CLIMATE CHANGE, FOOD SECURITY, NATIONAL SECURITY and ENVIRONMENTAL RESOURCES

GLOBAL ISSUES & LOCAL PERSPECTIVES

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Preface

This book adopts an exegetical approach as well as a pedagogic model, making it attractive agriculture and environmental economics teachers, professional practitioners and scholars. It is eschews pedantry and lays bars the issues in such clarity that conduces to learning. The book elaborates on contemporaneous climate change, food security, national security and environmental resources issues of global significance and at the same time, is mindful of local or national perspectives making it appealing both to international and national interests. The book explores the ways in which climate change, food security, national security and environmental resources issues are and should be presented to increase the public's stock of knowledge, increase awareness about burning issues and empower the scholars and public to engage in the participatory dialogue climate change, food security, national security and environmental resources necessary in policy making process that will stimulate increase in food production and environmental sustainability.

Climate Change, Food Security, National Security and Environmental resources: Global issues and Local Perspectives is organized in four parts. Part One deals with Climate Change with Six Chapters, Part Two is concerned with Food Security with Nine chapters, Part Three deals with National Security with Five Chapters, while Part Four pertains Environmental Resources, has Five Chapters.

Ahmed Makarfi / Eteyen Nyong

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CHAPTER 19

Duck Farming

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Introduction

Among the livestock species that significantly contribute to supply of animal protein, poultry are the most widely distributed in both urban and rural areas (Adeniyi and Oguntunyi, 2011). The commercial poultry industry in Nigeria is valued at approximately 80 billion naira ($6600 million) and is considered the most industrialized component of the livestock subsector Folorunsho *et al.*, (2024). However, the industry is dominated by exotic chicken breeds, which are given better attention in terms of research for genetic improvement, for better performance of the birds in terms of meat and egg as well as nutritional requirements (Folorunsho *et al.,* 2024).

This prevalent situation is mainly at the detriment of the local / indigenous poultry breeds, which have hardly received any systematic scientific attention (Onyeocha, 2002). Even with all these interventions / attentions given to the exotic chicken the cost of poultry meat still remains elusive to the average households (Jha and Chakrabarti, 2017 and Folorunsho, 2024). Therefore, in the bid to reverse the trend and ensure reduction in protein deficiency, poverty and unemployment, the local chicken began to receive more attention in comparison to other promising local poultry species (duck, geese, turkey and pigeon), which have been hitherto greatly neglected (Sule *et al.*, 2024*;* Folorunsho *et al.*,, 2024). Presently, global attention has been directed towards the contribution of poultry species like the duck with the aim of further alleviating animal protein deficiency, reducing unemployment and poverty among rural communities (Jha and Chakrabarti, 2017).

There are many breeds of duck raised globally either for ornamental or domestic reasons. Domestic ducks are water-fowls, which are raised mainly in high rain fall regions, deltas, riverine areas and coastal districts of the tropics and also in temperate climates where they are kept in commercial

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quantities (NAERLS n.d.) Duck farming plays a significant role in the agricultural economy in the Asian continent, which accounts for 82.6% of the total duck meat production of the world. (Santoso, Setiadi and Prastiwi, 2023; Jha and Chakrabarti, 2017). According to Pingel (2009), duck meat production increased from 1.3million tons in 1991 to 3.6 million tons in 2007, with 65% of the worlds production coming from China. The National Bureau of Statistics (Kadurumba, Iloeje, Ogundu, Okoli, Okoro, and Kadurumba, 2022; NBS, 2012) reported that in Nigeria, the duck population ranked third (9, 553, 911) after chickens (101, 676, 710). Local ducks in the country are raised on free range, small scale backyard units for household consumption along with domestic chickens (Folorunsho, 2024 and NAERLS n.d.).

However, many farmers are yet to recognize the potentials of duck production (Folorunsho, 2024 Antyev *et al.*, 2023), due to the neglect/veneration of the ducks based on the perception of their being dirty as well as having superstitious and cultural taboos (Balogun, 2007; Onyeocha, 2002; Folorunsho, 2024), which tends to portray ducks as mystique birds and thus they are not widely consumed and furthermore, they are not considered economically viable and like the chicken, inspite of these short comings, the development in research and technology has increasingly eliminated these cultural barriers and enhanced the productivity of the birds in the recent decades with due respect to the other promising attributes / advantages of the birds viz-a-viz being hardier and more resistant to diseases and environmental hazards than the chickens. This chapter therefore explores the potentials of duck farming towards increasing meat food (protein) sufficiency, reducing poverty and unemployment rates amongst the rural poor people.

Advantages of Duck Farming over Chicken

- They require little space. They do not require elaborate and expensive housing facilities. They only require shelter at night since they are let loose to scavenge during the day time
- Ducks are hardy and more resistant to prevalent chicken diseases (thus have lesser mortality rate).
- The meat quality is comparable to that of local chicken and exotic chickens in terms of appearance, juiciness, tenderness and flavor (Oluyemi and Ologhobo 1997).
- Ability to survive on low-cost diet. Ducks are able to digest fibre and protein food relatively more efficiently than chickens. Therefore, the use of non-conventional feedstuffs will be an advantage.
- Integrated farming systems are feasible with duck raising e.g.
  i. Duck –swampy rice production
  ii. Duck-fish-farming (NAERLS, n.d.)
- Duck farming provides manure for improved soil fertility of agricultural lands (Jha and Chakrabarti, 2017).
- They require little attention (labour) since their eggs are either laid at night or early morning. (The eggs can be collected in the morning prior to releasing the ducks on free range during the day.

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- They have higher hatchability rates in comparison to chickens due to their plumage, which ensures more effective incubation (Folorunsho, *et al.*, 2024).
- Ducks lay more eggs than chickens with each duck laying about 250-300eggs/year (Jacob, 2024)
- Duck eggs have unique flavor, they are larger and also have thick shells and more appropriate for processing into value-added products (Nworgu *et al.*, 1997).
- Profitable small backyard projects is more feasible with ducks than chickens due to the fact that ducks have longer productive (egg laying) period.
- Farmers only replace the laying duck flock twice every three years while for optimum egg production, chickens flocks need to be replaced after every egg laying season.

Common Duck Varieties

There are many varieties of duck in the world. These include:

i. The Muscovy
ii. The Campbell
iii. Pekin
iv. Aylesbury

Pekin: They originated from China and they are popular table ducks in North America and Australia. They are completely white. Pekins are meat types with rapid growth. The males attain up to 4kg while females attain abour 3.5kg on modern farms.

Aylesbury: They originated from Britain, they are good meat producers, usually snow white in colour and they attain a weight of about 4.5kg at maturity. They lay up to 100eggs/year.

Indian Runner: They originated from Malaya and were introduced into Britain as egg types. They can lay up to 180eggs/year. They are easily recognized because of their upright posture/stance. Generally, the birds are kept for either meat or egg or for both.

Duck Meat

The muscovy duck is a gamey table bird. The Pekin and Aylesbury are heavier breeds as such they are good meat producers.

Duck Eggs

Duck eggs are not often collected or consumed because the egg output of ducks is low compared to chickens thus it is believed that the female ducks should raise as many young from the eggs as possible in order to cover for high mortality rates of ducklings due to predator attacks (NRC, 1991).

Common Duck Varieties in Nigeria

The most popular varieties of ducks kept in Nigeria include:

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i. The Muscovy
ii. The Campbell (Khaki Campbell)

The Muscovy: The Muscovy ducks are the most popular variety in Nigeria and they make up to 74% of duck population in Nigeria. They are considered healthier due to their lower fat content (Sandhu, 2020; Hassan *et al.*, 2018). The Muscovy duck originated from Central America. The bird is commonly kept on free range and at backyard level. The plumage varies from black to white or a combination of both colours. The Muscovy ducks are easily recognized by the red fleshy out growths found around the eyes and beaks. The ducks are popular due to their high adaptation to scavenging conditions. They are numerous in the Southern states along the coastal regions of Nigeria. They are excellent mothers and good egg sitters. Muscovy ducks are able to hatch and care for an average of 30 ducklings (young ducks) annually/bird. The egg weighs between 55-60kg each. Under scavenging conditions the duck can lay between 100-125/bird/year on modern commercial farms. As scavengers, the adult female weighs 1.5kg while the male weighs 2.2kg. The Muscovy duck is recommended for the Nigerian poultry farmers because of its readiness and ability to hatch other eggs set under it aside from its own (Lamido, Mukaddas and Jallaba, 2024).

The Campbell. It is found mostly in some modern and government/research farms in Nigeria. The ducks is Khaki coloured, thus the name Khaki Campbell duck. It is known for its egg-laying performance (the most popular egg type) variety in most regions of the world. It is of average size and more compact in posture than the Muscovy. The eggs are fairly large, thick shelled and weigh 60-70g each. The ducks are not valued for meat. The mature male birds weigh less than 2kg while the female weigh about 1kg on free range. The Campbell duck is known to produce up to 300 eggs/year/bird when adequately fed and housed on modern farms.

Selection of Breed Stock

Selection of ducks for breeding purposes is normally carried out as early as the 8^{th} week and thereafter at the 4^{th} and 5^{th} months prior to placing the breeders in the breeding pens. By the 5^{th} month all healthy ducks should have well developed bodies. The selection criteria usually includes:

i. Body size
ii. Posture
iii. Feather
iv. Colour
v. Bill shape

The male duck should be the same age as the female or a month older. They should be raisd separately from the females and they should be kept together when they are ready to mate. Breeding stock should be purchased from reliable duck rearers in the local community and it is usually advisable to begin with day-old ducklings. The ducklings should have the following traits:

i. Steady legs

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ii. Alert eyes
iii. Healthy looking feathers
iv. No physical defects

For both egg and meat selection, the potential duck farmer or practicing duck farmers should avoid purchasing ducklings, which are drowsy/sleepy. If the purpose of selection is for egg production, the purchase of ducklings should be made from a farmer who has good egg production records from his flock.

General Reproduction of all Duck Breeds

Commercial production systems

The mating ratio of drake (male duck) to females is 1:10-12. Beyond this ratios a low percentage fertility of eggs is obtained from the eggs produced. Ducks mate both on land and in water.

Ducks start laying at about 4 ½ months (18weeks) of age. Modern ducks of egg laying strains produce between 250/280 eggs/year. The local birds only produce about 60-80/birds/year. Ducks are usually sold after about two to three years of continuous laying (when they are spent layers). Ducks lay their eggs at night and thus the eggs have to be collected in the morning to prevent them from getting muddy. Under the backyard system (free range system), empty cartons could be provided to serve as egg nests and they should be placed in hidden places to prevent disturbance of ducks during laying. Under this same system, the reproductive cycle of ducks is three (3) phases:

i. laying phase (10-15 days)
ii. Incubation phase (28-30days)
iii. Brooding Phase (60-65days)

The most critical period in the life of ducklings is the first 3weeks. Any slight disturbance causes stampede, which results in the death of weaker ones. Thus extra care needs to be taken during the brooding process. There are two methods of brooding namely:

1. Natural brooding
2. Artificial brooding

1. Natural Brooding: Is the oldest and traditional method of brooding practiced by backyard duck producers in which the mother ducks furnish ducklings with additional heat and intensive care needed by the ducklings to assist them in maintaining their body temperature and for healthy growth. This method is practicable for commercial level of duck production. The Muscovy duck can naturally brood up to 10-15 ducklings. Muscovy ducks and broody hens are better sitters than most duck species. A broody hen can be given at least 8 eggs to sit on.

2. Artificial Brooding: This brooding practice is done without the mother duck; it is done with the use of artificial brooders. Ducks like the Khaki Campbell and the Indian Runner are poor mothers

thus ducklings of such duck varieties are brooded artificially. Artificial brooders usually in contrast to natural brooders can accommodate as small as 50 ducklings, hundreds and even thousands of ducklings at the same time depending on their design and size as well as the type of fuel used to supply heat (lamp or electric bulbs).

A simple shed or store house could be used as a brooder house. The brooder house should have the following qualities:

- Should be predator proof
- They should have proper ventilation (however care should be taken so that ducklings are not exposed to rains and strong winds)
- They should have adequate space based on the minimum floor space for ducklings in brooders

Age (Week)	**Floor Space/Bird (cm^2)**
Day old	0.03
1-2	0.05
2-3	0.07
3-4	0.09

- They should be maintained at the right temperature. When brooding ducklings, the temperature should be 34^{o}C in the first week, 21^{o}C in the second week, 16% in the third week and 14^{o}C in the succeeding weeks (NAERLS, n.d). However, NRC (1991), indicated that incubators need to be kept at 39.5^{o}C and that a high humidity of 80-85% should be maintained. Ventilation should be maintained and eggs turned 3 times daily. The behaviors of the ducklings is usually a good indicator of whether the temperature is right for them or not. The ducklings tend to huddle close together when the temperature is low and they scatter or spread out when it is too hot.

Housing

Like any other form of livestock production ducks require adequate shelter for optimum production. At night during the resting time, they require dry shelter/nests free from wind. Invariably, they require dry beddings, adequate ventilation, and protection against wind, rain and sun. Ducks do not like rain and egg production has been reported to reduce in rainy reason. The yard fence can be made of bamboo or chicken wire and not more than 1 inch high. Ducks should be housed in groups based on age to facilitate easy management and to prevent quarrels that is usually common among ducks of different age range. Old ducks tend to bully young ducks during feeding. The houses should contain egg nest (for cleaner eggs), waterers and feeding troughs.

Feeding

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Under the free-range system of duck production, the birds are reared with minimal attention with regards to feeding the ducks. The ducks scavenge around and feed on grasses, seeds, insects and water fleas, slugs from ponds, kitchen waste, chopped vegetables, rice bran and other grain brans. Ducks generally benefit from a relatively energy-poor and cellulose rich diets. Ducks are able to balance their nutrients intake since there movements are unrestricted; they have access to a variety of feed. However, ducks under confinement (intensive system) must be provided with balanced feed for enhanced production. Ducks at different growth stages require specific nutrient levels (water, carbohydrate, protein, minerals and vitamins) in their diets.
Ducks should also be given drinking water at all times. However, ducks also like water for swimming although it is not critical. Ducks at 0-4weeks require crude protein (19%, above 4 weeks (17%) and at laying state (15.0%), the metabolizable energy (KCaJ/kg) for 0-4 weeks ducks is 2,800, above 4 weeks (2,800) and laying ducks (2,700). Ducks have rapid growth within the first weeks of their lives and the feed conversion efficiency ratios are low, however, beyond this age, feed consumption and feed conversion ratios of ducks increase rapidly. An adult of duck consumes between 170-200g of feed/day. Ducks can be fed at least twice/day instead of at once. They can be fed in the morning hours before letting them out and at night when they come back for shelter.

Ducks have the habit of transferring feed into their waterers and this can lead to wastage and in order to ensure prevention, the feeders and waterers should be placed about 60-70cm apart. Ducklings from day old can be fed with moistened cracked maize or guinea corn 4-5 times daily for 3 weeks. As from the 5th day ground soya bean cake or groundnut cake can be added to the diet. The quantity of feed should be increased as the ducklings grow older. Ducks should be provided with clean water in the waster troughs on a daily basis. Commercial feeds (concentrates) for ducks are rarely available and if available they could be expensive, therefore, they are not recommended for backyard duck production.

Health

Ducks raised in small numbers and in isolation are relatively resistant and hardy to the common poultry diseases. However, large flocks particularly under intensive system are easy predisposed to diseases. Lack of proper management and nutritional inadequacy are the main causes of diseases.

Sings of a Healthy Duck

i. It is normally alert
ii. Curious
iii. Interested in its food
iv. Upright stance/posture

Signs of a Sick Duck

i. Standing in isolation

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ii. Drooping position
iii. Huddled up into its feathers

Sick birds should be culled to prevent hug losses.

Healthy ducks should always be attended to before sick ones in order to prevent possible transfer of diseases during routine management practices. Some common diseases and health problems of ducks in Nigeria include:

i. Botulism
ii. Salomnellosis
iii. Duck virus
iv. Nepatitis
v. Parasites

Duck Marketing

Ducks are rarely taken to the market and mostly they are consumed at household levels as protein supplement. However, where they are reared as a source of petty cash they are sold in unorganized markets. Therefore, there is need for functional cooperative groups that will harness the efforts of farmers for improved production and more organized marketing.

They are usually sold at open markets in villages and along major roads in peri-urban and urban centres by hawkers. The ducks are marketed along with some other poultry birds like chicken, guinea fowls, pigeons, etc. in baskets and cages. Farmers sell their ducks when they are in need of petty-cash for the household/family use (to pay children's school fees, to settle medical bills and to purchase of farm inputs amongst others). Therefore, middle men take advantage of the situation to buy ducks at give away prices from farmers. The marketing is such that middle men buy ducks from the farmers at farm gate price (give away prices) and then sell to retailers who thereafter sell to consumers.

Husbandry

Ducks are invariably reared under the free range systems and they scavenge around for food. Ducks prefer to be in environments close to water and they thrive well during the dry season in the semi-arid zones. In Nigeria, intensive production of ducks is not popular, however, ducks can be reared under the integrated system of management in rice fields where they pick up food and also provide good manure (Huo, Weng, Gu, Lao, X, Zhang, Zhang, Xu, and Chen, 2021; Singh and Pandey, 2021). They can be reared close to fish ponds. Their manure is used as food and they also pick up fish food waste and insects and worms from ponds.

Conclusion

Ducks are to a considerable extent productive given the low level of management they get.Therefore, to improve their performance, the right intervention/attention should be directed at

the birds, in terms of research in the areas of breeds, husbandry practices as well as nutritional requirements.

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