

Production trend of coffee in Nigeria: A review

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World Journal of Advanced Research and Reviews, 2022, 13(03), 137–146

Publication history: Received on 20 January 2022; revised on 03 March 2022; accepted on 05 March 2022

Article DOI: <https://doi.org/10.30574/wjarr.2022.13.3.0182>

Abstract

The introduction of coffee into Nigeria was as far back as the 1920 s but the crop has been growing in Nigeria since the late 1890 s. Large-scale production of coffee started in the 1940 s but increased in the early to mid-1950 s. Coffee is known to be a source of income generation, adds to the socio-economic value of the household and also led to the development of the producing states especially Kogi state which is one of the major producers of Robusta coffee in Nigeria. Coffee demand is rising globally, while output in Nigeria has decreased from 1961 to 2019. This study aims to examine coffee production trends in Nigeria, factors mitigating its production and recommend possible solutions to improve the production. Previous research has showed a declining trend in coffee output, which has been linked to: poor pricing and marketing; old coffee trees; lack of training on good agricultural practices; lack of government support in the coffee sector; lack of input; climate change; lack of capital or access to credit and lack of improved technology which has led to poor productivity and abandoned farmlands. To improve coffee production; rehabilitation of old trees and implementation of improved technology should be encouraged, an improvement on processing technique that can increase the quality of the coffee thereby increasing the market value. Farmers should be given priority in terms of finance and quick access to loans.

Keywords: Coffee; Trend; Nigeria; Production

1. Introduction

Coffee is a tropical tree crop belonging to the *Rubiaceae* family and genus *Coffea*, which is one of the largest tropical plant families. Coffee is a native African plant that has spread over the Indian Ocean to Madagascar, Sudan, the Comoros, Mauritius, and Réunion [1]. *Coffea arabica* L., generally known as "Arabica coffee," and *Coffea canephora* A., widely known as "Robusta coffee," are two of the 124 species of *Coffea* that are commercially grown for the manufacturing of coffee beverage [2]. *Coffea arabica* is noted for producing high-quality coffee [3], but *Coffea canephora* has a poor flavor profile and a relatively bitter taste [4].

Coffee species are woody, ranging from shrubs to small tree sizes but the characters of coffee species differ from one another [5]. Some drop their leaves at the start of the dry season, while others keep them for three years or more. Nonetheless, the two economically produced varieties, Arabica and Robusta [6], are evergreens. The leaf colour ranges from yellowish to dark green, newly developed leaves of some species are bronzed while others are purple-tingled. The leaf size varies from 1 – 40 cm, though the *C. liberica* variety tends to be of larger tree and leaf size [7]. Coffee cultivars feature thick clusters of fragrant white blooms. Some species are cream-like, even tinged with pink or purplish without fragrance. The flowers are borne with leaves in most species, while in some species flowers are borne on leaflet's branches [8]. The fruit is a drupe, varies in size and has little shape. Fruit refers to as berry which usually contains two seeds except a few (5-10%) of them that have only one, these are called Pea berries. The berries are green when

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immature ripen to yellow and then turn to crimson red which later changes to black when dry [9]. The fruit comprises of epicarp parchment (skin), integument (silver skin), mesocarp (pulp) which envelopes the endocarp parchment shell and the endocarp (parchment) which encloses the seed [10]. The coffee plant attains maturity stage and starts bearing flower 3-4 years after planting but full productivity is attained in 5-7 years [11]. Productivity starts diminishing after 20 years but if good management and agricultural practices are maintained, the tree can bear fruit for about 50 years [12].

The importance of coffee to the economies of most producing countries cannot be overstated. Coffee is cultivated in 80 countries in the world, exported by more than 50 countries in Central and South America, Africa and Asia [13] and functions as a means of generating foreign exchange earnings [14]. It has also created several million jobs in many producing countries where more than nine million tons of green beans are produced annually [15]. Coffee is the world's second most popular beverage after water, with global commerce exceeding US\$10 billion [16, 17]. Coffee is mainly consumed in developed countries; the USA, Finland, Belgium, Sweden, Japan among others [18]. Every day, an estimated 3.5 million cups of coffee are consumed worldwide [19]. According to International Coffee Organization (ICO) statistics, export figures show an increase in coffee export to 10.61 million bags in July 2021, compared with 10.47 million bags in July 2020. Exports improved by 2.5 percent to 98.55 million bags in the first nine months of the coffee year 2020/2021 (October 2020 to July 2021), compared to 96.15 million bags in the same period of the previous year. Export of Arabica and Robusta totaled 82.80 million bags and 46.93 million bags respectively in the twelve months ending June 2021, compared with 79.58 million bags and 49.43 million bags in the year 2020 [20].

Globally, yearly coffee output is increasing. Coffee output and export in Africa, on the other hand, are declining [21]. The decline in production is attributed to; lack of capacity to generate technical knowledge on high-yielding diseases resistant varieties and drought, climate change, aging coffee trees, poor agronomic practices due to weak extension service, dropping in the global market of coffee among others [22]. The objectives of the study are to examine the coffee production trend in Nigeria, identify factors mitigating coffee production in Nigeria and recommend possible solutions towards improvement of its production in Nigeria. A desk research methodology was employed using statistical data and past research papers.

2. Environmental Requirements of Coffee

Coffee-growing zones are found between the equator's latitudes of 25° N and 25° S. Coffee requires certain specific environmental conditions for commercial cultivation but the requirements vary according to the varieties grown. Temperature, rainfall, sunshine, wind, and soil are the ambient conditions [23]. The annual rainfall require for Arabica ranges between 1400 mm and 2000 mm [24], the average temperature required is between 15^oc and 24^oc while the altitude ranges from 1000m to 2000 m above sea level [25]. Relative humidity required for Arabica is around 60% [24]. *C. arabica* grows at higher elevations and grows in steep terrain [25]. Robusta requires annual rainfall of 2000mm to 2500mm, ideal temperatures of 22°C to 28°C, and relative humidity between 70% and 75% [24]. Cool to warm tropical regions, as well as rich soils, are ideal for coffee production [26].

3. Good Agricultural Practices (GAP) for Coffee

Good agricultural practices (GAP) are procedures that must be properly followed from pre-planting to post-harvest to ensure environmental, economic, and social sustainability from pre-planting operations up to postharvest handling to ensure quality and safety of food and non-food agricultural product [27]. For yield improvement and better quality of coffee production, the following agricultural practices have to be considered; site selection, seed origin and variety, nursery management, shading, mulching, weed management, pruning, pest and diseases management among others.

3.1. Site selection

The site to be selected for coffee cultivation must be flat preferably, well-drained, friable and have good water retaining capacity during the dry season (clay content of about 15-20%). Arabica and Robusta have pH levels of 4.5-5.5 and 5.5-7.0, respectively. Waterlogged areas or polluted soils must be avoided. Soil testing is also important to determine the fertility level and fertilizer required for optimum coffee production. The two most important nutrients for coffee are nitrogen and potassium, with K being more important in fruit development and N for vegetative growth. Phosphorus is necessary for root, flower bud, and fruit development in crop plants, as well as for energy storage and transfer [28].

3.2. Seedling and variety selection

The yield and quality of coffee produced are determined by the origin and variety of coffee used. Some varieties are highly susceptible to Coffee Berry Disease (CBD) and other diseases. Therefore, a certified source, such as the Cocoa Research Institute of Nigeria (CRIN) or any other certified coffee seed supplier, should be contacted to purchase certified and healthy seedlings. When choosing a new variety, be sure that it is suited to the growth circumstances in your area. For instance, the Java variety performs best in the North West region as it is most resistant to CBD. It is very important to consider the quality of seedling you want to obtain [29] and also avoid buying twisted tap root seedlings, as this will not penetrate deep into the soil, thereby making the tree weak and susceptible to drought damage.

3.3. Nursery management

Nursery requires good agricultural practice (GAP), as poor practices in it led to a high percentage of weak young coffee plants [30]. Seed should be planted in a proper growing medium, the appropriate size of plastic bags, tubes or jiffy pots to avoid constriction of the root [30]. Maintenance of good sanitation to avoid harboring pests, washing tools after use and keeping them in a cool and dry place. To avoid losses due to insect pests and infections, operation must be done in a pathogen-free environment. Adequate weeding should be done manually as the need arises, daily inspection of the planted seedlings for any irregularities, watering of the beds should be done regularly and also hardening off is necessary before transplanting the seedlings.

3.4. Mulching

This is the provision of a surface layer of dead surface vegetative matter to conserve soil moisture, reduce soil temperature, increase the organic content of the soil, suppresses weed growth, increase nutrient uptake of the coffee plant, has beneficial effects on soil nitrate and increases both vegetative growth and yield of coffee berries. Best organic mulches include leguminous plants, *Chromoleana odorata*, and Elephant grass and plantain trash. Mulch should be at least 10-15 cm radius and about 10cm away from the base of the seedlings. The essence of the distance is to reduce termites risk attack on the seedlings if the place has termites [31].

3.5. Shading

Shade plants are planted a year before coffee is cultivated. The ideal shade crop is plantain, planted in the middle of two coffee stands. The essence of shade is to recreate their original forest environment and also to mitigate the effect of extreme high and low temperatures [24].

3.6. Weed management

To facilitate the good establishment of coffee seedlings and eliminate weed problems in later years, weeding should be done manually 3-4 times per year during the first 18-24 months. However, when herbicides such as gramazone, primextra are used, weeding frequency is lesser. Herbicides should be used prior to the emergence of the weed [31].

3.7. Pruning

This is important maintenance in coffee to remove unwanted stem, suckers, dead, weak and unproductive branches to maintain regular shaped trees, encourage new growth and productivity using secateurs, pruning saw, sharp cutlass, knife and red paint [32].

3.8. Integrated Pest and Disease Management (IPDM)

Vigorous plantation with high productivity of good quality coffee is obtainable through adequate prevention from disease and pest attacks [33, 34, 35].

4. Coffee Value Chain

The coffee value chain refers to a set of activities involved in transforming a raw product into finished goods and sold to the consumer. The coffee value chain is divided into four stages: cultivation, processing, roasting, and consumption.

4.1. Cultivation stage

This is the first stage in the coffee value chain, it involves activities like planting, weeding irrigation, fertilizers supply, application of pesticides, herbicides and finally harvesting the coffee berries (harvesting is done manually in most developing countries which is too laborious and cumbersome [36].

4.2. Processing stage

This is the second stage in the coffee value chain and it involves the transportation of coffee berries from where it is produced to the processing mill. There are two processing methods; wet and dry processing method. The wet approach necessitates a significant amount of energy, time, and money. A lot of measures like sorting, polishing, washing and drying are applied in wet processing. Sorting is done by immersion of berries in water whereby the good and the ripe cherries are sinks and the unripe and the bad cherries float in water. The ripe cherries are cleaned in a machine by pushing them through a screen into water. Finally, the beans are dried, either mechanically or naturally. The dry method involves sorting, cleaning and drying either naturally by sun or by machine to speed up the drying process [37]. The major problem of the wet processing method is water pollution as used water for fermenting process is often dumped or finds its way back into the river [38].

4.3. Roasting stage

This is the third stage in the coffee value chain and it is done at a processing company or various coffee houses. Coffee of different regions and types can be blended and heated between 370 degrees and 540 degrees 8-15 minutes as required by the roasters. The water content of the coffee bean is lowered during roasting, and a chemical process occurs in which carbohydrates are transformed into sugar while proteins are broken down and the whole cellular structure of the bean is altered. While heating, coffee oil is released, this is the essence of coffee. Finally, the coffee is grinded, packaged, branded and sold to the retailer [37].

4.4. Consumption

This is the final phase of the coffee value chain. Consumption can either take place either in the individual consumer's house or at various coffee shops commercially.

5. Nigeria Coffee Production's Trend

According to the Federal Department of Agriculture (FDA), coffee was first introduced to Nigeria in the 1920s. However, the crop has been growing in Nigeria for a much longer period before FDA introduction as shown in a record of export figures of 5.5 tons and 25.2 tons in 1896 and 1901 respectively [39]. A large scale of coffee production started as far back as the 1940s but gained momentum in the early to mid-1950s [40]. Before the introduction of the FDA, *C. liberica* and *C. abeokutae* are the most widely cultivated species and natives of Nigeria. Following the dwindling demand for indigenous coffee, other economically important coffee species were introduced to the farmers in the 1930s; *C. arabica* and *C. canephora* [39]. Small-scale farmers grow the majority of coffee in underdeveloped nations like Nigeria [18]. The crop is grown in fourteen of 36 Nigerian states, covering over 5000 hectares of land. The producing states are Kogi, Ondo, Taraba, Abia, Ogun, Ekiti, Kwara, Oyo, Cross River, Bauchi, Edo, Akwa Ibom, Delta and Plateau [41]. Except for the Mambilla plateau in Taraba state, certain areas of the Obudu ranch in Cross River state, and the Jos plateau in Plateau state, *C. robusta* is primarily grown in Nigeria. [41]. *C. robusta* accounts for 94%, *C. arabica* accounts for 4% and *C. liberica* accounts for 2% of Nigeria's coffee production [39].

Coffee is one of the major cash crops constituting the backbone of the Nigerian economy before the emergence and re-emergence of petroleum oil. The crop has been a source of income generation, contributes to the socio-economic value of the household and also led to the development of the producing state particularly Kogi state that is known to be one of the major producers of Robusta coffee in Nigeria [42]. Despite all these signs and the fact that coffee demand is on the rise in the world, coffee production in Nigeria is experiencing a downward trend and fluctuation over the period between 1961 and 2019. According to Raw Materials Research and Development Council (RMRDC) statistics, about N1.5billion worth of coffee products were imported into Nigeria between 2010 and 2015 [43]. According to the United States Department of Agriculture (USDA), zero percent of coffee output was reported during the first four months of 2015, and no export data was recorded during the first seven months of the same year [19]. Africa country like Nigeria produced 174,000 tons of coffee, earning \$1billion for its export [19].

6. Factors Affecting Coffee Production in Nigeria

There is a consistent decrease in coffee production in Nigeria over many decades but the downward trend in Nigeria coffee production is attributed to many factors as identified by [19, 42, 44, 45] are; the problem of marketing, old coffee trees, lack of training on good agricultural practices and improved technologies, lack of government support and investments in the coffee sector in terms of capital and access to credit are also locked coffee production into low performance trap, lack of farm inputs and drought leading to poor productivity and abandoned farmlands.

6.1. The problem of marketing

This is the most important challenge dwindling coffee production trend in Nigeria [19, 44, 45] attribute this challenge to poor pricing and lack of market information. Causes of poor pricing of processed coffee beans can be explained by several factors which are; the lower pricing trend in international marketing harming local producers; Low quality of processed coffee bean which majorly characterizes coffee bean produced in Nigeria which is as a result of poor handling in the processing stage leading to rejection at the international market because it does not meet international market standard and competitiveness process [42]. According to [46], pre-harvest procedures account for 40% of coffee quality, post-harvest practices account for 40%, and export processing and storage account for 20%. High quality of coffee attracts a high premium in the world market [47, 48]; inadequate quality control system; Poor marketing channel; Lack of market information.

6.2. Moribund coffee trees

Coffee tree age is another important factor contributing to low yield in Africa coffee production [49]. It is evident that farmers across the country have trees that are up to 40 years old except the few ones with a mean age of about 22 years old found in the Southern Western block [50]. Most of the coffee trees in Nigeria are old and have already surpassed their productive age, as many of the farms were acquired through family inheritance with existing coffee stands [42]. The yield of old coffee trees would continue to decline without proper management up to a certain point when they can no longer be rehabilitated to produce reasonable yields. Hence, to enhance the productivity of coffee, rehabilitation becomes necessary to bring the coffee tree back to its youthful productive cycle, only if it will be economical to rehabilitate otherwise renovation which involves the complete replacement of old coffee trees with young high yielding and disease resistant varieties seedling will be practiced. Coffee trees, on the other hand, may be productive for up to 50 years if properly managed [12]. According to [42], a farmer in Kogi state informed that his coffee plantation was established in 1957, more than five decades and is still fruiting with the aid of pruning, as a rehabilitation technique. Aside from the lower yields that aged coffee plants can produce, there are other factors to consider, another problem of the old coffee tree is that coffee cherries obtained from it usually provides strong taste with harsh characteristics brew [51], which can affect the quality and ultimately affect the marketability as quality determines the relative price and the usefulness of a given quantity of coffee [52].

6.3. Lack of farm input

Poor use of agricultural inputs such as fungicides, pesticides, and fertilizers among others by farmers results in low yield in coffee production. Fungicides application is needed to control the prevalence of coffee disease to increase coffee yield [53]. Uncontrolled disease coffee plantations can reduce the crop yield by 50 to 0% [54]. Fertilizer is one of the important inputs in increasing coffee production [55]. Fertilizer use has a significant impact on coffee yield. Inadequate use of it may result in low coffee yield [56]. However, the right application of recommended fertilizer with appropriate dosage at the right time will increase coffee yield [53]. The majority of Nigerian coffee farmers do not apply fertilizer at all and the few who apply don't apply sufficient amount due to the high cost of fertilizers [44].

6.4. Lack of capital and access to credit

The access to finance and credit are critical factors in increasing agricultural output. Productivity and standard of living of smallholder farmers can be improved, if agricultural credit is made available to them [57]. Coffee is a seasonal crop that need investment prior to harvest in order to generate profit. [58]. Access of credits to small-scale farmers allows them to procure modern agricultural inputs in which their savings alone cannot purchase [59]. Research revealed that farmers' access to credit is limited and the cost of borrowing in terms of interest is high [60]. Peasant farmers' access to finance is limited by a lack of bank accounts, collateral security, and understanding on procedures to take to access credit from banks [61]. According to [62], 71% of the farmers do not access credit this may be due to fear or lack of awareness of it. To address the limitations imposed by a lack of credit, farmers should be well oriented on the procedure to follow in accessing credit and also increase their level of awareness on the existing policy through radio, television and newspaper allowing farmers to take advantage of the opportunity [62].

6.5. Drought

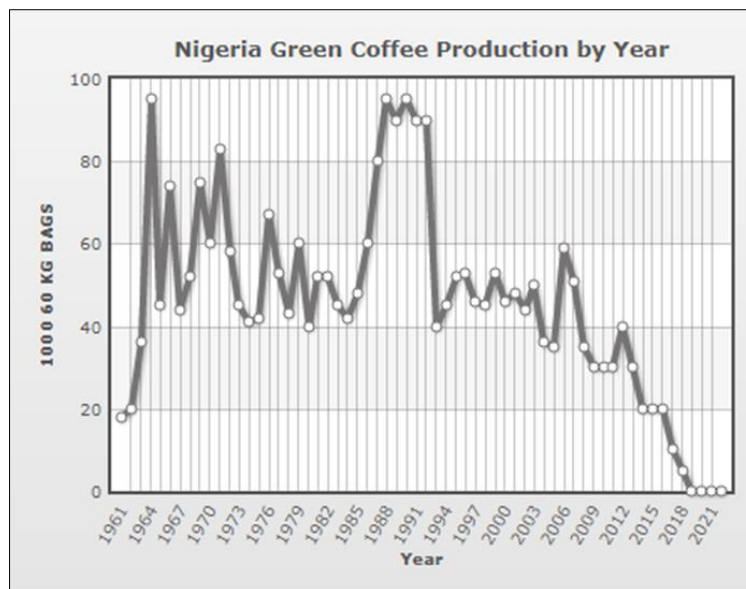
This occurs as a result of climate change. Drought has become constant in Nigeria arising from a decline in precipitation and a rise in temperature [63]. Drought condition negatively affects germination of seeds and also affects the growth and development of crops [64, 65]. The occurrence of drought inhibits bio-physiological processes such as photosynthesis and respiration of crops leading to poor growth and low productivity [64, 66]. Drought is one of the most significant restrictions to coffee production. It is the most significant environmental issue impacting coffee-producing countries [67]. Coffee yields can be reduced by as much as 20% if there is a long period of drought without

irrigation [67]. To overcome the problem of drought caused by climate change, it is therefore pertinent to support coffee farmers in building their resilience to climate change risk by developing local strategies to improve coffee production and the livelihoods of coffee farmers [68]. According to [63, 69], adoption of existing improved technologies in adapting to climate change and variability is of great importance to many ecological zones in Nigeria, the adaptation strategies include; adoption of drought resistant and early maturing varieties of crops, water harvesting for irrigation, mulching of young seedling and crop diversification.



Source: [45] Legend: 1. Bauchi state; 2. Kogi state; 3. Ogun state; 4. Oyo state; 5. Taraba state; 6. Plateau state; 7. Ondo state; 8. Ekiti state; 9. Kwara state; 10. Delta state; 11. Edo state; 12. Abia state; 13. Akwalbom state; 14. Cross- River state.

Figure 1 Map of Nigeria showing coffee-growing states



Source: [70]

Figure 2 Nigeria Green Coffee Production From 1961-2019

7. Conclusion

Despite coffee's importance for economic growth and poverty reduction, the study revealed that the coffee production trend in Nigeria has shown a highly significant level of decline over time. Poor pricing and marketing channels particularly at the international level, aging coffee trees, lack of training on good agricultural practices, lack of government support, climate change, lack of input, land acquisition and drought have been attributed as the major causes of the decline in Nigeria coffee production. However, to avert the downward trend in Nigeria coffee production;

- There should be adequate sensitization for altitudinal changes and develop farmers' knowledge and skills on how to improve their agricultural practices and adopt improved cultivars by extension agents.
- There should be sufficient resources for the effective implementation of improved technology developed.
- Farmers should be encouraged to practice rehabilitation techniques like coppicing to rejuvenate their farmlands.
- Boosting coffee production by improving processing practices of smallholders to improve coffee quality which is one of the determinant factors to increase the market price of coffee.
- Extension agents should assist farmers on how to adapt to climate change using appropriate strategy techniques.

Compliance with ethical standards

Acknowledgments

I want to sincerely appreciate my co-authors for their great inputs towards the success of this research.

Disclosure of conflict of interest

The authors declare no conflict of interest.

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