

Management and Challenges of Pigeon Production in South-West Nigeria

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Abstract: A study was conducted in South-West Nigeria to assess pigeon production; its management and challenges, with the aim of understanding its potential to alleviate animal protein shortages and poverty. Data were collected from 810 stakeholders, and analyzed descriptively using frequencies and percentages. Respondents were predominantly aged between 21 and 50, with a majority of female respondents (62%) and married individuals (80.5%). Most households had 1 to 5 members (80.4%), and a significant portion lacked formal education (33.9%) while majority were traders (59.8%). Over half of the respondents had more than 6 years of experience in pigeon production. Majority were unaware of taboos (64.6%), with some adhering to them (21.9%), and most adopting a extensive production system (62.5%). In terms of marketing, a significant portion sold pigeons to any buyer (37.5%) or pigeon sellers (18.8%), typically sold for prices ranging from N1000 to N2000. Challenges such as housing, feeding, and sales difficulties were prevalent among sellers. As for consumers, 42.3% used pigeons as meat, mainly sourced from local markets (73.1%), with various taboos and traditional beliefs influencing consumption patterns. It was concluded that addressing these challenges would require intensified educational initiatives, extension services, and awareness programmes.

Keywords: Consumption, Multi-stage, Pigeon, Production, Selling, South-West.

1. INTRODUCTION

The poultry industry predominantly focused on chickens, which constitutes 94% of the global poultry population and contributes 90% to poultry meat production (FAO, 2023). With the world's population projected to approach 10 billion by 2050, meeting the escalating demand for animal protein, including meat, eggs, and milk, poses a significant challenge (Searchinger *et al.*, 2018). While developed regions have established research priorities, many developing countries grappling with food security continues to lag behind, some receives support from organizations like FAO and ILRI to enhance sustainability (FASS, 2012, Scollan *et al.*, 2011). Part of the measures that could be adopted to achieve food security for rural and urban populations in these areas is to develop new programs of livestock research and management practices that focus on the promotion of short-cycle species in general and poultry in particular. The domestic pigeon, with a lineage tracing back over 5000 years to the rock dove, remains underutilized despite its hardiness, disease resistance, and minimal investment requirements.

Moreover, in South-West Nigeria, a prevalent misconception persists, portraying pigeons as sacrificial and ritual animals. They are often associated with cultural and religious practices, and are erroneously perceived as exclusively serving ritualistic purposes (Abulude *et al.*, 2006), overlooking their substantial nutritional benefits (Bhuyan *et al.*, 1999). This misinterpretation undervalues their true significance and potential contribution to food security. By dispelling myths and recognizing the potential of pigeons in agriculture, people of South-West Nigeria could harness these birds as a valuable resource for enhancing food security. Educating the community on the nutritional value of pigeons and promoting their

responsible cultivation can pave the way for a more holistic understanding of the birds' role in both cultural practices and sustainable food production. Agricultural activities in South-West Nigeria mainly consist of arable and tree crops cultivation and livestock rearing. Livestock species such as goats, sheep, cattle, pigs, chickens, ducks, turkeys, and pigeons are raised in every part of the region (Molina-Flores *et al.*, 2020). Despite pigeons being present year-round in virtually all cities, towns, and villages in the region, they remain unpopular, non-commercialized, and historically reared sub-optimally among the rural populace. Therefore, their production is subsistent compared to other poultry species (broilers, layers, and turkeys). Pigeons, as domestic birds, have not garnered reasonable awareness and research efforts compared to other poultry species. Marketing of pigeons is not well-structured and is conducted in various local chicken markets or general markets in South-West Nigeria. This paper aims to investigate the potentials and challenges of domestic pigeons and its management in South-West Nigeria, with the goal of correcting obvious misconceptions and exploring the potential of pigeons to contribute to animal protein supplies and food security in the region.

2. METHODOLOGY

The study focused on understanding the practices and challenges surrounding pigeon rearing, selling, and consumption in the South-West geopolitical zone of Nigeria, covering Lagos, Oyo, Ogun, Osun, Ondo, and Ekiti States. This region spans about 77,818 square kilometers and hosts a population of around thirty-eight million people (NPC, 2006). The climate here is typically tropical, with temperatures ranging from 21°C to 34°C and annual rainfall between 150 and 3000 mm, characterized by distinct rainy (March - November) and dry seasons (November - February) (NIMET, 2022).

Primary data were collected through a structured questionnaire covering socio-economic characteristics, rearing practices, sales methods, and challenges related to pigeon production, selling, and consumption. Employing a multistage sampling approach, the six (6) states in South-West Nigeria and the component three (3) senatorial districts in each of the states were purposively selected, five (5) localities, covering urban, peri-urban, and rural communities from these senatorial districts were randomly selected to ensure comprehensive coverage. Pigeon producers were identified using the snowball sampling technique, while sellers and consumers were randomly selected from various markets and households. A total of nine (9) respondents were questioned in each of the communities visited. In total, eight hundred and ten (810) questionnaires were administered across the six states, with a response rate of 769 retrieved after the survey. Respondents included individuals involved in pigeon production, selling, consumption, as well as others who are interested in pigeons. Personal interviews were conducted by 10 trained enumerators, and data collection spanned 12 weeks. The breakdown of respondents according to different groups from each state is presented in Table 1.

Descriptive analysis was conducted on data gathered from pigeon farmers, sellers, and consumers. This involved employing techniques such as frequency counts and percentages.

Table 1: Breakdown of respondents according to groups from each State of the South-West Nigeria

State	Producers	Sellers	Consumers	Others	Total
Ondo	26	31	34	39	130
Ekiti	28	25	29	43	125
Osun	38	40	42	13	133
Oyo	32	38	34	27	131
Ogun	37	32	34	26	129
Lagos	31	36	35	19	121
Total	192	203	208	167	769

3. RESULTS AND DISCUSSION

Table 2 shows the socio-economic characteristics of pigeon farmers, sellers, and consumers in the study area were investigated in relation to age, gender, marital status, household size, level of education, and primary occupation.

The age distribution revealed that only 22.80% of respondents were above 51 years of age, while approximately 72.2% fell within the age range of 21–50 years. Additionally, 5% were 20 years and below. This suggests that the majority of respondents were in their active years and were likely to be capable of engaging in poultry production activities, including pigeon rearing. Unlike local chicken rearing, which is commonly associated with women and children (Gueye, 2005), pigeon rearing in the study area appeared more prevalent among middle-aged individuals. The youthful population of pigeon

producers in the region is indicative that they possess the vigour, intellectual capacity, and information necessary for pigeon production. These findings align with studies on duck production by Alfred and Agbede (2012), Ayodele and Olufemi (2020), as well as research on village poultry production by Adeniyi and Oguntunji (2011) and small-scale turkey production in Owerri by Onwumere and Obasi (2010).

The study highlighted a substantial difference in participation, with a notable prevalence among females compared to their male counterparts. This discrepancy is likely linked to the significant role that women play in both generation and disposal of household waste often utilized as pigeon feed. This observation is consistent with reports by Gueye (2005), McAinsh *et al.* (2004), and Mogesse (2007), indicating that in several African countries, local poultry flocks are predominantly owned by women. Kitalyi (1998) and Mapiye and Sibanda (2005) also noted that women play a dominant role in village poultry ownership and management. The involvement of more women than men in pigeon ventures underscores the economic contributions of women, challenging the perception that their role is less important.

Regarding marital status, the study found that the majority of pigeon producers (83.3%) were married. This indicates that pigeon farming can serve as an additional source of income for family units. Further examination of household size revealed that the majority had 1-5 members. In such cases, household labour is likely to play a more significant role than hired labour, especially in pigeon rearing. Shared responsibilities for pigeon management within households could contribute significantly to meeting family needs and serve as an additional source of income. This finding aligns with the observations of Brorholt and Odgaard (2009), who noted that poultry keeping is a skill commonly associated with household members in Nicaragua.

In terms of educational distribution among stakeholders in South-West Nigeria's pigeon production, a significant revelation is that 33.9% of stakeholders lack formal education, underscoring the substantial impact of high illiteracy in pigeon farming. This signals a potential knowledge and skills gap related to modern practices, resulting in less productive methods and diminished profitability. Moreover, illiteracy hinders the adoption of advanced technologies, contributing to sub-optimal production.

Research finding indicates that an individual's exposure to education correlates with a better understanding of their environment and enhanced skills, leading to greater success in their pursuits. Onwumere and Obasi (2010) attributed the high success rate among turkey farmers in Owerri area to the substantial formal education of the majority of farmers. Proficient literacy within the farming community enables the comprehension and embrace of contemporary agricultural methods, ultimately elevating productivity and profitability (Ezeh *et al.*, 2012).

The correlation between a farmer's educational attainment and increased farm output is evident, with educated farmers demonstrating a capacity to adopt innovative techniques, make informed managerial decisions, and use inputs more efficiently (Amos, 2006). Needed in the present study area are targeted training programmes to enhance pigeon production skills, particularly for the 18.5% with primary education, who could be facing obstacles in adopting modern practices. Conversely, the 33.4% with secondary education form a knowledgeable segment capable of driving innovation, while the 13.8% with tertiary education, though a minority, can significantly contribute to industry advancement. Bridging these educational gaps is crucial for industry improvement, emphasizing the necessity for tailored initiatives to cultivate a skilled workforce and ensure the efficiency and sustainability of pigeon production in South-West Nigeria.

The results also showed that only 15.1% of the respondents identified farming as their primary occupation. Instead, various other activities, including trading, artisan work, and civil service, were reported as the primary employment in the study area. This discovery diverges from the typical scenario in rural communities of Nigeria, where previous research (Alfred, 2001 and Olayide, 1980) demonstrated that over 70% of rural residents rely on agriculture for their livelihood. This deviation in results could be attributed to a reflection of a contemporary trend where young individuals prefer alternative employment options over farming. The observation that a significant proportion of stakeholders in pigeon production engage in other occupations implies that pigeon production in the study area is a part-time pursuit rather than a sole means of livelihood. This aligns with the findings of Ajala *et al.* (2007) who reported that the majority (62%) of turkey farmers in Zaria, Nigeria were civil servants. Similarly, the results correspond with the findings of Amaza and Olayemi (2000) who indicated that many farming households supplement their farming activities with non-farming endeavours to sustain their livelihoods.

Table 3 shows the result of producers experience, stock population and beliefs about pigeon. Majority (52.1%) of respondents engaged in pigeon production had more than six years of experience. This indicates that most respondents possessed sufficient experience and qualities to effectively manage challenges in pigeon production, generate income, and adopt new innovations to enhance production efficiency. Nwaru (2004) reported that the number of years farmers spend in their farming business indicates the practical knowledge they have acquired, enabling mastery of the intricacies of their farming enterprises. The highest proportion of respondents (61.5%) had a foundation stock of 1 to 10 birds. Small flock sizes in this study aligned with previous research on extensively managed Muscovy ducks in Nigeria, where Nwata *et al.* (2006) and Duru *et al.* (2006) reported average flock sizes of 6.9 and 10.9, respectively. The small foundation stock of pigeons recorded in the study area may also indicate a small scale of production, poor acceptability, and low demand for pigeon and its products. However, majority of pigeon producers who started pigeon farming with not more than 10 pigeons currently records an average population of 100. This is a direct result of the high prolificacy of pigeons, even though female pigeons lay a maximum of two eggs per breeding cycle. Pigeons can breed all year round, especially in warm climates, with a frequency of up to 8 times a year. The eggs are incubated for 18–20 days, and the hatched chicks (squabs) fledge and leave the nest after 28–30 days. Dijkstra *et al.* (2010) and Roof (2001) reported that wood and rock pigeons have long breeding seasons and lay two eggs per clutch.

Among the surveyed respondents, 21.9% admitted to holding taboos and superstitious beliefs regarding pigeon rearing, while 64.6% stated they did not possess such beliefs. This significant proportion of respondents with taboos and superstitions highlights the complex interplay between cultural beliefs and agricultural practices. This discovery aligns with previous research conducted by Oguntunji (2014) on Muscovy ducks, indicating a consistent pattern. In African societies, various socio-cultural factors, religious beliefs, taboos, and norms govern the

production, consumption, and utilization of some animals (Ogunjinmi *et al.*, 2009). The continued association of pigeon rearing and selling with taboos, traditional and cultural beliefs contributes to one of the major constraints of pigeon rearing and consumption in many rural and urban populations in Nigeria, it has the perception that it is a poultry species attached to several fetish and spiritual undertakings.

The results of the producer's motivation and knowledge of pigeon management are presented in Table 4. Producer motivation includes income generation, cultural adherence, protein supply, and aesthetic enjoyment. While recreational use is rare in Nigeria, studies show pigeons' ceremonial roles worldwide. Parkhurst and Mountney (2002) noted their ceremonial use in developed nations, contrasting Abulude *et al.* (2006) who reported that they are mostly used for sacrificial purposes in Nigeria and other developing nations. In the current study, 63.5% raised pigeons for income, 6.2% for consumption, 14.6% for culture, and 2.1% for various other reasons. El-Hanou *et al.* (2000) highlight pigeons' economic role for rural families, Sudhanya (2020) underscores their economic and entertainment contributions. The predominant management system in the current study, observed across all states, was the extensive system, representing 62.5% of cases. In this approach, temporary pens are set up for pigeons to roost at night, while they freely forage for feed and water during the day. Owners provide limited amounts of feed and water. Oluyemi and Roberts (2002) noted a similar trend in rural areas, where poultry birds are commonly managed extensively. The costs and technical expertise required for intensive pigeon farming may have limited its adoption, leading many farmers to prefer the extensive method.

Beyond economic considerations, some respondents reported a lack of awareness about permanently confining pigeons, contrasting their experience with chickens. Some respondents believed in the positive impact of allowing pigeons to fly freely, associating it with bringing good fortune to their owners.

Regarding feed resources, the study found that a majority (54.2%) of respondents utilized grains and leftover foods. This aligns with previous research, such as Moon and Zeigher (1979), who reported pigeons' preference for grains like pears and millet. Wong *et al.* (2017) emphasized the significance of household wastes and residues for village poultry flocks. Only 33.3% of respondents fed pigeons with grains exclusively, with Sales and Janssens (2003) suggesting that pigeons can thrive on grains like corn, wheat, and barley. To ensure efficient digestion, pigeon farmers must provide clean water to these birds. Health management practices were explored, revealing that 45.8% of respondents believed pigeons never fall sick, while 22.9% claimed to recognize sick pigeons.

Table 2: Socio-Economic Characteristics of Respondents on Production, Selling, Consumption and People’s Perception of Pigeon

PARAMETERS	ONDO		EKITI		OSUN		OYO		OGUN		LAGOS		TOTAL	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Age of Respondents														
≤ 20 years	0	0.0	1	0.8	1	0.8	1	0.8	1	0.8	0	0.0	4	5.0
21 – 30 years	9	6.9	10	8.0	11	8.3	9	6.9	8	6.2	10	8.3	57	7.4
31 – 40 years	32	24.6	21	16.8	22	16.5	24	18.3	27	20.9	25	20.7	151	19.6
41 – 50 years	59	45.4	54	43.2	70	52.6	68	51.9	67	51.9	64	52.9	382	49.7
51 – 60 years	21	16.2	28	22.4	19	14.3	19	14.5	17	13.2	12	9.9	116	15.1
61 years and above	9	6.9	11	8.8	10	7.5	10	7.6	9	7.0	10	8.3	59	7.7
Total	130	100.0	125	100.0	133	100.0	131	100.0	129	100.0	121	100.0	769	100.0
Gender of Respondents														
Male	47	36.2	49	39.2	53	39.8	55	42.0	51	39.5	37	30.6	292	38.0
Female	83	63.8	76	60.8	80	60.2	76	58.0	78	60.5	84	69.4	477	62.0
Total	130	100.0	125	100.0	133	100.0	131	100.0	129	100.0	121	100.0	769	100.0
Marital Status of Respondents														
Married	104	80.0	95	76	110	82.7	115	87.8	96	74.4	99	81.8	619	80.5
Single	9	6.9	14	11.2	7	5.3	9	6.9	14	10.9	9	7.4	62	8.1
Separated	2	1.5	2	1.6	7	5.3	3	2.3	2	1.6	6	5.0	22	2.9
Widowed	15	11.5	14	11.2	9	6.8	4	3.1	17	13.2	7	5.8	66	8.6
Total	130	100.0	125	100.0	133	100.0	131	100.0	129	100.0	121	100.0	769	100.0
Household Size of Respondents														
1 - 5	104	80.0	111	88.8	101	75.9	99	75.6	91	70.5	112	92.6	618	80.4
6 - 10	22	16.9	12	9.6	27	20.3	31	23.7	36	27.9	9	7.4	137	17.8
≥ 11	4	3.1	2	1.6	5	3.8	1	0.8	2	1.6	0	0.0	14	1.8
Total	130	100.0	125	100.0	133	100.0	131	100.0	129	100.0	121	100.0	769	100.0
Educational Status of Respondents														
No formal education	35	26.9	39	31.2	57	42.9	52	39.7	49	38.0	29	24.0	261	33.9
Primary Education	19	14.6	18	14.4	31	23.3	26	19.8	28	21.7	20	16.5	142	18.5
Secondary Education	53	40.8	41	32.8	37	27.8	41	31.3	34	26.4	51	42.1	257	33.4
Tertiary Education	23	17.7	26	20.8	8	6.0	12	9.2	16	12.4	21	17.4	106	13.8
Others	0	0	1	0.8	0	0	0	0	2	1.6	0	0	03	0.4
Total	130	100.0	125	100.0	133	100.0	131	100.0	129	100.0	121	100.0	769	100.0
Primary Occupation of Respondents														
Farming	32	24.6	27	21.6	20	15.0	18	13.7	19	14.7	0	0	116	15.1
Salary work	8	6.1	12	9.6	13	9.8	6	4.6	12	9.3	21	17.4	72	9.4
Trading	66	50.8	67	53.6	65	48.9	86	65.7	77	59.7	99	81.8	460	59.8
Artisan	17	13.1	13	10.4	22	16.5	14	10.7	13	10.1	1	0.8	80	10.4
Others	7	5.4	6	4.8	13	9.8	7	5.3	8	6.2	0	0	41	5.3
Total	130	100.0	125	100.0	133	100.0	131	100.0	129	100.0	121	100.0	769	100.0

Source: Field Survey in South-West Nigeria.

A significant portion (57.3%) did not vaccinate or administer medication to their pigeons, with 29.2% trusting in pigeons' ability to self-heal. A small percentage (2.1%) sought veterinary assistance for pigeon medication. Diseases in pigeons, though fewer compared to other poultry birds, include typhoid, cholera, newcastle, influenza, and various nutritional disorders (Rahman *et al.*, 2020).

Marketing of pigeons by producers is shown in Table 5. A notable 37.5% of respondents sell pigeons to people who used them for personal consumption and various other purposes. Wendell (1977) highlights pigeons' importance for fresh meat supply, particularly in winter when larger animals are scarce. Moreover, 18.8% engage in selling to traders for commerce, while 8.3% abstain from sales; some aim to preserve family heritage, while others withhold reasons for non-selling. Additionally, 44.8% of the respondents reported that they could sell a matured pigeon for between ₦1,000 and ₦2,000, while 38.5% reported that they would sell a matured pigeon for ₦1,000 and below. Only a few respondents stated that they sell matured pigeons for more than ₦2,000. However, most of the times, the price a producer sells their pigeons depends on the bargaining power of the buyer or the relationship between the buyer and producers. In addition, more respondents reported that they normally sell up to 100 pigeons in a year, 8.3% said they sell up to 500 pigeons, while another 8.3% claimed they sell up to 1,000 pigeons in a year.

In Table 6, the majority (63.4%) of the respondents who are pigeon sellers reported having 1 to 5 years of experience in pigeon selling, while 15.8% and 8.7% claimed to have been in the business for up to 10 years and more than 10 years, respectively. This indicates that pigeon selling within the study area is not a new venture. For sellers to remain in the business for such a number of years, they must have found it lucrative and may have been motivated by the profits accruing to them. Regarding the feed given by pigeon sellers to the birds before sales, respondents provided various options such as grains only (44.6%), grains and homestead leftover foods (39.6%), leftover foods only (3.0%), and formulated feed (1.0%).

Although these feed resources, except the formulated concentrate feeds, are abundant and cheap, they are generally low in nutrients. However, if these feeds could be supplemented with protein-rich feed resources, it would go a long way in boosting immunity, enhancing feed utilization, and subsequently increasing the weight of these birds for profit maximization by the sellers. Unlike pigeon producers, the majority (75.2%) of pigeon sellers interviewed house their birds in cages specially made for keeping the birds. These cages are mostly made of wood and wire mesh, aligning with the findings of Asaduzzaman *et al.* (2009), who reported that wood and metal mesh are the major materials used for building pigeon houses in many parts of Bangladesh. Some sellers also house their birds in smaller woven basket cages to allow for easy movement of the birds from place to place.

The majority (67.3%) of pigeon sellers get their pigeons from pigeon producers situated in several places across the South-West and in the middle belt parts of Nigeria. A previous study on the marketing of goods and services validated this result. The common practice is to sell the pigeons to middlemen, who are the pigeon sellers, and they, in turn, sell them in the market to consumers. A small percentage (18.8%) rear their pigeons for sale themselves, while an infinitesimally small 2% of the sellers get their pigeons from other sources, including free-range birds that fly around in cities and villages.

A majority (45.5%) of pigeon sellers sells to people who need these birds for special purposes, and their sales are not restricted to any particular time of the year. In finding out the purposes for which buyers purchase pigeons from sellers, it was discovered that 51.5% of people buy pigeons

Table 3: Producers Experience, Stock Population and Beliefs about Pigeon

PARAMETERS	ONDO		EKITI		OSUN		OYO		OGUN		LAGOS		TOTAL	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Years of Production														
No Response	3	11.5	4	14.3	1	2.6	2	6.3	4	10.8	6	19.4	20	10.4
1 – 2 years	4	15.4	1	3.6	3	7.9	3	9.4	5	13.5	4	12.9	20	10.4
3 – 4 years	4	15.4	3	10.7	4	10.5	8	25.0	4	10.8	5	16.1	28	14.6
5 – 6 years	3	11.5	6	21.4	3	7.9	5	15.6	5	13.5	2	6.5	24	12.5
Above 6 years	12	46.2	14	50.0	27	71.1	14	43.7	19	51.4	14	45.1	100	52.1
Total	26	100.0	28	100.0	38	100.0	32	100.0	37	100.0	31	100.0	192	100.0
Number of Foundation Stock														
No response	4	15.5	3	10.7	6	15.8	6	18.8	2	5.4	1	3.2	22	11.5
1 – 10 birds	16	61.5	20	71.4	25	65.8	16	50.0	23	62.2	18	58.1	118	61.5
11 – 20 birds	4	15.4	3	10.7	5	13.2	9	28.1	5	13.5	10	32.3	36	18.8
31 – 40 birds	1	3.8	-	-	-	-	-	-	4	10.8	1	3.2	6	3.1
More than 40 birds	1	3.8	2	7.2	2	5.3	1	3.1	3	8.1	1	3.2	10	5.2
Total	26	100.0	28	100.0	38	100.0	32	100.0	37	100.0	31	100.0	192	100.0
Present Stock Population														
No Response	6	23.1	7	25.0	10	26.3	8	25.0	9	24.3	8	25.7	48	25.0
1 – 50 birds	2	7.7	2	7.2	3	7.9	4	12.5	3	8.1	2	6.5	16	8.3
51 – 100 birds	6	23.1	6	21.4	11	28.9	7	21.9	5	13.5	7	22.6	42	21.9
101 – 1000 birds	5	19.2	7	25.0	9	23.7	6	18.8	10	27.0	7	22.6	44	22.9
Above 1000 birds	7	26.9	6	21.4	5	13.2	7	21.8	10	29.7	7	22.6	42	21.9
Total	26	100.0	28	100.0	38	100.0	32	100.0	37	100.0	31	100.0	192	100.0
Taboos and Cultural/Traditional Beliefs about Pigeon														
No Response	3	11.5	3	10.7	6	15.8	6	18.8	4	10.8	4	12.9	26	13.5
Yes	3	11.5	4	14.3	21	55.3	5	15.6	7	18.9	2	6.5	42	21.9
No	20	77.0	21	75.0	11	28.9	21	65.6	26	70.3	25	80.6	124	64.6
Total	26	100.0	28	100.0	38	100.0	32	100.0	37	100.0	31	100.0	192	100.0

Source: Field Survey in South-West Nigeria

mainly for traditional or cultural purposes, 18.8% for personal consumption, 4.0% for educational and research purposes, while 13.9% fell under the category labeled as “others,” which the sellers were not willing to disclose. Wendell (1977) reported that the purpose of buying pigeons is for homing and racing competition, but findings from the present study in the South-Western part of Nigeria did not agree with this report. Instead, it further corroborates Abulude *et al.* (2006), who reported that people in many parts of Nigeria use pigeons for spiritual purposes and ceremonies involving sacrificial rituals. The average price a matured pigeon sold for, according to the sellers, was between N1001 to N2000. This could be a motivating factor for the sellers and could attract more people to the business. Moreover, since the sale of pigeons is not season-dependent, it implies that sales are guaranteed throughout the year, as long as there is a regular supply.

Table 7 present information on pigeon consumers in the study area. Majority (42.3%) of respondents confirmed using pigeon as meat. This observation aligns with the report of Bhuyan *et al.*, (1999), stating that pigeon meat has been consumed

by rural populations worldwide since time immemorial, and recognized for its delicious and nutritious qualities. Saikia (2013) added that squabs or pigeons have been consumed in many civilizations, including ancient Egypt, Rome, China, India, and medieval Europe. Omojola *et al.* (2012) also emphasized the importance of pigeon as a secondary source of animal protein in Nigeria. 15.4% of pigeon consumers use pigeons for religious or sacrificial purposes. Among these respondents are spiritualists, herbalists, and worshippers of certain deities located in places of worship such as shrines, watersides, prayer centers, mountain tops, and farmsteads which were visited during the course of this study. It was also revealed that majority (73.1%) of consumers get their supply of these birds from local poultry markets, while 20.2% are producers, and 5.8% reported getting their pigeon supplies from other sources. 44.2% of consumers used to consume between 1 to 5 pigeons in a month, 21.2% used 6 – 10, while 9.6% used more than 10 pigeons in a month. Woolgar *et al.* (2006) reported that although squab has been consumed throughout much of recorded history, it is generally regarded as exotic, not as a contemporary staple food. However, in the present study, 77.9% of the respondents stated that the price of pigeon is affordable. This may be because pigeon meat is not generally consumed among people of different strata of society compared to chicken and turkey. 81.7% of respondents agreed that there are no taboos or beliefs hindering the consumption of pigeon as meat or its utilization for other purposes, however, such respondents were quick to restate their belief in the tendency of pigeons to improve the lot of their producers, sellers, and consumers through their ability to confer good fortunes on them. It must be stated that beliefs and stories about the ability of pigeons to bring good fortunes to people have no reported scientific basis.

4. CONCLUSION

This study highlights significant challenges in pigeon production, including illiteracy, reliance on outdated methods, and superstitions. Most stakeholders, especially women aged 21-50, engage in pigeon farming sub-optimally for additional income, cultural reasons, and as a protein source. Despite misconceptions about pigeons as poultry, respondents recognized their potential contribution to animal protein supplies, source of income and poverty alleviation just like other conventional poultry. However, entrenched traditional beliefs remain barriers. Addressing these challenges requires tailored education, extension services, and awareness campaigns to promote modern husbandry practices, dispel myths, and foster sustainable pigeon management strategies.

Table 4: Producer’s Motivation and Knowledge of Pigeon Management

PARAMETERS	ONDO		EKITI		OSUN		OYO		OGUN		LAGOS		TOTAL	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Reasons for Pigeon Production														
No Response	2	7.7	1	3.6	6	15.8	4	12.5	3	8.1	4	12.9	20	10.4
Household consumption	1	3.8	4	14.3	1	2.6	2	6.3	3	8.1	1	3.2	12	6.2
Source of income	20	76.9	18	64.3	22	57.9	18	56.3	24	64.9	20	64.5	122	63.5
Pets/Aesthetic purpose	1	3.8	-	-	2	5.3	1	3.1	1	2.7	1	3.2	6	3.1
Cultural/Traditional reasons	2	7.7	5	17.9	6	15.8	6	18.8	6	16.2	3	9.7	28	14.6
Others	-	-	-	-	1	2.6	1	3.1	-	-	2	6.5	4	2.1
Total	26	100.0	28	100.0	38	100.0	32	100.0	37	100.0	31	100.0	192	100.0
System of Pigeon Management														
No Response	3	11.5	2	7.1	4	10.5	3	9.4	3	8.1	3	9.7	18	9.4
Extensive System	15	57.7	19	67.9	21	55.3	20	62.5	23	62.2	22	71.0	120	62.5
Semi-Intensive	6	23.1	2	7.1	12	31.6	7	21.9	7	18.9	4	12.9	38	19.8
Intensive	2	7.7	5	17.9	1	2.6	2	6.3	4	10.8	2	6.5	16	8.3
Total	26	100.0	28	100.0	38	100.0	32	100.0	37	100.0	31	100.0	192	100.0
Pigeon Feeding														
No Response	4	15.4	3	10.7	1	2.6	5	15.6	3	8.1	4	12.9	20	10.4
Grains only	10	38.5	12	35.7	12	31.6	10	31.3	11	29.7	9	29.0	64	33.3
Grains + Leftover foods	12	46.1	13	46.4	23	60.5	16	50.0	22	59.5	18	58.1	104	54.2
Leftover foods only	-	-	-	-	2	5.3	1	3.1	1	2.7	-	-	4	2.1
Total	26	100.0	28	100.0	38	100.0	32	100.0	37	100.0	31	100.0	192	100.0
Water Supply to Pigeon														
No Response	3	11.5	5	17.9	4	10.5	3	9.4	5	13.5	2	6.5	22	11.5
Birds fend for themselves	6	23.1	4	14.3	3	7.9	7	21.9	9	24.3	9	29.0	38	19.8
Farmers supply water	17	65.4	19	67.9	31	81.6	22	68.8	23	62.1	20	64.5	132	68.8
Total	26	100.0	28	100.0	38	100.0	32	100.0	37	100.0	31	100.0	192	100.0
Health Status of Pigeons														
No Response	9	34.6	8	28.6	6	15.8	10	31.3	7	18.9	20	64.5	60	31.2
Recognize them when sick	9	34.6	7	25.0	8	21.1	6	18.8	8	21.6	6	19.4	44	22.9
No sick birds at all	8	30.8	13	46.4	24	63.2	16	50.0	22	59.5	5	16.1	88	45.8
Total	26	100.0	28	100.0	38	100.0	32	100.0	37	100.0	31	100.0	192	100.0
Care for Sick Pigeons														
No Response	3	11.5	2	7.1	5	13.2	2	6.3	3	8.1	7	22.6	22	11.5
Birds recover on their own	6	23.1	10	35.7	8	21.1	10	31.3	13	35.1	9	29.0	56	29.2
Veterinary personnel	-	-	-	-	-	-	-	-	1	2.7	3	9.7	4	2.1
No medication at all	17	65.4	16	57.1	25	65.8	20	62.5	20	54.1	12	38.7	110	57.3
TOTAL	26	100.0	28	100.0	38	100.0	32	100.0	37	100.0	31	100.0	192	100.0

Source: Field Survey in South-West Nigeria

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Table 5: Marketing of Pigeons by Producers

PARAMETERS	ONDO		EKITI		OSUN		OYO		OGUN		LAGOS		TOTAL	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%
How Farmers Sell Pigeons														
No Response	11	42.3	10	35.7	13	34.2	8	25.0	14	37.8	12	38.7	68	35.4
Sell to people who need them	9	34.6	11	39.3	15	39.5	13	40.6	14	37.8	10	32.3	72	37.5
Sell to pigeon sellers	3	7.7	4	14.3	9	23.7	8	25.0	5	13.5	7	22.6	36	18.8
Don't sell at all	3	7.7	3	10.7	1	2.6	3	9.4	4	10.8	2	6.5	16	8.3
Total	26	100.0	28	100.0	38	100.0	32	100.0	37	100.0	31	100.0	192	100.0
When Farmers Sell Pigeons														
No Response	4	15.4	8	28.6	5	13.2	7	21.9	2	5.4	6	19.4	32	16.7
Anytime of the year	17	65.4	15	53.6	23	60.5	16	50.0	27	73.0	20	64.5	118	61.5
During special festivals	5	19.2	3	10.7	4	10.5	7	21.9	6	16.2	3	9.7	28	14.6
Others	-	-	2	7.1	6	15.8	2	6.3	2	5.4	2	6.5	14	7.3
Total	26	100.0	28	100.0	38	100.0	32	100.0	37	100.0	31	100.0	192	100.0
Price Range of Adult Pigeon														
No Response	6	23.1	2	7.1	4	10.5	2	6.3	6	16.2	2	6.5	22	11.5
₦100 – ₦1000	17	65.4	18	64.3	10	26.3	11	34.4	10	27.0	8	25.8	74	38.5
₦1001 – ₦2000	3	11.5	8	28.6	21	55.3	17	53.1	20	54.1	17	54.8	86	44.8
Above ₦2000	-	-	-	-	3	7.9	2	6.3	1	2.7	4	12.9	10	5.2
Total	26	100.0	28	100.0	38	100.0	32	100.0	37	100.0	31	100.0	192	100.0
Quantity of Pigeon Sold in a Year														
No response	14	53.8	16	57.1	12	31.6	13	40.6	14	37.8	7	22.6	76	39.6
1 – 100	10	38.5	10	35.7	18	47.4	11	34.4	17	45.9	18	58.1	84	43.8
101 – 500	1	3.8	1	3.6	4	10.5	4	12.5	3	8.1	3	9.7	16	8.3
Above 500	1	3.8	1	3.6	4	10.5	4	12.5	3	8.1	3	9.7	16	8.3
Total	26	100.0	28	100.0	38	100.0	32	100.0	37	100.0	31	100.0	192	100.0

Source: Field Survey in South-West Nigeria

Table 6: Seller's Experience and Knowledge of Pigeon and its Management

PARAMETERS	ONDO		EKITI		OSUN		OYO		OGUN		LAGOS		TOTAL	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%
Number of Years in Selling Pigeon														
No Response	1	3.2	9	36.0	2	5.0	6	15.8	3	9.4	3	8.3	24	11.9
1 – 5 years	23	74.2	12	48.0	27	67.5	22	57.9	19	59.4	25	69.4	128	63.4
6 – 10 years	5	16.1	2	8.0	8	20.0	7	18.4	4	12.5	6	16.6	32	15.8
Above 10 years	2	6.5	2	8.0	3	7.5	3	7.9	6	18.8	2	5.6	18	8.9
Total	31	100.0	25	100.0	40	100.0	38	100.0	32	100.0	36	100.0	202	100.0
How Sellers get Pigeons for Sale														
No Response	4	12.9	2	8.0	3	7.5	6	15.8	4	12.5	5	13.9	24	11.9
From Producers	24	77.4	17	68.0	26	65.0	21	55.3	23	71.9	25	69.4	136	67.3
Self Rearing	3	9.7	6	24.0	9	22.5	10	26.3	4	12.5	6	16.7	38	18.8
Others	-	-	-	-	2	5.0	1	2.6	1	3.1	-	-	4	2.0
Total	31	100.0	25	100.0	40	100.0	38	100.0	32	100.0	36	100.0	202	100.0
Pigeon Buyers														
No Response	3	9.7	2	8.0	7	17.5	6	15.8	4	12.5	6	16.7	28	13.9
Other Poultry Buyers	7	22.6	6	24.0	3	7.5	4	10.5	5	15.6	3	8.3	28	13.9
Special Buyers	12	38.7	13	52.0	18	45.0	17	44.7	15	46.9	17	47.2	92	45.5
Others	9	29.0	4	16.0	12	30.0	11	28.9	8	25.0	10	27.7	54	26.7
Total	31	100.0	25	100.0	40	100.0	38	100.0	32	100.0	36	100.0	202	100.0
Uses of Pigeons by Buyers														
No Response	5	16.1	2	8.0	4	10.0	7	18.4	3	9.4	3	8.3	24	11.9
Personal consumption	7	22.6	4	16.0	9	22.5	6	15.8	5	15.6	7	19.4	38	18.8
Spiritual/Traditional/cultural	14	45.2	17	68.0	22	55.0	17	44.7	18	56.3	16	44.4	104	51.5
Education/Research	1	3.2	-	-	-	-	4	10.5	3	9.4	-	-	8	4.0
Others	4	12.9	2	8.0	5	12.5	4	10.5	3	9.4	10	27.8	28	13.9
Total	31	100.0	25	100.0	40	100.0	38	100.0	32	100.0	36	100.0	202	100.0

Source: Field Survey in South-West Nigeria

Table 7: Information on Pigeon Consumers

PARAMETERS	ONDO		EKITI		OSUN		OYO		OGUN		LAGOS		TOTAL	
	F	%	F	%	F	%	F	%	F	%	F	%	F	%
What consumers use pigeon for.														
No Response	14	41.7	9	31.0	16	38.1	10	28.4	11	32.4	12	34.3	72	34.6
As meat	16	47.1	19	65.5	8	19.0	15	44.1	16	47.1	14	40.0	88	42.3
Religious/sacrificial purpose	4	11.8	1	3.4	10	23.8	6	17.6	5	14.7	6	17.1	32	15.4
Others	-	-	-	-	8	19.0	3	8.8	2	5.9	3	8.6	16	7.7
Total	34	100.0	29	100.0	42	100.0	34	100.0	34	100.0	35	100.0	208	100.0
How consumers sources pigeon														
No Response	-	-	-	-	-	-	-	-	-	-	2	5.7	2	1.0
Self rearing	8	23.5	9	31.1	11	26.2	7	20.6	5	14.7	2	5.7	42	20.2
Chicken market	26	76.5	20	69.0	28	66.7	23	67.6	25	73.5	30	85.7	152	73.1
Others	-	-	-	-	3	7.1	4	11.8	4	11.8	1	2.9	12	5.8
Total	34	100.0	29	100.0	42	100.0	34	100.0	34	100.0	35	100.0	208	100.0
Quantity of pigeon consumed monthly														
No Response	10	29.4	7	24.1	9	21.4	7	20.6	8	23.5	11	31.4	52	25.0
1 – 5	14	41.2	13	44.8	20	47.6	14	41.2	16	47.1	15	42.9	92	44.2
6 – 10	8	23.5	5	17.2	10	23.8	5	14.7	7	23.5	9	25.7	44	21.2
More than 10	2	5.9	4	13.8	3	7.1	8	23.5	3	8.8	-	-	20	9.6
Total	34	100.0	29	100.0	42	100.0	34	100.0	34	100.0	35	100.0	208	100.0
Is pigeon affordable?														
No Response	1	2.9	-	-	-	-	-	-	2	5.9	1	2.9	4	1.9
Yes	27	79.4	22	75.9	32	76.2	30	88.2	23	67.6	28	80.0	162	77.9
No	6	17.6	7	24.1	10	23.8	4	11.8	9	26.5	6	17.1	42	20.2
Total	34	100.0	29	100.0	42	100.0	34	100.0	34	100.0	35	100.0	208	100.0

Source: Field Survey in South-West Nigeria

REFERENCES

- [1] Abulude, O., Adesanya, W.O., Akinjagunla, Y. and Akinbule, W. (2006). Studies on pigeon bird (*Columbia livia* G). Anatomical weight, proximate composition, selected minerals content and sensory evaluation. *Electronic Journal of Environmental, Agricultural and Food Chemistry (EJEA FCHE)* 5: 1473-1478
- [2] Adeniyi, O.R. and Oguntunji, O.A. (2011). A socio-economic survey of cultural practices and management of village poultry production in Ondo area, Nigeria. *Livestock Research for Rural Development* 2, (12) Article 261.
- [3] Ajala, M. K., Nwagu, B. I., Sekoni, A. A., and Adeshinwa, A. O. K. (2007). The profitability of Turkey production in Zaria, Kaduna State, Nigeria. *Asian Journal of Information Technology*, 6(1), 27-33.
- [4] Alfred, S.D.Y. (2001). Sociological and psychological factors affecting agricultural innovation among rural households in Kogi State of Nigeria. A Ph.D Thesis, Federal University of Technology, Akure, Nigeria.
- [5] Alfred, S.D.Y. and Agbede, J.O. (2012). Influencing factors of duck production in the Southwest of Nigeria, *African Journal of Agricultural Research* 7(24): 3498-3505 <http://www.academicjournals.org> Assessed on December 20, 2023
- [6] Amaza P and Olayemi J.K. (2000). Technical efficiency in food crop production in Gombe State Nigeria, *Nigeria Agricultural Journal* 32(1)
- [7] Amos T. T. (2006) Analysis of Backyard Poultry Production in Ondo State, Nigeria. *International Journal of Poultry Science* 5 (3): 247-250
- [8] Ayodele, O.A. and Olufemi, A.O. (2020). Duck production in Ibadan metropolis area of Oyo State, Nigeria. *Journal of Agricultural Science and Practice* 5(3): 119-124.
- [9] Asaduzzaman, M., Mahinddin, M., Howlider, M.A.R., Hossain, M.M., and Yeasmin, T. (2012). Pigeon farming in Gouripur Upazilla of Mymensingh District. Bangladesh, *Journal of Veterinary Medicine* 9: 145-153.
- [10] Bhuyan, P; Nath, D.R. and Hazarik, M. (1999). Influence of age, and sex on nutritive value (Proximate composition) of squab and pigeon meat. *Indian Veterinary Journal*, 76: 530 – 532).

International Journal of Novel Research in Life Sciences

 Vol. 11, Issue 1, pp: (14-24), Month: January - February 2024, Available at: www.noveltyjournals.com

- [11] Brocholt, G. and Odgaard, P. 2009. Women and Chicken: Traditional Poultry Management in Nicaragua and Tanzania. Proceedings of Development Workers Course on Poultry as a Tool in Poverty Eradication and Promotion of Gender Equality. *Time Landboskole*, Denmark. 22-26.
- [12] Dijkstra, C., Riedstra, B., Dekker, A., Goerlich, V.C., Daan, S. and Groothuis, T.G.G (2010). An adaptive annual rhythm in the sex of first pigeon eggs. *Behavioural Ecology and Socio-Biology* 64: 1393 - 1402
- [13] Duru, S., Akpa, G.N., Saidu, L., Olugbemi, T.S. and Jokthan, G.E. (2006). A preliminary study on duck management under peri-urban system. *Livestock Research for Rural Development* 18(3).
- [14] El-Hanoum, A.M, Hassanein, M.N.F. and Sabra, Z.A.M. (2018). Studies on native pigeons under Egyptian village Nile Delta conditions. *Egyptians Poultry Science Journal*. 28(3): 883-900.
- [15] Ezeh C. I., Anyiro C. O. and Chukwu J. A (2012). “Technical Efficiency in Poultry Broiler Production in Umuahia Capital Territory of Abia State, Nigeria” *Greener Journal of Agricultural Sciences* ISSN: 2276-7770 2 (1): 001-007.
- [16] FAO (2023). Food and Agriculture Organization: Gateway to poultry production and products. <https://www.fao.org/poultry-production-products/events/events-detail/en/c/1602270/>. Assessed on December 11, 2023
- [17] FASS (Federation of Animal Science Societies) (2012). FAIR (Farm Animal Integrated Research) 2012. Online. Available at [http://www.fass.org/docs/FAIR2012 Summary](http://www.fass.org/docs/FAIR2012%20Summary). Accessed July 5, 2023.
- [18] Gueye, E.F. (2005). Village egg and fowl meat production in Africa. *World Poultry Science Journal*, 54(1): 73-86.
- [19] Kitanyi, A.J. (1998) Village chicken production systems in rural Africa: household food security and gender issues. FAO Animal Production and Health Paper 142, Rome, Italy
- [20] Mapiye, C. and Sibanda, S. (2005). Constraints and opportunities of village chicken production systems in the smallholder sector of Rushinga district of Zimbabwe, *Livestock Research for Rural Development* 17(10)
- [21] McAinsh, C. V., Kusina, J., Madsen, J. and Nyoni O. (2004). Traditional chicken production in Zimbabwe. *World Poultry Science Journal*, 60: 233-246.
- [22] Mogesse, H.H. (2007). Phenotypic and genetic characteristics of indigenous chicken population in northern Ethiopia. Ph.D dissertation submitted to Department of Animal, Wildlife and Grassland Service. University of Free State, Bloem Fountain, South Africa.
- [23] Molina-Flores, B., Manzano-Baena, P. and Coulibaly, M.D. (2020). The role of livestock in food security, poverty reduction and wealth creation in West Africa. FAO, Accra. <https://doi.org/10.4060/ca8385en>. Assessed on December 20, 2023
- [24] Moon, R.D. and Zeigler, H.P. (1979). Food preferences in the pigeon (*Columba livia*), *Physiology and Behaviour*, 22(6), 1171-1182.
- [25] NIMET (2022). State of the Climate, Nigerian Meteorological Agency, www.nimet.gov.ng/ Retrieved 28 October, 2023.
- [26] NPC (2006). Analysis of Nigerian 2006 census results. National Population Commission (NPC),
- [27] Abuja, Nigeria
- [28] Nwaru, J.C. (2004). “Rural credit market and resource use in arable crop production in Imo state of Nigeria” PhD Dissertation, Michael Okpara, University of Agriculture, Umudike, Nigeria.
- [29] Nwata, J.A., Umoh, J.U., Abdu, P.A., Ajogi, I. and Ali-Balogun J.K. (2006). Management of losses and Newcastle disease in rural poultry in Kaduna State. *Nigerian Journal of Animal Production*. 33(2): 274-285.
- [30] Olayide, S.O. (1980). Nigerian Small Scale Farmers: Problems and Prospects. In: S. O. Olayide, J.A. Eweka, V.E. Bello-Osagie (eds.). Nigerian Small Farmers: Problems and prospects in Integrated Rural Development. Center for Agricultural and Rural Development, University of Ibadan, Nigeria, Pp 2-15.
- [31] Oluyemi J.A. and Robert R.A. (2000): Poultry production in wet warm climate. Macmillian Press, London: 315 – 325.

International Journal of Novel Research in Life Sciences

Vol. 11, Issue 1, pp: (14-24), Month: January - February 2024, Available at: www.noveltyjournals.com

- [32] Omojola A. B., Isa M. A., Jibir M., Ajewole B. T. Garba S., Kassim O. R., Omotoso A. B., Adeyemo O. A. and Akinleye S. B. (2012). Carcass Characteristics and meat attributes of pigeon (*Columbia Livia*) as influenced by strain and sex, *Journal Animal Science Advances* 2(5): 475-480
- [33] Onwumere, J. and Obasi, R.O. (2011). Analyses of Small-Scale Turkey Production in Owerri Agricultural Zone of Imo State, Nigeria *International Journal of Agriculture and Rural Development* 13(2) DOI:10.4314/ijard.v13i2.67390
- [34] Parkhurst, R.C. and Mountney, J.G. (2004). Poultry meat and egg production, 3rd Indian Report, CBS Publishers, New Delhi, India Page 293
- [35] Rahman, M.S., Hakim, M.L., Rima, U.K., Rahman, M.M. and Rumi, N.A. (2020). Prevalence of diseases of pigeons and responses to treatment of bacterial disease *The Bangladesh Veterinarian* 37(1 – 2): 21 - 26
- [36] Roof, J. (2001). “*Columba livia*” (on line). Animal diversity: Web Accessed April 14, 2023 at <http://animaldiversity.org/account/Columbia-livia>.
- [37] Saikia, A. (2013). Food habits in pre-colonial Assam. *International Journal of Humanities and Social Science Invention*, 2 (6): 1–5
- [38] Sales, J. and Janssens, G.P.J. (2003). Nutrition of the domestic pigeon (*Columba livia domestica*), *World's Poultry Science Journal* 59 (2):221-232
- [39] Searchinger, T., Waite, R., Hanson, C., Ranganathan, J. and Matthews, E. (2018). Creating a Sustainable Food Future: A Menu of Solutions to Feed Nearly 10 Billion People by 2050, World Resources Institute, ISBN 978-1-56973-963-1, www.wri.org/research/creating-sustainable-food-future. Assessed on December 23, 2023.
- [40] Scollan, N. D., Greenwood, P. L., Newbold, C. J., Ruiz, D. R. Y., Shingfield, K. J., Wallace, R. J. and Hocquette, J. F. (2011). Future research priorities for animal production in a changing world. *Animal Production Science* 51(1):1-5.
- [41] Sudhanya, N. (2020). Pigeons: A journey from messengers to a potential livelihood for farmers. Poultry Farming <https://epashupalan.com/7564/poultry-farming/pigeons-a-journey-from-messengers-to-a-potential-livelihood-for-farmers>. Assessed on February 24, 2023.
- [42] Wendell L.M. (1977). The Pigeon Published by Levi Publishing Company, ISBN 10: 0910876010 / ISBN 13: 9780910876018
- [43] Woolgar, C.M.; Serjeantson, D. and Waldron, T. (2006). Food in medieval England: diet and nutrition. Medieval history and archaeology. Oxford University Press. p151. ISBN 978-0-19-927349-2