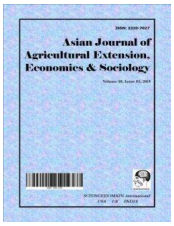

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Determinants of Chilli Pepper Production in Ido Local Government Area of Oyo State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author OIO designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Authors OFA and AAK managed the analyses of the study. Authors OAO and AAR managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

This study analyses the determinant of chilli pepper production in Ido Local Government Area of Oyo State, Nigeria. The data were collected from 80 pepper farmers with the aid of a structured questionnaire. Descriptive statistics and multiple regression analysis were used to analyse the data. The results revealed that 71.2% were male with a mean age of 42.4 years and 76.2% had one form of formal education or the other. The majority (80%) of the farmers financed their production through personal savings, 91.3% cultivated between 1 and 5 ha of land, 57.5% of them had a household size between 6 and 10 with the mean household size of 6 persons. The multiple regression result revealed that farm size and fertiliser quantity were positively significant at 1% and 5%, respectively to the pepper output. The major constraints to chilli pepper production among the sampled farmers were weather condition (100%), poor transportation system (93.8%), and pest and disease (92.5%). The study, therefore, recommended the formation of farmer's cooperative to provide agro-

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chemicals, fertilisers, tractors, land and storage facilities at a subsidised rate to the farmers to enable more production, and the government should also provide good roads to ensure good and smooth transportation of farm produce for sale.

Keywords: Determinants; production; chilli pepper; regression; medicine; Oyo State.

1. INTRODUCTION

Chilli is one of the world's most popular vegetables. It is consumed fresh or processed and used mainly as a spice and condiment [1]. Production of green chilli pepper in Africa is estimated to be 2.8 million tons 363,937 ha of land [2]. The crop is cultivated mostly during the rainy season but also in the dry season in places where irrigation is available and mainly produced under subsistence conditions by smallholder farmers and is a significant source of household income [3]. Peppers are used in stews and some local dishes all over the country. Pepper has increased in recent years worldwide and this could be ascribed partly to its nutritional value [4]. Peppers belong to the family Solanaceae which is an important group of vegetables cultivated extensively in Pakistan and also widely cultivated in almost every country in the world [5]. Pepper is a source of vitamin C to prevent flu-colds than any other vegetable crop. Pepper grown in Nigeria is in high demand due to its urgency and good flavour [6]. Four main varieties are grown in Nigeria, Bird peppers- 'atawere' (*Capsicum frutescens*), Chilli or Red pepper- 'shombo' (frutescens), Hot pepper- 'atarodo' (*Capsicum chinese*) and Sweet pepper- 'tatase' (*Capsicum annum*). The crop thrives best in a warm climate, where frost is not a problem during the growing season. Chilli does well in a climate with temperatures ranging between 18 and 27ºC during the day and between 15 °C and 18 °C during the night. Chilli pepper is a high-value crop that is grown for cash by farmers all over the world [7]. Nigeria is known to be one of the major producers of pepper in the world accounting for about 50% of the African production [8]. Chilli pepper occurs in the wild, though domesticated in many parts of the tropic, In Nigeria in particular, it is utilised in the dry state as spice, capsicum content, an alkaloid that is a digestive stimulant is used in an ointment for relief or arthritic and neuropathic pains [9].

The capsaicin content of pepper is one of the parameters that determine their commercial quality; the amount of capsaicin can vary depending on the light intensity and temperature at which the plant is grown, the age of the fruit, and the position of the fruit in the plant [10]. Capsaicin is a compound that produces the pungency, aroma and flavour of chilli pepper. The distribution of pepper is widely spread especially in tropical and subtropical ecologies including America, either as wild or cultivated forms [11]. In recent years, interest and demand for peppers have increased dramatically worldwide, and peppers have achieved major economic significance in the global market.

Nigeria has good soils and weather that can readily support the growth and production of pepper. Pepper grown in Nigeria is in high demand because of its pungency and good flavour, it can be readily dried, grind and packaged for export [6]. Pepper is an important agricultural crop not only because of its economic importance, but also due to the nutritional and medicinal value of its fruit, it is a source of natural colours and antioxidant compound [12]. It is used extensively in food flavouring in the daily diet of over 120 million Nigerians, irrespective of their socio-economic status. Some of the numerous benefits of pepper include income generation, spice for flavouring stews, sauces, and rich source of vitamin A and C. Pepper is utilised mostly for culinary purposes and seasonings; it also has medicinal uses, internally as a stimulant and carminative and externally as a counter-irritant [6] and forms remedies for a toothache as well as a sore throat [13].

2. METHODOLOGY

The study was carried out in Ido Local Government Area of Oyo State. It lies between latitude 6.05 ^{0} N and longitude 3.02 ^{0} E. It is bounded to the north by Ibadan Local Government and partially by Oyo Local Government to the east by Ibarapa southwest and Akinyele Local Government, respectively and to the west by Oluyole Local Government to the south of Ogun State, Nigeria. It occupies a total mass 986 km square and the population of 103,261 people [14]. The Local Government headquarters at Ido town and has eleven major prominent areas under its jurisdiction namely: Apata, Eleyele, Elenusonso, Idi-oro, Atere, Ayegun, Omi-adio, Ijokodo, Bode-igbo and

Akufo. Rainfall of the area is average of 1520 mm per annum.

Data were collected with the aid of a structured questionnaire to source information from the respondents. There are 10 wards in Ido Local Government Area of Oyo State, Nigeria; namely: Abaemo/Ilaju; Akufo/ Idigba; Apete/Ayegun; Akinware/Akande; Batake/Idiya; Erinwusi/Elenus onso; Fenwa; Ido; Omi Adio and Ogundele/Apata wards. Two wards (Omi-adio and Bode-igbo wards) were purposely selected because of the population of the chilli pepper farmers availability, 4 villages (Alakaso, Aba-aremu, Aba-ibu, Aboje, Seeni, Oderinde, Osebele, Amugbekun) were purposively selected from each of the two wards, while 10 farmers were randomly selected from each of the villages, making a total of 80 respondents which were used for the study.

2.1 Data Analysis

Descriptive statistics was used to describe the socio-economic characteristics of the respondents and multiple regression analysis was used to identify the determinant of pepper production in the study area. Below is the model specification:

$$Y= b_0 + X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 + X_8 + \mu$$

Where Y = Output (kg)
X_1 = Age
X_2 = Educational level
X_3 = Farming experience
X_4 = Fertiliser used
X_5 = Seed used
X_6 = Farm size
X_7 = Capital
X_8 = Labour use
bo = Coefficient
μ = error term

3. RESULTS AND DISCUSSION

Table 1 shows the socio-economic characteristics of the respondents in the study area. The result shows that 71.2% were male while 28.8% were female which implies that men are mostly involved in the occupation because farming requires a lot of energy. The findings also show that 80% of the respondents were married and 18.8% were single, while 1.2% of the respondents were divorced. This shows that majority of the respondents were matured and responsible to cater for their household and have clear knowledge about their wellbeing. The age distribution also revealed that 18.8% of the respondents were the age ranges of 20-30 years, 37.5% were the age ranges of 41-50, while 23.7% were the ages of 51-60 years with mean age of 42.4 years old. This implies that majority of the respondents were still in their active age. It was also observed that 23.8% of the respondents had no formal education, 47.5% had primary education, 26.3% had a secondary education while 2.5% had a tertiary education which implies that majority of the respondents had one form of formal education or the other in the study area. The table also revealed that 55% were Yoruba, 43.8% Igbo while 1.2% was Hausa, 42.5% of the respondents had 1-5 household size, while 57.5% had between 6 and 10 with the mean household size of 6 persons. This implies that the respondents' household sizes were moderate and could also be used as family labour. About 13.8% were engaged in trading, 83.7% in farming and 2.5% in others as their primary occupation. The year of farming experience of the respondents (36.3%) had 1-5 years farming experience, 57.5% had 6-10 years farming experience, while 6.3% had above 10 years with a mean of 7.1 years of farming experience. The respondents (87.5%) had been operating on the commercial farming system; while 12.5% had been operating on subsistence farming system meaning that majority of the respondents rely on farming for their source of income enhancing food security for their household. A certain level of farm diversity promotes environmental sustainability and is also needed for households to better cope with risk. But beyond a certain point, the marginal benefits of diversity decrease, whereas the marginal costs in terms of foregone cash incomes increase [15]. This has contributed to a market bias against more nutritious foods such as fruits, vegetables, pulses, and animal products. Overcoming such biases and promoting developments in previously neglected foods could help to create new market and price incentives for smallholder producers. This would help to raise cash income opportunities and make smallholder food systems more nutrition-sensitive [16].

Table 2 shows that, 91.2% had 1-5 years of chilli pepper production experience, while 8.8% had 5-10 years with mean years of 3.39 years, 36.3% had 0.5 hectare of farm size, 8.8% had 0.25 hectare of farm size, 54.7% had 1-5 hectare,

while 1.2% had 6-10 hectare of farm size, thus farmer is operating on a small scale production. About 83.8% used hired labour, while 16.3% use their family as labour for their farming operation; this could be due to the family size and the age group of the family members, most especially the children who were not fully grown up to handle farming operation or activities. The cost of labour per day (28.8%) paid labour ₦ 500-1000, 53.8% paid ₦ 1100-2000, 17.4% are from ₦ 2100 and above, which implies that majority of the respondents paid not less than ₦ 500 as labour cost per day. All (100%) of the farmers confirmed that labour is always available when needed. Farmers (80%) used personal savings as a source of capital, 17.5% through their family, while 2.5% through other sources. This implies that the majority of the farmer's source of capital was through personal savings which may likely not allow the farmers to operate on a larger scale of production. About 61.3% sold their products within the town, 5.0% sold their products outside the town and 1.2% sold their products at home, while 32.5% sold their products at both places which include the market and home. In terms of mode of transporting the

Table 1. Socioeconomic characteristics of the respondents

Variable (N = 80)	Frequency	Percentage	Mean
Marital Status			
Single	16	18.8	
Married	54	80.0	
Divorced	1	1.2	
Gender			
Male	57	71.2	
Female	23	28.8	
Age			
20-30	15	18.8	
31-40	16	20.0	
41-50	30	37.5	42.4
51-60	19	23.7	
Educational Level			
No formal education	19	23.8	
Primary education	38	47.5	
Secondary education	21	26.2	
Tertiary education	2	2.5	
Tribe			
Yoruba	44	55.0	
Igbo	35	43.8	
Hausa	1	1.2	
Religion			
Christianity	55	68.8	
Islam	25	31.2	
Household size			
1-5	34	42.5	
6-10	46	57.5	
Primary occupation			
Trading	11	13.8	
Farming	67	83.7	
Others	2	2.5	
Farming experience (years)			
1-5	29	36.3	
6-10	46	57.5	7.1
Above 10	5	6.2	
Farm type			
Commercial	70	87.5	
Subsistence	10	12.5	

Source: Field survey, 2017

Table 2. Production activities of Chilli pepper

Variables (N=80)	Frequency	Percentage	Mean
Production year of Chilli pepper			
1-5	73	91.2	
5-10	7	8.8	
Farm size in hectare			
0.25	7	8.8	
0.5	29	36.3	
1-5	43	54.7	
6-10	1	1.2	
Labour used			
Hired	67	83.8	
Family	13	16.2	
Labour cost (₦)			
500-1000	23	28.8	
1100-2000	43	53.8	
2100-3000	14	17.4	1416.18
Labour availability			
Yes	80	100.0	
Source of capital			
Personal savings	64	80.0	
Family	14	17.5	
Others	2	2.5	
Marketing place			
Market within town	49	61.3	
Market outside town	4	5.0	
At home	1	1.2	
Others	26	32.5	
Mode of transportation			
Vehicle	75	93.8	
Others	5	6.2	
Transportation cost (₦)			
100-600	11	13.8	
700-2000	28	35	
2100-5000	26	32.5	
5100-8000	10	12.5	
8100 and above	5	6.2	
Insecticide used			
No	6	7.5	
Yes	74	92.5	
Used for Medicinal purpose			
No	43	53.8	
Yes	37	46.2	
Kind of medicinal purpose			
Do not use	43	53.8	
Sore throat	9	11.3	
Teeth pain	6	7.5	
Herbs	11	13.8	
Stomach pain	5	6.2	
Heal wound or cut	5	6.2	
Mouth pain	1	1.2	

Source: Field survey, 2017

products, 93.8% used vehicle, while 6.2% used other mode such as a motorcycle, trekking etc. About 13.8% spent ₦ 100-600 on transportation, 35% spent ₦ 700-2000, 32.5% spent ₦ 2100-5000, 12.5% spent ₦ 5100-8000 as transportation fare to transport the produce. 7.5%

of the farmers did not use insecticide on their farmland, while 92.5% used insecticide on their farmland, which implies that majority of the farmers used insecticide to prevent pest and disease of chilli pepper in the study area. Also, 46.2% used it for medicinal purpose while 53.8% did not consider chilli pepper as a source of medicine, 11.3% confirmed it to be used for curing sore throat, 7.5% as medicine for teeth pains, 13.8% as herbs, 6.2% as a medicine for stomach pain, 6.2% used it to heal wounds and cut, while 1.2% used it as medicine for mouth pain. This implies that majority of the respondents did not use pepper for medical purposes in the study area, this could be due to unawareness or lack of knowledge of its uses as a medicinal vegetable [17].

Table 3 revealed that the entire respondents (100%) considered the rainy season as the period of much harvest, this implies that pepper production is easily cultivated and yield good

Table 3. Chilli pepper production physical inputs assessment

Variables	Frequency	Percentage	Mean
Harvest period			
Rainy period	80	80	
Total	**100**	**100.0**	
Sources of Input			
Market	37	46.2	
Extension agent	35	43.8	
Others	8	10.0	
Total	**80**	**100.0**	
Fertiliser quantity (bags)			
0-8	65	81.2	
8-18	15	18.8	4.5
Total	**80**	**100.0**	
Fertiliser type			
Do not use	3	3.8	
Inorganic fertiliser	77	96.2	
Total	**80**	**100.0**	
Seed quantity (250 g)			
1-6	50	62.4	
7-12	15	18.8	
13 and above	15	18.8	7.2
Total	**80**	**100.0**	
Seed cost (amount in Naira)			
300-400	27	33.8	
2,500-6,200	25	31.2	
6300-11,200	18	22.5	5483.78
11,300 and above	10	12.5	
Total	**80**	**100.0**	
Harvest (bags) (50 kg)			
1-10	24	30	
11-20	15	18.8	
21-30	15	18.8	24.9
31-40	11	13.8	
41-50	5	6.2	
50 and above	10	12.4	
Total	**80**	**100.0**	
Price / Bag (in Naira)			
6000	2	2.4	
6500	11	13.8	
6800	3	3.8	
7000	64	80	6910.39
Total	**80**	**100.0**	

Source: Field survey, 2017

produce during the rainy season. 46.3% source their input from the market, 43.8% source theirs from extension agent, while 10,% from other sources. The quantity of fertiliser used on the farmland: 81.2% used 1-7 bags of fertiliser, while 18.8% used between 8 bags and above, with a mean value of 4.5 bags. About 96.2% used inorganic fertiliser on their farmland, while 3.8% did not use fertiliser. The farmers used different seed quantity. 62.4% used 1- 6 cups of 250 g, 18.8% used 7-12 cups and 18.8% used above 13 cups of 250 g with a mean of 7.2 per acre. The cost of the quantity of seed used (33.8%) spent ₦ 300-2400, 31.2% spent ₦ 2500-6200, 22.5% spent above ₦ 11,300. The result further revealed the bags of chilli pepper harvested at the end of the farming season. 30% harvested 1-10 bags, 18.8% harvested 11-20 bags, 18.8% harvested between 21 and 30 bags, 13.8% harvested between 31 and 40 bags, 6.2% harvested between 41 and 50 bags, 12.4% were above 50 cups. 2.4% of the respondents sold a bag of chilli pepper at ₦ 6000, 13.8% sold a bag for ₦6800, while 80% sold a bag for ₦ 7000. This shows that the majority of the respondents sold a bag of chilli pepper at the rate of ₦ 7000 in the study area.

Table 4 revealed that all farmers (100%) viewed that weather was one of the major constraints to chilli pepper production which ranked 1st, also poor transportation which ranked 2nd, followed by the problem of pest and disease which ranked 3rd, poor marketing ranked 4th and price instability ranked 5th among others. Therefore, transportation and marketing inadequacy and agricultural drug problems should be investigated as well as weather forecasting data should be made available to the farmers in the study area.

The Table 5 revealed that farm size and fertiliser quantity was positively significant at 1% and 5%, respectively to the pepper output. This implies

Table 4. Problems encountered by chilli pepper farmers in the study area

Variable	Frequency	Percentage	Rank
Weather	80	100.0	1st
Poor transportation	75	93.8	2nd
Problem of pest and diseases	74	92.5	3rd
Poor marketing	70	87.5	4th
Price instability	66	82.5	5th
Poor storage facilities	61	76.3	6th
Problem of seed and seedlings of varieties	61	76.3	6th
Theft	58	72.5	7th
Inadequate credit facilities	57	71.3	8th
Land tenure	44	55.0	9th
High cost of production	41	51.3	10th
Aging of farmers	6	7.5	11th

Source: Field survey, 2017. (Multiple responses)

Table 5. Determinants of chilli pepper production

Variable	Coefficient	t-value	Significant
(Constant)	-2.727	-0.986	0.327
Age	0 .014	0.310	0.758
Educational level	0.582	1.056	0.295
Farming experience	0.178	1.171	0.246
Fertiliser quantity	0.601**	2.062	0.043
Seed quantity	0.532	1.562	0.123
Farm size	8.322***	6.630	0.000
Capital	0.370	1.218	0.227
Labour	-1.266	-0.641	0.523
R^2		0.768	

Source: Author computation, 2017.
***significant at 5% and ***significant at 1% level*

that with an increase in the farm size and fertiliser quantity, there will be an increase in the level of farmer's harvest. Although, the coefficient of age, education, farming experience, capital had a positive relationship to the pepper output but were not significant. R^2 was 0.77; this shows that 77% variation in pepper output could be explained by the explanatory variables included in the model, while 23% could be explained by the error term. It was, therefore, concluded that farm size and fertiliser quantity were the major determinants of pepper production in the study area.

4. CONCLUSION

Majority of the farmers were males with mean age of 42 years, and most of them were married. Their major source of capital by the farmers was personal savings and majority of the farmers rely solely on their farm produce for survival. The major identified problem facing the farmers in the study area includes weather, poor transportation, pest and disease and poor marketing. The regression result shows that farm size and fertiliser used were the major determinants of chilli pepper production in the study area. It was, however, recommended that farmers' cooperative group should be formed to provide agro-chemicals, fertilisers, tractors, and storage facility at a subsidised rate to the farmers and also organic fertiliser should be encouraged by the farmers to enable good production, and proper attention should be paid to the problems identified by the farmers in the study area.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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