Nigerian Institute of Animal Science, as a first step towards ensuring that a common standard is established for operators in the market, especially for complete feed. With this, medium- and small-holding farmers can get the most out of the feed they use. Commercial farms often employ an in-house vet / nutritionist, who develops the feeding regime and rations, optimised for the bird development stage, be they broilers or layers. Such professionals sometimes prepare their own feeds, so quality is maintained and checked at every juncture.

3.1.3 Cost of feeds

Feed in the poultry sector currently accounts for 70% of the total costs. Feed production is seen as one of the

limiting factors in the growth of the poultry sector. It has been thought that bringing more expertise to Nigeria's feed mills could lower the feed price. The feed mills do not always have an optimal nutrient balance in their feeds, leading to a higher FCR, slower growth and higher feed costs. It is also often the case that there is often no effective biosecurity plan in place. This means significant micro bacterial growth can take place, causing potential health risk for the birds.

The raw materials do not currently undergo sensitivity analysis, so market price fluctuations or variations in nutrients are not properly taken into account during the formulation, resulting in higher feed and production cost²³.

The above-mentioned factors could be solved with more expertise in Nigeria's feed mills and feed production. When all processes are optimised, the costs of the raw materials will still, however, have a significant impact on the final feed price. If certain ingredients increase in price and no cheaper alternatives are available, the feed price will also have to be increased to make the business profitable for the feed miller. Current prices and the fluctuations of the main raw materials used in poultry feed can be found in Table 11 below.

Table 11: Price of main feed ingredients

Ingredient	Most recent price (US dollar/100 kg)	Price USD/kg	Fluctuations in price reported in the last year
Soybean ⁷	46.07	0.47	30%
Maize (Corn) ⁸	30.30	0.30	40%
Wheat* ⁹	40.00	0.40	0%*
Cassava ¹⁰	20.00	0.20	

*To discourage wheat import, feed millers are required to buy local wheat at a fixed price.

The table above requires some clarification. As can be seen, soybean is the most expensive ingredient, which can be explained by it providing the largest protein contribution to the feed - proteins are usually the most expensive ingredient in animal feeds. The significant fluctuations in soybean and maize prices could be caused by various factors, such as higher market demand or scarcity of supply. The lack of a sensitivity analysis can result in significant increases in feed prices.

As such, in addition to efforts to lower the cost of feed ingredients, a more important initiative would be one seeking to stabilise prices or that could cushion the industry against sharp price fluctuations (specifically for maize and soya).

Maize prices have doubled during the last decade, thereby encouraging, at least to some extent, increased maize production. Since 2017, however, cases of armyworm disease have affected production. Furthermore, maize is a rain-fed crop in most production areas and, as such, the price is affected by seasonality (tied to the rainy season). Maize prices in Nigeria are highest at the onset of the wet season (April to June) and often lowest between October and December. Soya is grown in Nigeria, with some integrators and quality conscious feed mills recently starting to produce their own soya.

²³ Feed formulation problem in Nigerian poultry farms: a mathematical programming approach oladokun, 2012

¹⁹ CABRI, the role of government in developing agriculture value chains, 2019

²⁰ Trading economics Nigeria wheat yield

²¹ Nigerian industrial standard, Standard for Poultry feeds

²² Zootechnica international, Outlook of Nigeria's poultry feed market

Table 12: Maize & Soya Requirement for Poultry – MMT

	2013	2014	2015	2016	2017	2018	2019	2020
Total feed MMT	2.588	2.865	3.14	3.426	3.70	3.979	4.262	4.552
Total Maize@ 50%	1.294	1.432	1.57	1.713	1.850	1.989	2.131	2.276
Total Soya @ 20%	0.518	0.573	0.628	0.685	0.740	0.796	0.852	0.910

The above analysis includes the 4 main raw materials in poultry feeds. Although some of the other raw materials can have a significantly higher price, they have less effect on the price of the feed because they are used in small amounts.

During the field visit we collected prices for various feeds (shown in Table 13 below). Variations in prices were relatively significant, which is testament to the strategy applied by various feed producers to ensure they are prepared for price fluctuations in raw materials prices (as shown in Table 11 above). The main factor affecting price is the cost of ingredients and that varies from one supplier to the next. In addition, due to the lack of standards or definition of quality, the formulation can differ, thereby affecting the final price for farmers and, eventually, their performance.

Table 13: Spot prices of poultry feed December 2019²⁴

Country	Nigeria				Cote d'Ivoire	
	Min	Max	Min	Max	Min	Max
Type of Feed	N/kg	N/kg	EUR/kg	EUR/kg	EUR/kg	EUR/kg
Broiler starter Feed	125	173	0.31	0.43	0.44	0.46
Broiler Feed	125	165	0.31	0.41	0.40	0.44
Layer starter Feed	101	133	0.25	0.33	0.36	0.40
Layer Feed	109	133	0.27	0.33	0.38	0.44

Source: Field research NABC and Premier Agribusiness Academy, December 2019

3.2 Vaccines and drugs

Nigeria has a veterinary pharmaceuticals market with a mix of locally produced and imported products. Due to Nigeria's size, every pharmaceutical company of repute anywhere in the world wants to sell in Nigeria. Thus, the nation is awash with brands of products. The downside, however, is that there has also been an influx of sub-standard products into the country, with many smuggled through the land borders.

Nigeria has a veterinary vaccines production unit at the Nigerian Veterinary Research Institute, Vom. Unfortunately, the vaccine plant is under-utilised and plagued with the usual government bureaucracy, so it cannot meet the needs of the poultry and livestock industry. Local vaccine production would have given the nation an advantage, because the laboratory would have access to strains of viruses that are peculiar to the Nigerian environment (thus making the vaccines more effective), but that is not currently the case. The NVRI Laboratory is the main animal disease analysis laboratory for Nigeria. It is an FAO certified laboratory.

²⁴ https://www.researchgate.net/publication/330938378_Modelling_the_price_of_Maize_and_its_Determinants_in_Nigeria_Error_Correction_Model_Approach

3.3 Hatcheries, Breeding and DOC's

The availability and quality of Day Old Chicks (DOCs) have been considered a weakness in the Nigerian poultry sector²⁵. Table 14 below gives a summary of DOC production in Nigeria up to 2019.

Table 14: Hatchery production in Nigeria (broilers and layers)²⁶

	2013	2014 ¹¹	2015	2016	2017	2018	2019
Broiler DOC (million)	171.37	156.72	166.39	175.77	179.55	189.98	199.80
Layer DOC (million)	43.43	44.39	45.78	47.02	48.03	49.44	50.63
Total (million)	214.8	201.11	212.16	222.79	227.58	239.42	250.43

Source: Field research NABC and Premier Agribusiness Academy, December 2019

Poor DOC quality can be caused by several factors - poor genetics, inbreeding and nutrient deficiencies in (parent) stock can result in birds that are weaker and not resilient to change. This can cause a slow growth rate and / or a high mortality rate, leading to increased costs for the farmer. It should also be considered that DOCs are more susceptible to diseases. Poor hygiene or infected water cause infections and or diseases in the birds, leading to poor performance. Importing new Grand parent stock could help to diversify the gene pool and create stronger birds. Even though companies are certified to import such birds most choose not to because it is hard for such businesses to become profitable.

Hygiene, water and feed have all previously been identified as causes for poor performance of DOCs²⁷. But no recent information was found on the DOC market and potential problems. In the last few years some international parties have invested in hatcheries²⁸.

Table 15 below provides a summary of projected growth based on the assumptions that growth remains constant from 2018 onwards and that the ratio of broilers and layers is similar to the ratio between demand for meat and eggs, taking productivity into consideration.

²⁵ Evaluation of Poultry egg marketing in Ikwuano local government area of Aiba State, Nse-Nelson et al, 2018

²⁶ About hatchery production a lot of contradicting information is available. During this research the DOC production is calculated by multiplying the (expected) meat and egg consumption with the (expected) population. After that an average slaughter weight of 2kg per broiler and a production of 270 eggs per cycle per bird and an average egg weight of 60 gram was assumed. It was also assumed that both layers and broilers had a mortality rate of 5%. Still there are some irregularities between the data of reported poultry products and the calculated produced DOC. It is expected that these discrepancies are caused because some sources include smuggled poultry products in their data and others not. This is not always clearly indicated.

²⁷ Poultry Production Constraints. The case of Esan West Local Government Area of Edo State, Nigeria Adali et al 2002

²⁸ OLAM Poultry Feed and day old chicks

Table 15: Projected growth of the DOC production in Nigeria²⁹

	2000	2005	2010	2015 ¹²	2020	2025	2030
Forecast Broiler DOC (million)	84	99.75	173.25	166.39	238.35	257.25	286.13
Forecast Layer DOC (million)	30.91	35.10	40.07	45.79	52.11	58.98	66.48
Total (million)	115	135	213	214	290	316	353

Source: Field research NABC* and Premier Agribusiness Academy, December 2019

There are several reputable hatcheries in Nigeria, but others operate without brand identity, with some collecting eggs from local farmers who have breeder birds and hatch more. As at January 2020, the average price for broiler DOCs was N260 (EUR 0.64) and N200 (EUR 0.52) for pullets (prices per bird).

The policy in Nigeria is to promote and incentivise local breeding, but, as the sector is still growing, import of hatching eggs is still possible. The most common layer breeds include ISA Brown, Bovans, Hyline and Lohman. The most prevalent broiler breeds include Ross, Arbor Acres, Cobb, Hubbard and Noiler (a dual purpose breed that is locally).

3.4 Challenges and opportunities

Despite the expected demand for poultry products, there are still constraints on the poultry sector's potential growth. Dealing with these challenges can lead to a faster expansion of the Nigerian poultry market. There are also opportunities in the feed sector that could make it worth further investment. An overview of the identified inputs challenges and opportunities can be found in Table 16 below.

Table 16: Opportunities and challenges, inputs

Challenges	Opportunities
Costs: The feed is expensive and the performance is often not optimal, leaving farmers with high costs.	Growing market because the population and the average income in Nigeria are increasing. A steep increase in the demand for poultry products is expected.
Quality of feed: Feed is often not mixed well, making the performance low and / or the price unnecessarily high.	New (foreign) investments are done in the poultry sector. Bringing innovation and expertise to the country.
Restrictions on import feed premix and concentrates. Without premix or concentrates it can be harder to produce a high-quality local feed. This can limit farmers' access to feed.	Education and training: A practical training institute, certified and accredited, is needed to offer poultry-specific training suited for modern farming. Such an institute must be linked to the industry to encourage and ensure that the courses and education offered meet industry standards. This would also improve the employment prospects for all graduates. Such a practical college should also be linked to tertiary education systems offering veterinary training courses.

²⁹ About the hatchery production a lot of contradicting information is available. During this research the DOC production is calculated by multiplying the (expected) meat and egg consumption with the (expected) population. After that an average slaughter weight of 2kg per broiler and a production of 270 eggs per cycle per bird and an average egg weight of 60 gram was assumed. It was also assumed that both layers and broilers had a mortality rate of 5%. Still there are some irregularities between the data of reported poultry products and the calculated produced DOC. It is expected that these discrepancies are caused because some sources include smuggled poultry products in their data and others not. This is not always clearly indicated.

Challenges	Opportunities
Low yields of raw materials making some ingredients scarce and expensive.	Feed quality standards: Feed quality standards need to be defined that would protect small- and medium-scale farmers from unscrupulous feed mill owners. These standards should in turn be enforced and checked regularly.
Enforcement of laws, standards and regulation: Poor or the lack of stringent enforcement of laws relating to hatcheries, breeders and other input service providers weakens the sector's ability to provide the quality inputs necessary for better performance.	Feed testing: The government should, following the definition of the feed standards, engage in random testing to ensure industry players stay honest.
Tax on raw materials / ingredients for feed production: The sector is reliant on soya and maize for feed production. Growth of the sector will rely on bringing the cost of feed down, which will reduce production costs.	Input service providers: Diversification of input service providers is needed. More independent importers, i.e. not linked to larger integrations, would also allow the industry to benefit from competitively priced feed ingredients and products.
Energy: Reliable energy from the grid is often unavailable, thereby inhibiting farmers' ability to improve the technology they have and to manage their inputs better.	Financing: The financial sector needs better education with regards to poultry financing, especially in relation to financing medium- and small-scale farmers. It is unclear what influence financial education for bankers and financiers in Nigeria would have on access to finance, but awareness of the cash flows and the challenges farmers face might enable local banks to develop products suitable for the sector.
Knowledge, training and education: Most farm managers are self-taught or were apprentices in other farms. Practical poultry training is almost non-existent, so it becomes difficult to address better management of inputs in circumstances where the knowledge is lacking.	Refurbished Equipment: European refurbished equipment seems to be on high demand due to the guarantee on quality.
Access to finance: Most medium- and small-scale farmers have to pre-finance their inputs in cash. Depending on whether they are layer or broiler farmers, this can weigh heavily on cash flows, as the production cycles are relatively long. Most small- and medium-scale farmers do not have access to finance for their inputs, whereas it is often relatively easy for large integrations to get financing for inputs.	

4. Production systems

Poultry production in Africa is traditionally kept at a small scale, usually outside with low inputs. Due to the growing African population and urbanisation, it is no longer possible for all households to keep chickens themselves. To produce poultry products on a larger scale and bring food to people in cities, the production systems have been intensified. Commercial feed was developed, birds were moved inside and more input was used in the production. As these developments were applied at different levels, the FAO developed guidelines to distinguish between different types of production systems. Those guidelines can be found in the table below, together with their implications for different parts of the production process.

Table 17: FAO definitions of poultry production systems

Sectors (FAO / definition)	Systems			
	Industrial and integrated	Commercial poultry production		Village or backyard
		Bio security		
		High	Low	
	Sector 1	Sector 2	Sector 3	Sector 4
Biosecurity	High	Mod-High	Low	Low
Market outputs	Export and urban	Urban / rural	Live urban / rural	Rural / urban
Dependence on market for inputs	High	High	High	Low
Dependence on goods roads	High	High	High	Low
Location	Near capital and major cities	Near capital and major cities	Smaller towns and rural areas	Everywhere. Dominates in remote areas
Birds kept	Indoors	Indoors	Indoors / Part-time outdoors	Out most of the day
Shed	Closed	Closed	Closed / Open	Open
Contact with other chickens	None	None	Yes	Yes
Contact with ducks	None	None	Yes	Yes
Contact with other domestic birds	None	None	Yes	Yes
Contact with wildlife	None	None	Yes	Yes
Veterinary service	Own Veterinarian	Pays for veterinary service	Pays for veterinary service	Irregular, depends on govt. vet service
Source of medicine and vaccine	Market	Market	Market	Government and market

Source of technical information	Company and Associates	Sellers of inputs	Sellers of inputs	Government extension service
Source of finance	Banks and investors	Own savings	Own savings	Own savings
Breed of poultry	Commercial	Commercial	Commercial	Native
Food security of owner	High	Moderate	Moderate	From low to moderate

Source: FAO

- **Sector 1:** Industrial integrated system with high-level biosecurity and birds / products marketed commercially (e.g. farms that are part of an integrated broiler production enterprise with clearly defined and implemented standard operating procedures for biosecurity), e.g. SIPRA and FOANI.
- **Sector 2:** Commercial poultry production system with moderate to high biosecurity and birds / products usually marketed commercially (e.g. farms with birds kept indoors continuously; strictly preventing contact with other poultry or wildlife).
- **Sector 3:** Commercial dual-purpose poultry production system with low to minimal biosecurity and birds / products entering live bird markets (e.g. a caged layer farm with birds in open sheds; a farm with poultry spending time outside the shed; a farm producing chickens and waterfowl).
- **Sector 4:** Village or backyard production with minimal biosecurity and birds / products consumed locally.

Sectors 1 and 2 characterise the commercial production system; sector 3 describes the more intermediate dual-purpose production system and sector 4 the local backyard system. According to Ministry of Agriculture and Fisheries data from 2011, at that time there were 1,771 poultry farms, 998 resellers and 17 industrial companies active in the poultry sector³⁰.

Historically, poultry-keeping in most parts of Nigeria was on subsistence basis. The local backyard rearing of birds, feeding them with grain and left-over food was prevalent. Over time, the commercial production system gained attention as poultry-keeping became a means of livelihood. Commercial farms make use of hybrid birds housed in specially constructed houses, fed with special rations, and kept under intensive care.

It is estimated that there are about 6.6 million households keeping poultry in an extensive way, i.e. matching the description of sector 4 in the table above. The average flock size in an extensive system is 12 and they have a vaccination rate of 4%. These households together hold an estimated 78 million birds³¹. About 60 million birds are kept in semi-intensive production systems, characterized as sectors 2 and 3 from Table 5. No information was found on the level of biosecurity in these types of production systems in Nigeria, so they cannot be distinguished between. About 1.3 million households keep poultry in this way, with a vaccination level of 13%³².

There are about 17,000 intensive farms in Nigeria that in total keep about 45 million chickens. The average flock size there is 2,625 birds per farm. This production method fits the description of sector 1 in Table 5. As described, all these birds are vaccinated³³.

³⁰ RNPA 2011

³¹ FAO, livestock and livelihoods spotlight Nigeria

³² FAO, livestock and livelihoods spotlight Nigeria

³³ FAO, livestock and livelihoods spotlight Nigeria

4.1 Layer Production

Layer farms in Nigeria are becoming bigger, with many farms having hundreds of thousands of layer birds. The number of eggs produced by a hen has also been going up, with some farms producing 320+ eggs (hen housed) in the production cycle. Growing depletions are a major concern to the layer industry and the impact of the increased number of vaccines is evident. Separate brooding and growing areas away from laying units are being adopted as a "bio-security measure". The rearing depletions are as low as 2% up to 14 weeks, where "All in All out" and separate brooding are practiced.

All layer chicks are fed with chick feed in the form of crumbles for a better start in well-organised farms and that approach will be copied by others in next 3-4 years.

Automation in feeding and egg collection is increasing, with well-developed farms going for movement of feed from material unloading to the bird. This reduces the contamination levels through the feed bags. Environmental issues are becoming important, with manure disposal and fly control needing attention. Bigger flocks on farms and pollution issues will encourage factory-type closed and controlled houses in the coming decade.

Eggs are still being sold by the unit, with smaller eggs (pullet eggs) at lower prices, but the industry may change to a weight-based approach. Breakages and shell strength are becoming important in choosing the brand of pullets and in designing feed formulations. These issues will become more important as mechanical egg collection replaces manual collections.

Designer eggs are also becoming more popular, with eggs enriched with Vit E, Selenium and Omega-3 fatty acids being produced and marketed. Supermarkets are marketing packs of 6, 12, 15 and 30 eggs. The use of expiry date labels also may appear soon on the eggs sold in supermarkets. Table 18 below compares egg production costs across three countries.

Table 18: Comparative Analysis of general costs layer production

	Nigeria	Côte d'Ivoire ³⁴	The Netherlands
Layer starter feed (EUR/kg)	0.29	0.38	0.30
Layer feed (EUR/kg)	0.30	0.41	0.30
FCR	2.5		2.17 ³⁵
Feed price (EUR/kg eggs)	0.75		0.65
Price DOC (EUR/piece)	0.52	1.07	0.23 ³⁶
Min hourly wage ³⁷	0.37	0.57	9.44
Average number of eggs per production cycle	270 ³⁸	325 ³⁹	351 ¹⁰
Price of power (EUR/kWh) ⁴⁰	0.11	0.11	0.10
Farm gate price (EUR/kg)	1.13	3.05	1.30 ⁹

Source: Field interviews NABC 2019, Cote d'Ivoire Poultry Sector Study 2019 and others.

Feed in Nigeria is cheaper than in Côte d'Ivoire, but similarly priced to that in the Netherlands. The FCR is higher, however, which could indicate a quality issue with the feed, making the feed price per kg eggs higher.

As with broilers, the price of the DOC is more than double the price in the Netherlands. Quality issues here might cause a higher production price on top of the higher purchasing costs. The number of eggs produced per cycle

³⁴ Poultry Sector Study Cote d'Ivoire, NABC 2019

³⁵ Laying hen performance in different production systems; why do they differ and how to close the gap? Results of discussions with groups of farmers in The Netherlands, Switzerland and France, benchmarking and model calculations.

³⁶ Bijleveld, Brutomarge legkippen in 2018 lager dan in 2017

³⁷ Globalpetrolprices.com

³⁸ Maoba, S. Production performance and profitability analysis of small scale layer projects supported through CASP in Germiston Region Gauteng Province, 2016

³⁹ Poultry Sector Study Cote d'Ivoire, NABC 2019

⁴⁰ Globalpetrolprices.com

is lower than in the Netherlands, possibly indicating a low quality of DOC. Environmental conditions, farming techniques, feed and / or other factors cannot, however, be ruled out as a (partial) cause.

The farm gate price in Nigeria is 35% lower than in Cote d'Ivoire, but the production costs are also lower. The price is more than 50% higher than in the Netherlands. This could affect margins.

4.2 Broiler Production

In organised farms, almost all the broilers are reared on an "All in All out" basis on deep litter. The market weight is stabilising at 1.2 to 1.40 kg dressed weight. All the chicks are fed with pre starter, starter and finisher feed, with 40% of the birds being fed with steamed and crumbled feed in the first 3 weeks of life. Pellet broiler finisher is also being used by integrators. Mechanical feeding and nipple drinking systems will be adopted in the next few years. The effect of summer is enormous on broiler performance. Live bird marketing, huge capital involvement and power availability are combining to delay changes to EC houses across the country.

For Broiler PS, the number of chicks produced per parent are low with enhanced commercial broiler performance. Broiler parent placements are going up and cage breeding is gaining momentum. Growing parent birds from day old to liquidation entirely in cages is giving the lowest ever grower depletions in broiler breeders, so cage breeding farms will become increasingly popular during the next 5 - 7 years. Even if the debate on banning such cages starts now, it may take a decade to reach a decision. The cage dimensions are changed constantly to get better performance, with cage mat designs being improved to reduce the number of breakages.

A trend observed in the last 5 years is that feed manufacturers, hatchery owners and marketing companies are attempting their own broiler rearing. The big companies which started as integrators are strengthening themselves with bigger feed mills and bigger hatcheries, while going for down the line marketing of both frozen chicken and value-added foods.

Production efficiencies are improving, with the average FCR being below 2.00 and efficient producers now talking about FCR below 1.7 and targeting an FCR of 1.6 to achieve 2.00 kg weight. Table 19 below shows a comparative analysis of certain aspects of broiler production.

Table 19: Comparative Analysis of general costs broiler production

	Nigeria	Côte d'Ivoire ⁴¹	The Netherlands
Broiler starter feed (EUR/kg)	0,37	0,45	0,25 ⁴²
Broiler feed(EUR/kg)	0,36	0,42	0,25 ⁴³
FCR	1,7	1,7	1,74 ⁴⁴
Feed price (EUR/kg live weight)	0,61	0,74	0,44
Price DOC (EUR/piece)	0,62	0,76	0,27 ⁴⁵
Min hourly wage ⁴⁶	0,37	0,57	9,44
Growth time until harvest weight (approx. 2 kg) in weeks	6	6	5 ⁷

⁴¹ Poultry Sector Study Cote d'Ivoire, NABC 2019

⁴² Horne Productiekosten van vleeskuienvlees, een internationale vergelijking

⁴³ Horne Productiekosten van vleeskuienvlees, een internationale vergelijking

⁴⁴ Horne Productiekosten van vleeskuienvlees, een internationale vergelijking

⁴⁵ Horne Productiekosten van vleeskuienvlees, een internationale vergelijking

⁴⁶ Globalpetrolprices.com

Price of power (EUR/kWh) ⁴⁷	0,11	0,11	0,10
Farm gate price (EUR/kg live weight)	1,49	2,13	0,86 ⁶

Source: Field interviews NABC 2019, Cote d'Ivoire Poultry Sector Study 2019 and others.

The above table mentions various indicators that influence the production price of poultry meat. The numbers can fluctuate throughout the year and can be influenced by the efficiency of the farmer, season, production methods, price of the commodities and other factors. The average data for these factors does allow us to study differences between countries and identify potential points of improvement and opportunity.

Feed costs in Nigeria are higher than in the Netherlands, but not as high in Côte d'Ivoire. The FCR is the ratio of how much feed is needed to gain the same equivalent of chicken mass. The FCR can, therefore, be multiplied by the feed price to determine the feed price per kg of chicken, to give a fairer comparison between different feeds under similar conditions.

The growth time can also affect production costs, as, even if the FCR is low, a longer growth time means relatively higher expenses for labour, housing and electricity. It takes on average of 2 weeks longer in Nigeria than in the Netherlands for a bird to reach the harvest weight. Labour is cheaper in Nigeria, however, than in the Netherlands, so it is still possible to reduce production costs. No direct cause can be definitively stated for the longer growth times, as the growth cycle can be influenced by various factors, such as feed, feeding, housing, genetics farming techniques and many others.

During the interviews, several people mentioned that they have experienced a knowledge gap in the poultry sector. It is possible that the efficiency of farming is lower because of these knowledge gaps. Bridging these gaps could help in pinpointing where the farming process can be improved, increase the growth rate and, therefore, lower costs.

DOC prices seem to differ significantly by country. Price of DOC in Nigeria more than double compared to the Netherlands but lower than in Côte D'Ivoire. Besides the price, several comments were made regarding DOC quality. Low quality can cause high mortality, high FCR and longer growth cycles, making the production costs higher than the DOC selling price.

Although the price for chicken meat is substantially higher than in the Netherlands, the price in Nigeria is 20% lower than Côte d'Ivoire. Not enough data is available to make a full cost comparison with Côte d'Ivoire, but it is possible that this lower price forces farmers to make a smaller margin and, therefore, see their income reduced.

4.3 Bio-security conditions for production

Diseases, parasites and other factors regarding bird health is not monitored on a national level. 34% of the farmers mention health issues as a major constraint to poultry production. They are aware of the risk and therefore take biosecurity measures. Health issues of birds therefore seem a problem but data was found to confirm this assumption.

Biosecurity has significantly improved among Nigerian poultry farmers. With the losses incurred during the bird flu outbreaks, farmers became aware of the importance of proper biosecurity, with most Nigerian farmers embracing the basic tenets of biosecurity. Most of the production is concentrated in and around south-west Nigeria. Biosecurity concerns are most acute in this part of the country, with intensive information campaigns carried out every year.

Large-scale farms take biosecurity measures, with floors being disinfected between batches and the water being chlorinated. It was reported during our interviews, however, that most farms do not have footbaths or provide employees with protective clothing and footwear. Furthermore, no quarantine period is established for new birds and stalls are built closer together than the FAO guidelines.

Antibiotics are freely available in Nigeria without prescription. It is reported that 86% of all farms use antibiotics⁴⁸. Nigeria only recently started testing for residues in the eggs and meat. Although residue's were discovered if

⁴⁷ Globalpetrolprices.com

⁴⁸ The Trends and Tides of Poultry Farm Building in Makurdi, Benue State, Nigeria Chia et al 2014

they will cause a problem. New actions are being taken to lower the antibiotic use among farmers. Most farmers comply with protocols but testing kits are scarce and expensive.

4.4 Housing and Equipment

Nigeria has a rich blend of local and foreign suppliers of poultry equipment. Over the years, many local companies have attempted to make local equivalents of imported poultry housing and equipment, but the technology gap creates a situation where end-users feel that the imported equipment is better, though more expensive.

In all 3 production system types, birds are kept inside for at least the night. Housing conditions can have an important impact on growth. Shelter can protect the birds from rain and unfavourable environmental conditions, but ventilation temperature and ground cover are needed to achieve optimal production. The buildings also need to be designed in a way that decreases the risks of biosecurity threats.

A recent study⁴⁹ has shown that there is a need for optimal housing facilities in Nigeria. More information is needed in what stocking density can be maintained on large-scale farms. Further optimisation of indoor environmental conditions can also help to improve production. No information was found on the layout of the stalls, so it is possible that improvements can be made there as well, though it seems that stalls are properly ventilated. Automatic feeders and drinkers are not currently in use. FAO notes that Hen groups are comfortable at a stock density of three to four birds per square metre. If more space is allowed, a greater variety of behaviour can be expressed. Less space creates stressed social behaviour, allowing disease vulnerability and cannibalism and leaving weaker birds deprived of feed or perch space. Individual birds need more room for normal behaviour and adequate exercise than the 22 birds/m² (0.5 ft²/bird) density currently used in commercial laying cages. Over recent decades, animal welfare concerns have encouraged research on laying cage structures to make designs better suited to the needs of hens, while retaining cost-effectiveness for production.

Table 20: FAO's⁵⁰ proposed stocking density by type of bird per/m²

Chicken Types	Floors Space (birds/ m ²)	Floor space (ft ² /bird)	Perch Space (Per Bird)
Layer	3	3.6	25cm (10 in)
Dual Purpose	4	2.7	20cm (8 in)
Meat	4-5	2.1-2.7	15-20cm (6-8 in)

Source: FAO

During our interviews, we noted that most poultry farmers use open houses, with only a few large farms using the closed system. Several commercial farms have adopted the high-rise pen house, which is also open sided. These high-rise pens have the advantages of better ventilation, improved waste management and better control of access. Most of the drinking systems on the farms visited are open drinking systems, which seems to be the norm. No reference to or association between production / yield and the quality of water was made, so the advantages of closed drinking systems were not immediately evident for most farmers interviewed.

⁴⁹ The Trends and Tides of Poultry Farm Building in Makurdi, Benue State, Nigeria Chia et al 2014
⁵⁰ <http://www.fao.org/3/y5169e/y5169e05.htm>

4.5 Challenges and opportunities in Production

These factors are drawn from the field interviews conducted in November and December 2019. The factor most mentioned by farmers is finance, with 41% of respondents expressing difficulty in finding funding for their business or new projects. Accessibility to affordable loans is often mentioned as a factor limiting the options for investment and growth. Interest rates are considered too high, making entrepreneurs reluctant to invest further or start up any new business. This could cause slower poultry sector growth and limit the chances of the sector to produce enough to satisfy demand.

Infrastructure was mentioned as a close second, with respondents saying that bad roads limit limiting transportation possibilities. This can cause feed to arrive too late, with insufficient feed in turn leading to slower growth rates, higher FCR and increased stress for the birds. All that results in higher costs for the farmers. Bad roads also result in extra stress for live birds during transportation, causing additional health risks. If slaughtered birds arrive at the customer too late, this can cause deterioration of the product, again resulting in financial losses for farmers.

Health issues, such as diseases and parasites, were mentioned by 34% of the respondents. Diseases and parasites can cause risks for bird health, leading to mortality issues or slow growth. Slow growth increases costs for farmers, while mortality causes them to lose part of their investment. Furthermore, 15% of the respondents said that it is hard to find good quality vaccines for an affordable price. The lack of such vaccines causes further health risks for the birds.

According to 33% of the respondents, the price of feed and raw materials is one of the factors that limits sector growth. Soya and maize prices can fluctuate throughout the year, making it possible for the feed price to increase abruptly, which in turn causes production prices to go up.

Another production cost often mentioned is electricity. The power from the grid is often found unreliable, so farms rely on generators and the fuel they consume, making power costs higher than originally estimated. Farmers that keep layers say the egg glut is also costing them money, as they cannot sell all of their products, resulting in lower income than they had hoped. Due to high production prices, 27% of the farmers mentioned that they have difficulty selling their products for a price that allows them to make profit.

A lack of knowledgeable staff was mentioned as a problem by 18% of the respondents. It is hard to find enough knowledge to deal with the problems encountered on the farm. Besides the difficulty of involving local people on the farm, the safety of the surrounding area is also considered a risk. Thefts are often mentioned in the interviews and conflicts with local people also cause problems for farm growth.

The quality of the DOCs in Nigeria was seen by 13% of the respondents as a constraint. Farmers mention early mortality and health problems in the early life stages, so optimal growth rates are not reached. The distances between hatcheries and growing farms are often long, causing extra challenges for the birds. Table 21 below gives a summary of the issues mentioned by the farmers in order of priority.

Table 21: Challenges in poultry production

No.	Constraint for growth of poultry sector	Percentage of respondents that mentioned the constraint
	Finances	41%
	Infrastructure	40%
	Bird health issues	34%
	Feed quality / price	33%
	Cost of electricity	29%
	Marketing / farm gate price	27%
	Lack of educated staff	18%
	Price and quality of vaccines	15%
	Quality and availability of DOC	13%
	Safety and surroundings	12%
	Egg glut	10%
	Availability of water	10%
	Other ²⁷	4%

6. Training, education and knowledge gaps

The federal government of Nigeria continues to promote entrepreneurship amongst its youth population. This also includes promotion of involvement in the poultry sector. One way of doing this is through the promotion of vocational education and skills acquisition. Many of the agencies providing credit to young entrepreneurs in the agricultural sector usually require them to first seek some training in the respective vocation (poultry, in this case). There are a few private institutions offering short-term, hands-on training for prospective poultry farmers. Monotechnics (such as the College of Agriculture) have also recently commenced short-term training for prospective poultry farmers.

The training required to improve the overall capacity of the poultry industry must target the entire value chain. It should develop the capacity of young people to play their roles as farm hands, farm managers, veterinarians, etc. Those who take an interest in the respective value chain activities need to be exposed to technical and management skills that make them sufficiently prepared for the market.

6.1 Current status of poultry training and education

From our interviews, the major areas of educational deficit are education for poultry farm attendants and the expertise of senior specialists / consultants. Many attendants who gain employment with secondary school certificates are totally ignorant about poultry and have to learn on the job – at great cost to farm owners. Youths who have acquired the National Diploma in Polytechnics tend to prefer supervisory roles. Furthermore, whenever there are complex challenges on the farm, many of those who pose as experts or consultants lack the skills to fix the problems or to do so on time. This is sometimes due to a lacking skill set. At other times it is due to a lack of the necessary technology or tools.

In order to establish a thriving poultry sector (or any other sector), a sound knowledge base of education and training is necessary at four different levels:

Practical hands-on training - also called informal training: The practical hands-on training can be carried out in different ways: in courses of different lengths; on-farm or at a training centre; by separate institutions or as part of the work of vocational training institutes or colleges; and for different target groups: farmers, farm workers, extension officers, students and teachers. Duration of courses can be anything from one day to several weeks, usually depending on the trainee's previous education level, the type of technology introduced and the possibilities for farmers or advisors to be involved in longer-term training courses;

Vocational / Middle Level Training (Certificate / Diploma level): Vocational training leads to certificate or diploma levels, usually in training programmes of two or three years. It provides students with a broad base for a mid-level career in the poultry industry;

Higher Agricultural Education (BSc): University-level training usually prepares students for a future life in advisory or extension services, with governments, in the private sector or with NGOs; and

Post-Graduate Education (MSc, PhD): Graduate education at university (Master's degree, PhD) leads to specialist functions at research organisations, government services, the private sector or NGOs.

Many of the formal academic institutions offering training in agriculture are often accused of being more theoretical than practical, many graduates having to then seek relevant practical exposure. This issue is being addressed through the introduction of practical field work during vacation periods, because most of the schools do not have facilities for students to do practical work.

Table 22: Livestock training institutions



Practical, hands on training, also called informal training	Vocational training (Certificate / Diploma level)	Higher Agricultural Education (BSc)	University Education (MSc, PhD)
Animalcare - Funtuna Institute of Poultry and Aquaculture Management Technology (FIPAMAT)28 Premier Agribusiness Academy	Leventis Foundation29 Obafemi Awolowo University - Institute of Agricultural Research and Training (IAR&T)30	Federal University of Agriculture Abeokuta (FUNAAB)31	University of Ibadan32

6.2 Existing gaps

As a result of the validation workshop and the consultation of experts in the field a list with knowledge gaps was established. This list can be found below. These gaps would be best addressed in the context of a PPP with the government, academia and the private sector. As stated above, the sector will not thrive if the education and training is weak and fails to address private sector demands.

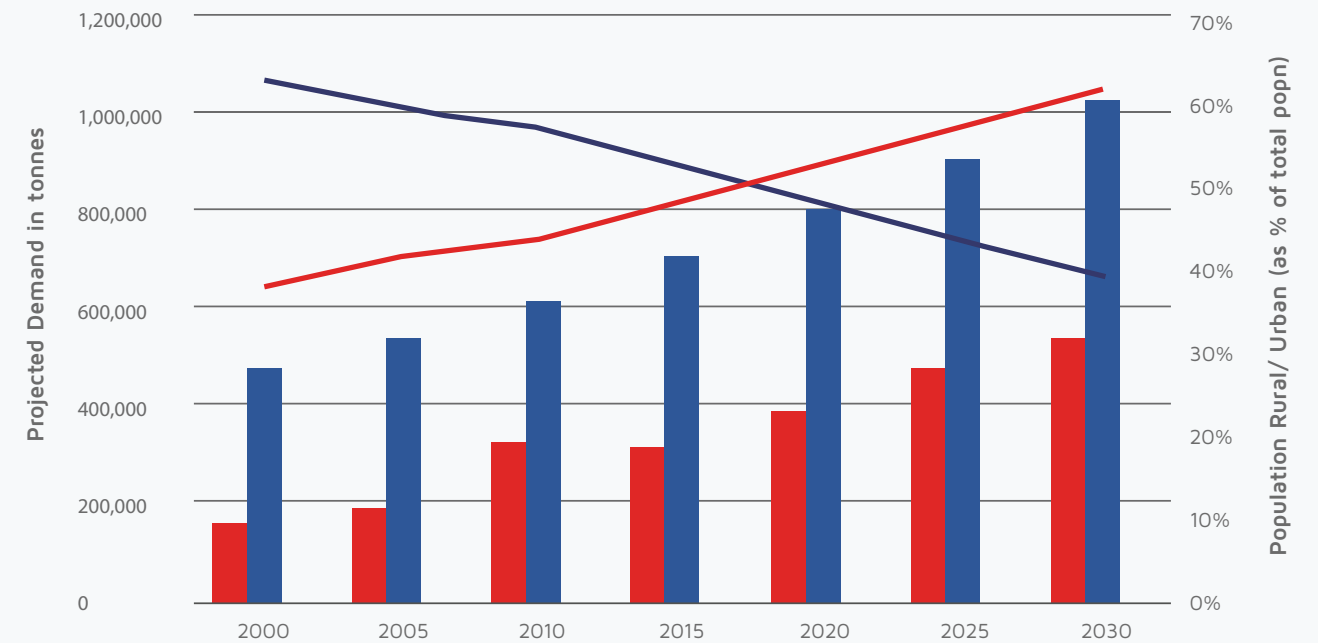
Education topics

1. Broiler Management
2. Biosecurity Manual
3. Farm Inspection Checklist
4. Feeds and Feeding
5. Litter Management
6. Rearing Manual
7. Record Keeping in Poultry
8. Poultry Brooding Manual
9. Poultry Disease, Prevention and Management
10. Effective Management of Layers
11. Feed mill Management
12. Precision nutrition as a means of profitable poultry farming
13. Mitigating the challenges of heat stress in poultry production
14. Brooding management for maximum livability in poultry production
15. Wealth creation from waste along poultry value chain

7. Market

Apart from poultry, other sources of animal protein that are well accepted in most parts of Nigeria include beef, fish and pork. There is competition for market between these animal protein sources. Given the population of Nigeria, it could be argued that there is a big market for poultry products.

Figure 2: Projected demand mapped against population growth



Source: NABC Analysis of Trade Economics, FAO and World Bank Data

The current average per capita consumption is 65 eggs and 1.9 kg of poultry meat per year. When compared with the per capita consumption in the Netherlands (approximately 210 eggs and 22 kg of poultry meat in 2017) and the global average (150 eggs and 13.8 kg of poultry meat per year), it is obvious that there is a wide gap / gulf to fill. It is however expected that the poultry meat consumption per capita will increase again to the same level before the oil crisis (2.1 kg per capita per year) due to the increasing middle class. It is reported that many people in Nigeria do not believe eating eggs has nutritional benefits. It is therefore expected that the amount of eggs consumed per capita will remain the same.

Table 23 below compares the per capita consumption levels for a number of countries across Africa.

Table 23: Poultry meat Consumption (kg/person/year)⁵²

Country	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Côte d'Ivoire	0.92	1.11	1.05	1.51	1.66	2.00	1.99	2.12	2.15	2.21
Ethiopia	0.52	0.59	0.53	0.57	0.58	0.56	0.55	0.54	0.53	0.52
Ghana	4.23	5.39	6.49	7.17	7.70	6.41	5.68	5.93	6.12	6.31
Nigeria*	1.90	2.10	1.80	1.72	1.75	1.75	1.75	1.80	1.85	1.90
SSA average	2.06	2.25	2.31	2.39	2.39	2.43	2.25	2.14	2.13	2.12
Global average	12.40	12.82	13.15	13.24	13.23	13.31	13.67	13.79	13.86	13.93

Source: OECD Data, FAO Data, IPRAVI Data and NABC Analysis (2020)

Please note that the per capita consumption figure for poultry meat reported (1,9 kg/capita in 2017) in the market is not substantiated, being based only on feedback received during the field visits. It has been mentioned, however, by several sources. The marked dip in 2010 could be linked to the drop in oil prices and, as such, purchasing power for the bulk of Nigeria's middle class. It is important to keep this in mind when reading the rest of this chapter, as the consumption of poultry meat is considered a "luxury" in most of Nigeria, consumed at parties, weddings and other social events.

7.1 Poultry value chain

"Increases in the demand for animal-sourced foods are estimated extraordinarily high in Africa over the coming decades" (Livestock Data Innovation in Africa Project, 2013). The reality for Nigeria is that meat consumption, particularly chicken consumption, is growing so fast that capacity is not meeting demand. Growth in Nigeria's poultry sector is driven by a rapidly modernising value chain and the fact that the market is protected from outside competition. Figure 3 below shows the characteristics of the value chain in Nigeria.

Figure 3: Characteristics of Nigeria's poultry sector value chain

Value Chain	Characteristics that define this section of the value chain
Grains and Oilseeds	Nigeria in recent years did not have to import any significant amount of soya. The production costs and low yields however are a concern because they could keep the cost for feed high. Nigeria has the potential for self-sufficiency in maize production for feed. More knowledge and expertise is needed to increase the production of these products in Nigeria.
Feed	This sector is dominated by 3 to 5 large millers that account for over 70% of total feed produced in Nigeria. A big concern is the issue of Toll Millers ³³ . Most branded feed is on average 67% more expensive than unbranded product sold by Toll Millers. There are significant price fluctuations (c.a. 30% to 40%) attributed to the price of raw materials. Quality is not guaranteed for many small- and medium-scale farmers.
Breeding / Hatchery	Nigeria's breeding and hatchery market is growing rapidly due significant investments by locals and foreign companies. Costs for hatching are due to relatively expensive cost of electricity which is unreliable.

⁵² FAO- Livestock data innovation project, Investing in African livestock Business opportunities in 2030-2050, 2013; Rabobank, Food & Agribusiness Research and Advisory, 2017; WUR & NABC, Regionalization in Poultry Development in Eastern Africa, 2018.

Farming	Nigeria has mostly layer farmers. Most farmers i.e. for both broilers and layers are relatively (comparatively) large, with the smallest flock size starting from 5,000 birds. Cost of production is high due to the cost of capital, cost of inputs and inefficiencies in the production process.
Traders	Due to the size of the farms, most farmers are linked to off-takers that are often themselves processors or have ready markets for sale of poultry meat. Trading is prevalent in the egg business where large volumes are sold to neighboring countries, with traders having a significant role to play.
Wet markets / Processing	Nigeria has underutilised processing capacity, specifically meat processing. There is limited or no processing of eggs - Nigeria experienced a glut in 2019 which was not properly managed. There is room for development in this regard.
Customer	Emphasis is put on production as the assumption is that Nigeria does not lack consumers. Though this may be true, consumer and shopper behaviour with regards to how and where they purchase poultry products needs further research. The glut in 2019 was experienced in a market where per capita consumption is at 65 eggs per year (compared to the world average of 150). Understanding why and how consumers buy could generate even more customers from an already large market.

7.2 Trade in poultry inputs

Trade in poultry inputs in Nigeria is concentrated around the large production areas (Ibadan, Ilora – Oyo State, etc.), for obvious reasons. Most of the traders and input suppliers have a presence in Lagos, as the commercial capital, and in Ibadan. A major concern in the trade in inputs is the influence seasonality has on the price of commodities and, therefore, its eventual effect on farmers' cashflows.

7.2.1 Feed

Approximately 70% of the 258 farmers interviewed expressed dissatisfaction with the price of feed. When questioned about the availability and quality of feed, they were, however, satisfied, though it was unclear for a majority of the farmers what "good quality" meant for them. The type of feed purchased is directly linked to the type of farmer.

Most small- and medium-scale farmers prefer buying complete feed from distributors licensed to sell branded products that also do mixing for the clients, as well as from Toll Millers. Large-scale farmers on the other hand prefer buying concentrate and mixing the feed themselves.

Interestingly, due to these differences, we observed a very wide variety of inclusion rates in the market, from 5% to 40% inclusion. Most feed companies and millers, however, indicated that they would only sell high inclusion rate concentrate to good professional farmers that they had already vetted. Table 24 shows the difference in price based on the level of inclusion compared to the price of complete feed.

Table 24: Price of concentrate and feed

No.	Type	SKU	Price per 25 kg bag		Price per kg	
			Naira	EUR	Naira	EUR
	Layer 30% inclusion	25 kg Bag	3,580	8.86	143.2	0.35
	Layer 40% inclusion	25 kg Bag	4,010	9.92	160.4	0.40
	Finished feed	25 kg Bag	3,010	7.45	120.4	0.30

Source: Field research NABC 2019

Seasonality is another factor that severely affects trade and the price of feed as inputs for production, specifically for crops or raw materials for feed. Fluctuations in the price of soya and maize have in the past year been very severe; as high as 30% to 40%. This has by extension affected the price of complete feed. The difference occurs in the wet and hot / dry seasons. Table 25 below shows an indicative price based on research conducted in 2019.

Table 25: Price as affected by seasonality

No	Product	Wet Season		Hot Season	
		Naira	Eur	Naira	Eur
	Concentrate	N370/ kg	0.93/ kg	N370/ kg	0.93/ kg
	Complete feed	N160/ kg	0.40/ kg	N180/ kg	0.45/ kg

The industry and the government are making significant investments in the sector to ensure that the cost price is not only lower but stable and more predictable. The Federal government has policies in place to ensure crop farmers produce enough to cater for both feed and food needs, whilst the private sector is being incentivised to produce concentrates locally at competitive prices.

7.2.2 DOCs

Good yields both for eggs and poultry meat starts with good genetics. Zartech, CHI, Amo, Agrited and Olam are 5 of Nigeria's largest players in the DOC sector. In 2019 these 5 companies accounted for about 90% of the birds placed on the market. Table 26 below shows a summary of the top 10 companies with regards to placements of broilers in 2019.

Table 26: Companies that place Broiler DOC in 2019

No.	Company
1	Zartech
2	CHI
3	AMO
4	AGRITED
5	OLAM
6	SAYED
7	GLOBUS
8	CBH/ VALENTINE
9	FARM SUPPORT
10	FIDAN

Source: Field Research NABC 2019

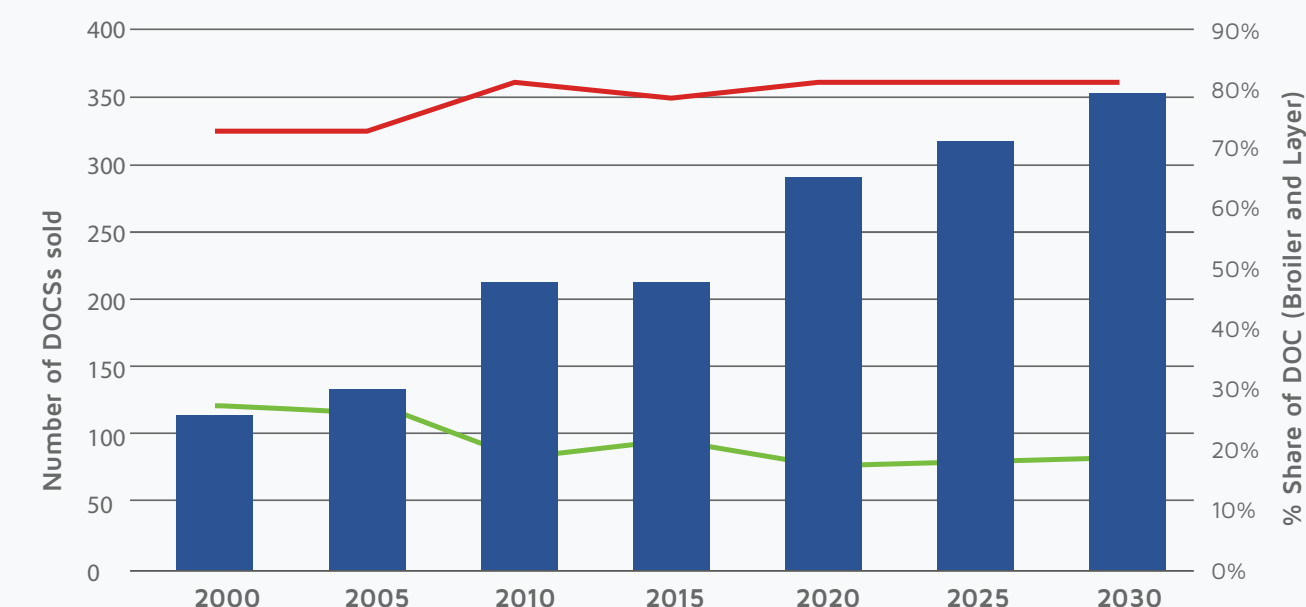
Over 50% of the farmers interviewed expressed satisfaction with the availability and "quality of DOC". Though their definition of quality was also unclear. Table 27 below gives spot prices for DOCs in 2019 (both layer and broiler DOC).

Table 27: Broiler and Layer DOC prices

DOC	Price in Naira / Bird	Price in EUR / Bird
Broiler	N260	EUR 0.64
Layer	N210	EUR 0.52

Source: Field Research NABC 2019

Given significant investments in the industry by the private sector, good quality DOCs will be available and will likely also be competitively priced in view of the competition on the market. The figure below shows forecast growth of DOCs in Nigeria based on the assumption that the sector continues to grow at the same pace as it has done for the past 3 years.

Figure 4: Forecast supply of DOCs⁵³ in Nigeria

Source: NABC Analysis* of FAO data and research 2019

⁵³ About the hatchery production a lot of contradicting information is available. During this research the DOC production is calculated by multiplying the (expected) meat and egg consumption with the (expected) population. An average slaughter weight of 2kg per broiler and a production of 270 eggs per cycle per bird and an average egg weight of 60 gram was assumed. It was also assumed that both layers and broilers had a mortality rate of 5%. Still there are some irregularities between the data of reported poultry products and the calculated number of produced DOC. It is expected that this discrepancies are caused because some sources include smuggled poultry products in their data and others not. This is not always clearly indicated.

7.3 Marketing poultry products

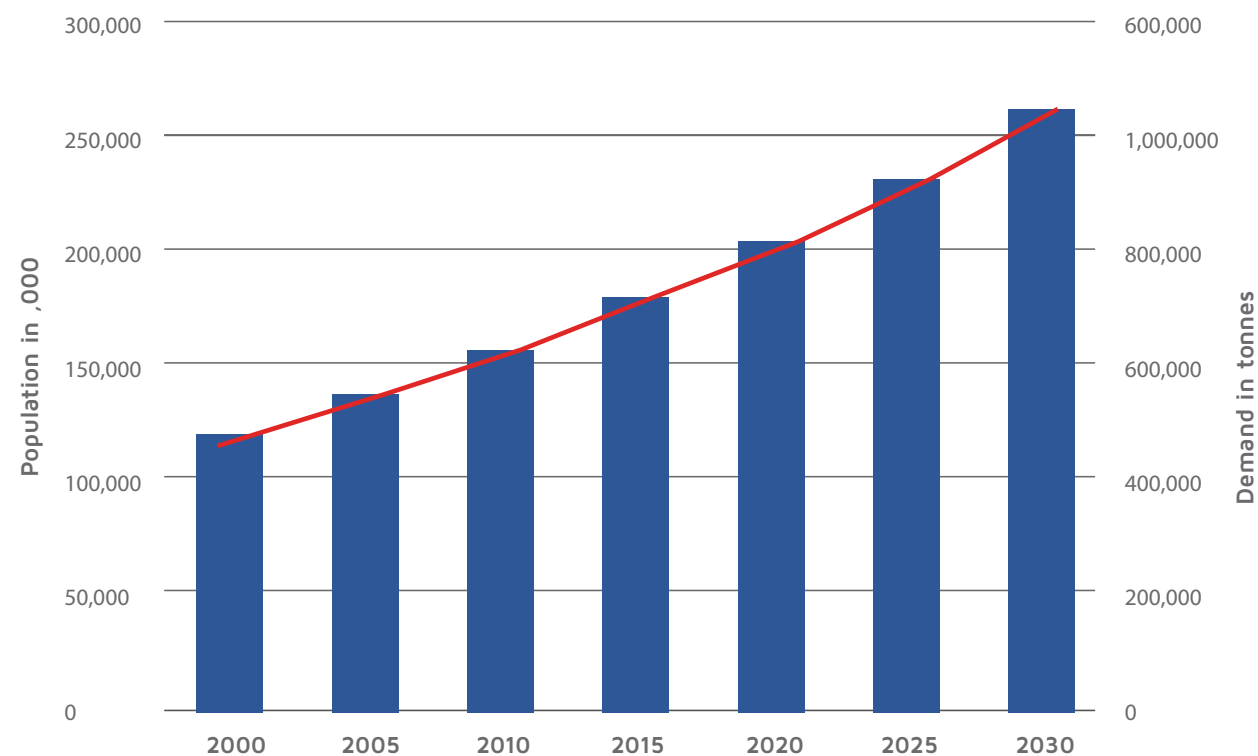
Most of the large integrations in Nigeria also distribute their own products. All of them have their own logistics and warehousing systems that allow them to distribute the products country-wide. There is no cold chain to speak of, as most of the logistics network is not refrigerated. The final stage of transport is undertaken by customised small trucks that then deliver the products to stores, usually owned or franchised by large integrations.

7.3.1 Trade in table eggs

Per capita egg consumption in Nigeria is 65 eggs per year. This is relatively low compared to the world average of 150 eggs per capita. Eggs are sold per piece and supermarkets sell them in packs of 6, 12, 15, 24 and 30. In 2019 there was a glut reported and most of the farmers were affected by the oversupply of eggs on the market. Some traders sold eggs to various neighbouring countries but a lot of eggs were still buried⁵⁴. It is, however, odd that Nigeria experienced a glut despite being way below the global average per capita consumption of eggs. This study could not establish the exact reason as to why consumption is low, despite the availability of eggs. Sentiments from some farmers and industry players indicate that the low consumption is due to "health concerns" (i.e. eggs as a contributor to cholesterol) and lack of awareness as to the benefits of eggs.

With regard to growing demand, significant investment in consumer and shopper awareness is required. The entire industry should be engaged and contribute to efforts that would see consumers become more aware of the benefits of eggs. The figure below shows the projected growth in demand for eggs. The assumption made is that the per capita consumption of eggs will remain constant.

Figure 5: Project demand for eggs in Nigeria



Source: NABC analysis 2019

⁵⁴ In order to dispose of the eggs, farmers bury them in the ground, as it is the most convenient form of disposal for them.

7.3.2 Trade in poultry meat

Poultry meat competes predominantly with fish as a source of animal-based protein in Nigeria. Following the outbreak of HPAI (Highly Pathogenic Avian Influenza) in 2006, the industry took measures to improve biosecurity and hygiene across the chain, including the slaughtering process. As such, since 2008, Nigeria has made significant advances in reducing live bird market (LBM) sales in favour of formal slaughterhouses. A number of large integrations have underutilised capacity in their slaughterhouse operations. It is estimated that the live market is approximately 15% to 30% of the total meat market.

The border closure (since August of 2019) has had a marked effect on the price of birds (slaughtered and live). Table 28 below shows the difference in price before and after the border closure for both live and slaughtered birds.

Table 28: Price for live birds and slaughtered.

	Price before border closure	Price after border closure		
	Naira/ kg	EUR/ kg	Naira/ kg	EUR/ kg
Live bird	N 560 to N 580	EUR 1.40 to 1.45	N 650 to N 700	EUR 1.63 to 1.75
Slaughtered	N 700 to N 800	EUR 1.75 to 2.00	N 900 to N 1,000	EUR 2.25 to 2.50

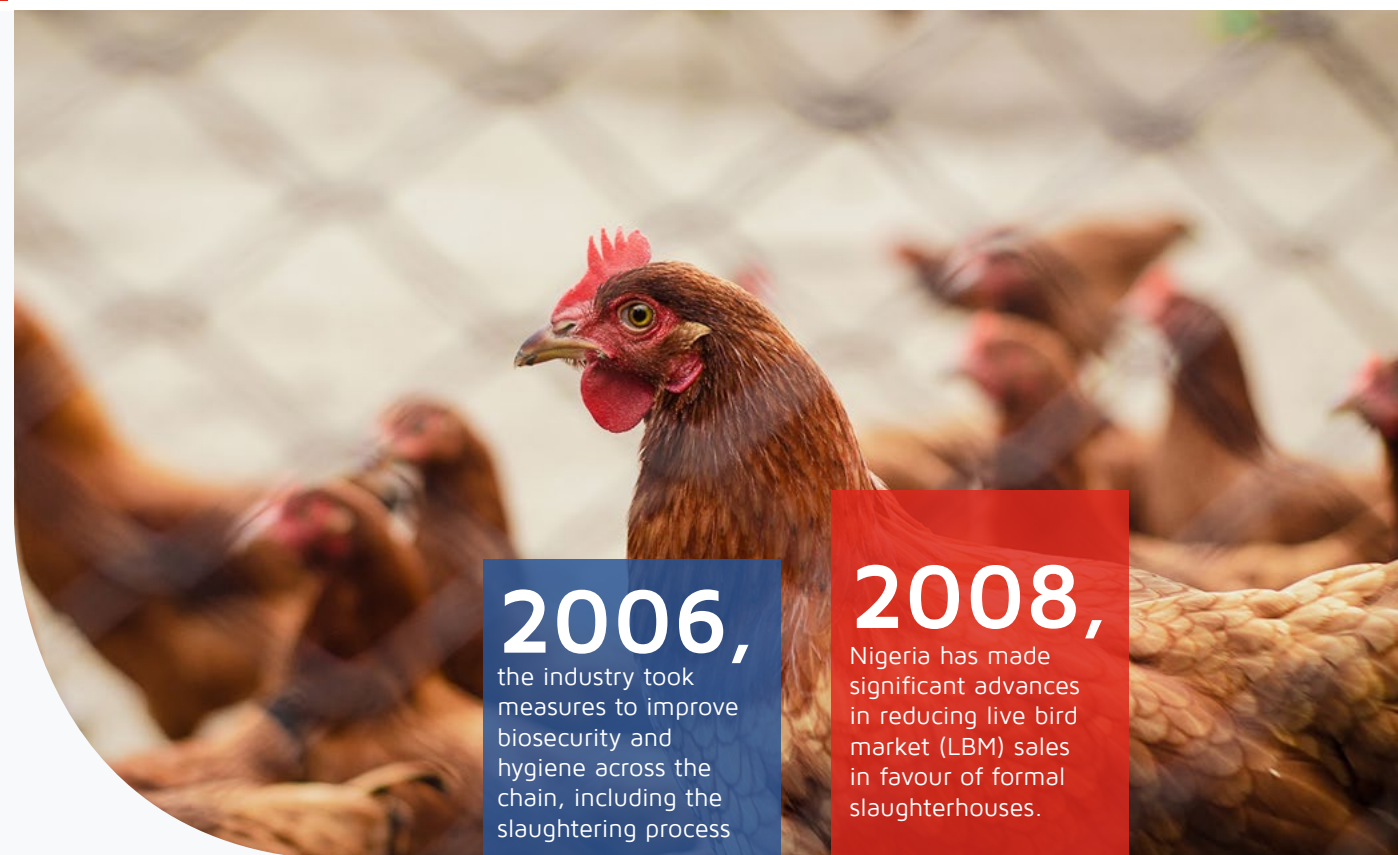
Source: Field Research NABC 2019

The LBM has also changed, as most consumers now buy to slaughter the birds at home, rather than in the market where they were purchased (Please note this still happens in certain areas / markets). Poultry meat is still largely considered a luxury product consumed predominantly during weddings, parties and other special occasions. Rightly so, as chicken meat is the most expensive option, followed by beef then fish⁵⁵ (1 kg of chicken is N 1,950; 1 kg of beef is N 1,850 and 1 kg of fish is N 1,500)⁵⁶.

The demand for animal protein and poultry specifically in Nigeria will continue to grow, as shown in Figure 6 below. The key is to ensure that poultry meat is priced competitively so it can be the norm, rather than the exception, for Nigerian households.

⁵⁵ <https://www.supermart.ng/sub-category/fresh-food/meat-poultry>

⁵⁶ Note prices might vary dependent on season, retailer and location of purchase.

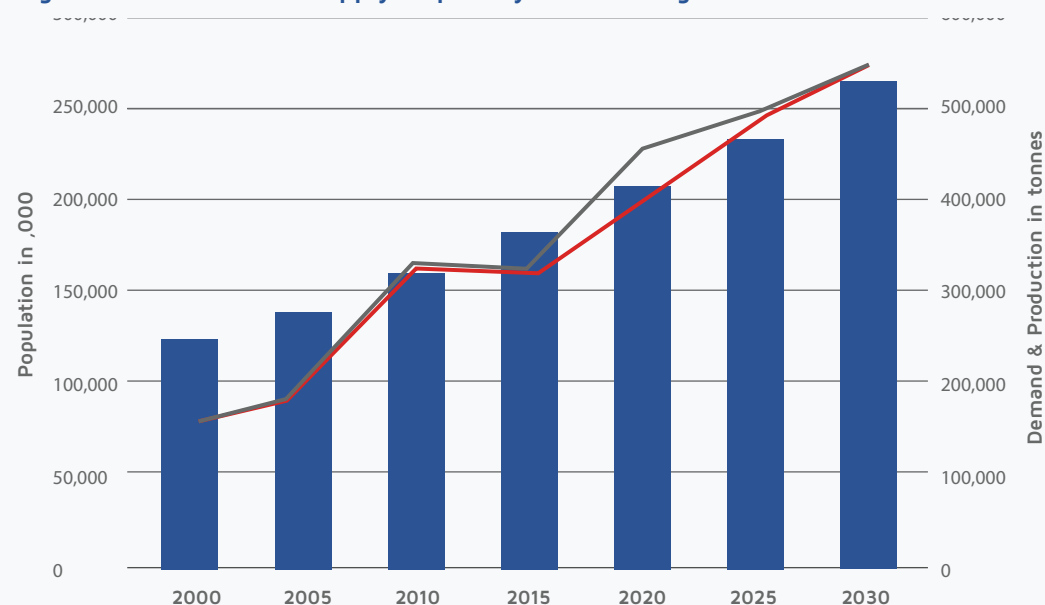


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Figure 6: Demand and supply of poultry meat in Nigeria



Source: NABC Analysis 2019

The entire poultry value chain has experienced organic growth in Nigeria over the years. Formal recognition and documentation, however, is only given attention at the beginning and end of the value chain. Much of the ancillary business activities within the value chain go unrecognised and undocumented (e.g. transportation,

processing, warehousing, consultancy, etc.). Adequate recognition of all elements of the poultry value chain would aid effective planning and development of the poultry sector. For example, rapid increase in production without commensurate increase in storage capacity leads to glut and / or wastage.

There is still room to grow consumption within Nigeria and, given the right incentives and business environment, the sector can thrive and become truly self-sufficient in poultry products within a short time.

7.4 Ban on imports and its effect on market

For a long time, a high percentage of poultry products offered for sale the open markets in Nigeria were smuggled in through the land borders. These products were not necessarily cheaper for the consumer, but they surely offered higher trade margins for the intermediaries than locally produced chicken. When necessary, these intermediaries would lower their prices to stave off competition from local farmers.

Even though the government banned the importation / smuggling of chicken and turkey, the enforcement of the ban only became effective from about 2017. The enforcement of the ban was aimed at encouraging the growth and development of the Nigerian poultry industry.

Of most consequence to the sector are the current trade agreements covering imports and exports of maize, cereals, soya, meat and fish. Table 29 below gives a summary of the significant trade deals to which Nigeria is a signatory and their nature.

Table 29: Trade Agreements Nigeria

Trade Agreement acronym	Description	Signatories to the agreement	Nature
ECOWAS	Economic Community of West Africa States	Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, the Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone & Togo	Economic
AfCFTA	Africa Continental Free Trade Agreement	Niger, Rwanda, Chad, Angola Central Africa Republic, Comoros, The Republic of Congo, Djibouti, Ghana, Gambia, Gabon, Kenya, Mozambique, Senegal, South Africa, Sudan, Mauritania, Zimbabwe, Cote d'Ivoire, Seychelles, Algeria, Equatorial Guinea, Lesotho, Morocco, Eswatini, Tanzania, Tunisia, Benin, Burkina Faso, Democratic Republic of Congo, Guinea, Liberia, Mali, Somalia, South Sudan, Uganda, Sao Tome and Principe, Togo, Malawi, Cameroon Cape Verde, Libya, Madagascar, Zambia, Egypt, Mauritius, Ethiopia, Nigeria, Namibia and Botswana	Economic

With respect to commitments made in this trade agreements, Nigeria must balance the need to protect its own industry to spur growth with a willingness to engage with its neighbours as Africa's largest economy.

7.5 Waste and offal

Waste (chicken fecal matter) is predominantly used by surrounding farms as manure. Most farmers collect, dry and store the waste in bags, then crop farmers come to collect it when they need manure. Offal (chicken intestines) is often sold to pig farmers or those rearing catfish in earthen ponds. The heads and legs are often sold to dog owners through pet shops.

8. Swot Analysis of poultry Trade and Investment

As can be seen in figure 7 below a Swot analysis is presented about the constraints and opportunities in the sector. Clear is that the demand for poultry products will increase strongly over the coming years. The increased demand will open opportunities to produce these products. A risk that must be considered is that the consumption of poultry products directly correlates with the GDP. During an economic crisis, the consumption per capita can decrease and therefore the expected demand can be lower. This is a risk for producers especially eggs producers where currently there is a risk for glut. As egg processing currently is nearly not existent this can be presented as an opportunity to decrease the risk for glut. Also, this could bring new products to the Nigerian market.

Increased production of poultry products will open opportunities for the production as well. Currently the quality of the DOCs, health products, cold chain and infrastructure are considered poor. This means these factors can be seen as opportunities as well and open up chances for investment.

The quality of feed is considered good; however it is considered expensive sensitive to price fluctuations. Better management of the raw materials could reduce the cost of the feed and therefore reduce the production price of poultry products.

The possibilities for loans and investments are limited in Nigeria and as most producers indicate it is difficult for them to make sufficient profit from their enterprises. Solutions must be found to encourage future investments.

Figure 7: SWOT analysis

Strengths	Weaknesses
Growing demand	Lack of local means for investment
Enough meat processing facilities	Low quality DOCs
High quality feed is accessible	Limited accessibility to cold chain
Government is investing in the sector	Egg production is glut sensitive
	Limited accessibility to high quality bird health products
	Poor infrastructure
Opportunities	Threats
Processing of eggs	Consumption is linked to GDP, when the GDP will decrease so will the consumption of eggs and meat Feed price and therefore price of the
Improvement of cold chain	Product quality and price fluctuates
Demand for eggs and meat will grow along with population	Diseases are present.
Production of high quality of DOC	
Products improving bird health	

9. Opportunities for Partnership

Health issues, such as diseases and parasites, were mentioned by 34% of the respondents. Diseases and parasites can cause risks for bird health, leading to mortality or slow growth. Businesses active in the veterinary sector providing consultancy, medicines antibiotics etc. could partner in with the sector in order to improve bird health

The price of feed and raw materials is, according to 33% of the respondents, one of the factors limiting sector growth. Soybean and maize prices can fluctuate (price can vary up to +30% or even more) throughout the year, leading to sudden price spikes for production costs. The application of software for feed formulation and equipment for testing of raw materials and feed production could lower these costs

A lack of knowledgeable staff was mentioned as a challenge by 18% of the respondents. The majority of farm hands are not trained or educated in poultry farming. Trainings either at the farms or in educational institutions can help labourers to be more effective in their work.

The quality of the DOCs in the country is seen by 13% of the respondents as a constraint. Farmers mentioned early mortality and health problems in early life stages. Optimal growth rates are not achieved, with often long distances between the hatcheries and farms causing extra challenges for the birds. Improved genetics better infrastructure and new Grand Parentstock can help improving these issues.

Table 30 below provides a summary of the issues mentioned by the farmers.

Table 30: Summary of the challenges facing the sector

No.	Constraint for growth of poultry sector	Percentage of respondents that mentioned the constraint
	Finances	41%
	Infrastructure	40%
	Bird health issues	34%
	Feed quality/price	33%
	Cost of electricity	29%
	Marketing/farm gate price	27%
	Lack of educated staff	18%
	Price and quality of vaccines	15%
	Quality and availability of DOC	13%
	Safety and surroundings	12%
	Egg glut	10%
	Availability of water	10%
	Other34	4%

9.1 Opportunities for investments in Nigeria's Poultry Sector

In order to clearly define the opportunities for synergy between Nigeria and the Netherlands, we have split the opportunities for partnership into three areas, i.e. G2G, B2B and civil society, which could play a part in Nigeria's poultry sector. See Table 31 below for further details.

Table 31: Opportunities for partnership

No.	Partners	Description
	Dutch and Nigerian Government	<p>Improved access to finance, especially for medium- and small-holder farmers, with better financing costs and structures for all poultry farmers. Work on financial training for banks to enable them offer better services to the agriculture sector.</p> <p>Stabilise the policy and regulatory environment to encourage long-term planning and investments while boosting investor confidence. In addition, make room for refurbished poultry equipment.</p> <p>Introduce complementary legislation on two issues that could support growth in the sector i.e. regulation on refurbished equipment for production and processing purposes, and regulation on bulk importation of vaccines where applicable.</p>
	Dutch and Nigerian Businesses	<p>Develop local markets to further incentivise production and minimise fluctuations caused by speculator activities.</p> <p>Sector-driven promotion of consumption - national campaigns to drive consumption of poultry products, both eggs and meat. Educate consumers on the benefits of poultry as a source of protein and demystify the cholesterol issue.</p> <p>Encourage / Promote all-year round availability of good quality and cost-efficient inputs and / or raw materials for feed manufacturing; veterinary inputs; good quality DOCs, technology and equipment.</p> <p>Extend biosecurity awareness to all poultry-related businesses i.e. hatcheries, processors. Facilitate access to technologies and or equipment that improve biosecurity across the entire value chain.</p>
	Dutch and Nigerian Civil society actors and sector associations.	<p>More sector-specific training and education, especially at lowest (poultry attendant / secondary school leaver) and highest (expert / specialist) levels. Develop practical training courses / curriculum for farm hands and farm managers.</p> <p>Develop a practical Training Farm that would showcase / demonstrate Dutch technology and knowhow whilst improving the capacity and knowledge of local stakeholders.</p> <p>Target "Telephone Farmers" to improve their knowledge and capacity to influence the growth and development of their own farms, usually operated by farm hands.</p>

We have prioritised the issues indicated above, listing those we (the authors) think would catalyse greater change in the sector and, we hope, lead to faster growth of a sustainable poultry sector in Nigeria.

Improved access to finance, especially for medium- and small-holder farmers, with better financing costs and structures for all poultry farmers. Work on financial training for banks to enable them offer better services to the agriculture sector

Stabilise the policy and regulatory environment to encourage long-term planning and investments while boosting investor confidence. In addition, make room for refurbished poultry equipment.

Develop local markets to further incentivise production and minimise fluctuations caused by speculator activities.

Encourage / Promote all-year round availability of good quality and cost-efficient inputs and / or raw materials for feed manufacturing; veterinary inputs; good quality DOCs, technology and equipment.

More sector-specific training and education, especially at lowest (poultry attendant / secondary school leaver) and highest (expert / specialist) levels. Develop practical training courses / curriculum for farm hands and farm managers.

9.2 Involvement of the Dutch sector

Some of the constraints and issues that could limit the growth of the poultry sector in Nigeria can be seen as opportunities for the Dutch sector as well. In table 32 below the opportunities where the Dutch private sector can play a role are mentioned together with the instruments of RVO that can be used to encourage these partnerships.

Table 32: involvement of the Dutch sector

Constraint	Opportunity	Relation to the Dutch sector	Instrument of RVO	Dutch companies that could be involved
DOCs expensive and of low quality	Improvement of the production, genetics and specialized feeds for parent stock	There are several DOC producers and geneticists in the Dutch sector that are capable of improving the production	Important here is to bring the Dutch market in contact with the Nigerian sector. This can happen through events and trade missions.	Hendrix Genetics B.V. Verbeek Hatchery Holland *For specialized feeds see row below
Feed produced is considered expensive	Equipment and training for feed production.	Several Dutch feed producers are active in Nigeria. Also formulation software is sold in the Netherlands	Trade mission and events can bring the Nigerian sector in contact with Dutch producers of equipment and software	Agraplan B.V. Cagemax Champrix B.V. Darling ingredients (Sonac & PRO Ingredients) Koudijs Animal Nutrition B.V. Trouw Nutrition Ottevanger Milling Engineerings
Cold chains	Business opportunities for construction of new facilities	Dutch Consultants can advice and execute construction of coldstores, blast freezers etc.	Events and trade missions can bring the Dutch sector in contact with the Nigerian sector. DGGF could be promoted to attract investments in the sector	Celtic Cooling Geerlofs Refridgeration
Health products	High quality medicines and antibiotics can be offered	Dutch sector could provide these products	Trade missions and events can make the Dutch sector aware of business opportunities in Nigeria	Pas Reform Hatchery Technologies Royal GD



Constraint	Opportunity	Relation to the Dutch sector	Instrument of RVO	Dutch companies that could be involved
Housing is often open	Consultancy and new housing materials can be provided	There are several consultants and equipment providers in the Dutch sector	Trade missions, events and DGGF can make the Dutch sector aware of opportunities and attract investments.	Impex Barneveld B.V. Jansen Poultry Equipment (JPE) VDL Agrotech Vencomatic group
Egg glut	Processing of eggs could increase the demand and prevent glut	Numerous food manufactures that process eggs are present in the Netherlands	Trade mission can be organized specifically about egg processing, at the same time through the DGGF programme investment in the sector can be encouraged	GI-OVO B.V. MOBA Group

As can be seen in the table above the business opportunities presented will require Nigerian stakeholder to encounter the Dutch sector. Trade missions and events can encourage stakeholder to network and B2B business. Both Nigerian stakeholders and representatives of the Dutch sector were asked which events and trade shows they anticipate as the right place for their networking. The results can be found in table 33.

Table 33: Nigerian Poultry shows

Poultry show	Location
Nigerian Poultry Show	Abeokute
NIPOLI	Ibadan
Aviana	Ibadan
West African Agric Summit	Lagos
Agra-Innovate	Lagos
Nigerian Veterinary Medical Association National Conference	Venue rotates around the country
Animal Science Association of Nigeria Conference	Venue rotates around the country
Agrikexpo	Abuja

The nature of these events is to encourage stakeholders to network. They consist of exhibitions, technical sessions, product presentations and B2B meetings. Visitors come from all over the country and international participants are starting to find their way as well. This makes it a good place for the Dutch sector to meet Nigerian stakeholders



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