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Determinants of Melon Production in Iseyin Local Government Area of Oyo State, Nigeria

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Abstract: This study was carried out to assess the determinants of melon production in Iseyin Local Government Area of Oyo State, Nigeria. Multi-stage sampling technique was used in selecting 216 respondents from six (6) wards out of ten (10) wards in the Local Government Area. Primary data were collected using interview guide and analyzed using descriptive statistics and multiple regression analysis. Result showed that most (80.10%) of melon farmers were males and 87.04% were married with a mean age of 41 years. About 47.20% of the respondents did not have formal education while 36.10% attended primary school. The mean year of farming was 16 years. Most (82.41%) of the respondents relied on hired labour for their farms' operations. The average melon output was 280.70kg/ha. The estimated cost of land preparation, labour and agro-inputs were ₦20,000.00/ha, ₦26,000.00/ha and ₦3,791.67ha respectively. Major constraints to melon production were climate change (mean = 108.00), limited extension service support (mean = 107.66), non-availability of shelling and oil extraction devices (mean = 107.33) and pest and diseases (mean = 107.20). Results of multiple regression revealed that resource inputs and socio-economic characteristics of the respondents have significant influence on melon output at $p < 0.05$. It can be concluded that production factors had influence on the melon output and incomes of the farmers. It is hereby recommended that production inputs should be subsidized to encourage farmers to increase melon production in the study area.
Keywords: determinants, resource inputs, production, melon, farmers

INTRODUCTION

The world is faced with the problem of food shortage due to falling in quantity of food produced [1]. Over the past two decades melon yields have stagnated or have been declining[2]. Less than 50% of the country's cultivable agricultural land is under cultivation. Even then, smallholder and traditional melon farmers who use rudimentary production techniques, with resultant low yields, cultivate most of this land. Farming in sub-Saharan Africa is characterized by semi-subsistence, low-input and low-productivity farming systems [3]. *Egusi* farming systems reflect similar overview with objectives such as income generation, household food security, livelihood, social relationships and seeds for the next cropping season. These objectives have been impaired by the continuous reduction in production and productivity which characterized the Nigerian agricultural sector thereby limiting the ability of the sector to perform its traditional role of economic development[4]. Melon is known as *Egusi* in Yoruba language found in tropical Africa and it is widely cultivated in West Africa (Nigeria, Ghana, Togo and Benin) and other African Countries for the food in the seeds[5]. Melon plays vital roles in the farming system and in the well-being of West African rural farmers as a good source of energy, weed suppressants and for soil fertilization [6]. It is also used as mulch, leaving high residual nitrogen in the soil after harvesting. The seed of melon is an excellent source of dietary oil (53.10%), high in protein (33.80%), and containing higher levels of most amino acids than soybean meal [7]. Melon seeds contain between 30-50% by weight of oil and offer valuable sources of vegetable oil for local and export trade [8] The kernels are rich in fatty acids, minerals and proteins (United Nations Development Program (USDA) [9]. According to Food and Agriculture Organization of United Nations (FAO) estimates, it is essential for vital health that at least 30% of our daily food is made up of vegetables. Africans eat below this (<100kg/person/day). One may wonder why the Chinese stay young. The secret is that China is among high fruits and vegetables consuming nation in the world (above 500g/person/day) and the Chinese take fruits and vegetable sauces before meals and hot water thereafter. For the same secret, prostate cancer incidence is 120 times greater in the United State (US) than in China [10]. Melon is a very important nourishing food compliment, containing certain amounts of all 'life-giving' chemical substances that the body needs. Due to the unsaturated fatty acid composition of its oil, it was reported to resemble that

of safflower, corn, cottonseed, sunflower, soybean and sesame oil [11]. The major socio-cultural uses of melon include income generation, household food, as gift to relatives and seeds[6]. Despite the socio-economic, cultural, agronomic and culinary importance of melon, productivity has been on the decline in recent time (International Plant Genetic Resources Institute (IPGRI) [12]. The percentage yield declines in Nigeria from 103.26% in 2007 to 92.98% in 2008 (Food and Agriculture Organisation Statistics (FAOSTAT) [13]. The melon farmers are constrained by many problems including those of poor access to modern inputs and credit, poor infrastructure, inadequate access to markets, land and environmental degradation, and inadequate research and extension services. With the rising cost of labour and transportation in Nigeria, rural farmers can hardly sustain their farming system considering the meager returns from their harvest. It is against this background that this study assessed determinants of melon production as these will have bearing on the quantity of melon produced, its nutritional contributions to the rural people's diet, income to the farmers and farming households. However, the specific objectives of this study are to:

i. describe the socio-economic characteristics of the respondents in the study area
ii. estimate the yield of melon produced in the study area
iii. identify production factors of melon in the study area
iv. identify challenges to melon production in the study area

Hypothesis

H_{01}: Resource inputs and socio-economic characteristics of the respondents have no significant influence on melon output (yield).

MATERIALS AND METHOD

Sampling procedure and sample size

The study was carried out in Oyo State, Nigeria. A multi stage sampling technique was used in selecting respondents for this study. There are four major ADP zones in Oyo State namely; Ibadan/Ibarapa, Oyo, Ogbomosho and Saki. Oyo zone was purposively selected based on the prevalence of melon production by virtually every rural household in the communities (representing 25% of total zones). This area is particularly known for horticultural crop production and a large percentage of the inhabitants are farmers [14]. Iseyin Local Government Area (LGA) was purposively selected. In the third stage, a simple random sampling technique was used to select 60% of the wards in the selected LGA, making six (6) wards. The final stage was random selection of 36 melon farmers from each of selected wards through their association lists to make up a total of 216 respondents as sample size for this study.

Data Collection Method

The instrument used for the data collection was subjected to content validity by consulting experts in the field of Agricultural Extension and Rural Development. Items found ambiguous were removed. Test-retest was carried out with twenty melon farmers who were not part of this study to ascertain the reliability of the instrument. A reliability coefficient of 0.86 was obtained. Since the reliability coefficient of 0.75 and above is termed reliable, it is adduced that the instrument used for this study was reliable.

Measurement of variables

Age, household size, farming experience, and farm size were measured at interval level while sex, educational level, marital status and occupational status were measured at nominal level. Labour input was measured in manday while land preparation, fertilizers and seeds were measured in naira per ha. The constraints were measured on a 3-point indicator as High Constraints (HC), Moderate constraints (MC) and Low constraints (LC) with a score of (3), (2), and (1) respectively. The constraints were ranked based on the degree of severity.

Method of Data Analysis

Data collected from this study were subjected to both descriptive statistics such as percentage, mean and frequency distribution. All data on resource use and output were converted to per hectare equivalent. Multiple regression analysis was used for the hypothesis. A multiple regression model with three functional forms namely: linear, semi-log and double-log were used in estimating the coefficients of the socio-economic and other production variables which influenced the yield of the melon in the study area. The functional form that gave the best fit in terms of value of the R^2 as well as better F-ratio was finally chosen and used for the analysis. According to Koutsoyiannis, the primary objective of regression analysis is to determine the various factors which cause variations of the dependent variable [15]. SPSS software defined it as the estimation of the linear relationship between a dependent variable and one or more independent variables or covariates. It was assumed that total production Y, is a function of land size, labour (manday), fertilizer, seeds, age, farming experience, and household size [16].

Thus the explicit model is:

Linear: $Y = \alpha + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + \ldots\ldots + b_nX_n + ei$

Semi-log: $Y = \alpha + b_1\ln X_1 + b_2\ln X_2 + b_3\ln X_3 + b_4\ln X_4 + \ldots\ldots + b_n\ln X_n + ei$

Double-log: $\ln Y = \alpha + b_1\ln X_1 + b_2\ln X_2 + b_3\ln X_3 + b_4\ln X_4 + \ldots\ldots + b_n\ln X_n + ei$

Where;

Y = Output (kg/ha);
X_1 = Age (years);
X_2 = Household size (number of people);

X_3 = Farm size (hectare);
X_5 =Marital status (Married=1, Otherwise=0);
X_6 =Social status (Chief=1, Otherwise=0);
X_7 = Occupational Status (Full time=1, Part-time=0);
X_8 = Land preparation (Naira);
X_9 = Labour (manday);
X_{10} = Fertilizer (Naira/kg/ha);
X_{11} = Agro-chemicals (Naira/litre/ha);
X_{12} = Seeds (Naira/ha);
X_{13} = Constraints (scores);
α = Constant; and
e = error term

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents

The result of the analysis in Table 1 showed that the mean age of the respondents was 41.00 years. About eighty percent (83.80%) of the respondents were less than 50 years old revealing the presence of young and middle aged individuals who are known to be active and innovative. This is in line with Oladoja *et al*. which states that most Nigerian farmers are within this age group and are economically active part of the population [17]. Only few (16.20%) of the respondents were aged. Majority (80.10%) of the respondents were males while only 19.90% were females. This indicates the dominance of male folk in melon production in the study area. This is attributed to the fact that men are more involved in cultivation and harvesting activities while women do the post-harvesting and marketing of melon. This finding agrees with Odebode, that adult males engaged in land clearing, planting and weeding, while adult females carried out the seed selection and post-harvest practices in melon production [18]. About (47.20%) of the respondents do not have formal education while 36.10% attended primary school, 15.30% had secondary school education and 1.40% had tertiary education. This shows very low level of literacy in the study area which may in turn affect the rate of adoption of modern farming practices. This is in consonance with Yahaya and Olajide, who noted that educational level of farmers affected their preference for printed materials [19]. The mean year of farming was 16 years. The result also indicated that 44.90% of the respondents had grown melon for less than 10 years while16.20% had been in melon cultivation for more than 21 years. This further shows that melon production is not a new farming practice to the people in the study area. As experience is gained over time, so the older the farmer, the more experienced he is in farming activities. The mean farm size was 1.70 hectare. Most (91.70%) of the respondents cultivated 1-2ha while 8.30% cultivated more than 3ha. This shows that most of the melon farmers operated on a small scale enterprise. This result corresponds to the findings of Kolawole and Ojo that agricultural practice in Nigeria involves small scale farmers scattered over wide expanse of land area, with small holdings ranging from 0.5 to 3.0 hectare per farm land [20].

Table 1: Distribution of respondents based on their Socio-economics Characteristics (n = 216)

Variables	Frequency	Percentage (%)	Mean
Age (years)			
≥30	30	13.89	41.00
31-40	88	40.74	
41-50	63	29.17	
51 and above	35	16.20	
Sex			
Male	173	80.10	
Female	43	19.90	
Educational status			
No formal education	102	47.20	
Primary education	78	36.10	
Secondary education	33	15.30	
Tertiary education	3	1.40	
Marital status			
Single	10	4.63	
Married	188	87.04	
Widowed	13	6.02	
Divorced/Separated	5	2.31	
Social status			
Chiefs	2	0.93	
Ordinary Members	214	99.07	
Ethnicity			
Yoruba	171	79.20	
Others (Igede/Ohori)	45	20.80	
Household size			
1-4	93	43.10	5.00
5-6	123	56.90	

Major crops cultivated			
Melon, Cassava and Maize	156	72.20	
Melon, Yam and Maize	37	17.20	
Melon and okra	23	10.60	
Farming experience (years)			
≥10	65	30.10	
11-20	97	44.90	16.00
21-30	35	16.20	
31 and above	19	8.80	
Farm size (ha)			
1-2	198	91.70	1.70
3 and above	18	8.30	
Major occupation status			
Full time	136	63.00	
Part-time	80	37.00	

Source: Field Survey, 2011[26]

Melon Output (kg/ha)

The average yield of melon in the study area was 280.70kg/ha. The result of the yield contradicted the expected yield of 1100kg/ha in Nigeria as reported by van der Vossen *et al* [5]. In recent time, the consequence of low productivity of melon is noticed in the Southwest region of Nigeria, as the large proportion of melon sold in the markets were brought from the Northern parts of the country to cushion the effect of the decline and as such melon marketing is gradually dominated by Hausas' men while the Yoruba women involvement in melon business is reducing.

Table 2: Distribution of respondents according to their melon yields (kg/ha) (n = 216)

Yield (kg/ha)	Frequency	Percentage	Average
101-200	21	9.70	280.70
201-300	128	59.30	
301-400	57	26.40	
401-500	10	4.60	

Source: Field Survey, 2011[26]

Production factors

Source of Labour for various farm operations

The result of Table 3 revealed that majority (81.90%) of the respondents relied on hired labour for their farm operations while 18.10% depend on self and family labour. Similar findings by Enete *et al*. indicated that labour was found outside the farming household [21]. The majority (87.57%) of tasks performed by hired labour were weeding, harvesting and post harvesting. The melon farmers and their families/neighbours did joint work (12.43%) during the planting and post harvesting to complement hired labour. This shows that melon is a social crop as it involves collective efforts for its production. Similarly, 68.52% of the respondents worked for 6-10 hours daily on the melon field. The average manday was 6.60 hours.

Table 3: Distribution of respondents according to farm labour service (n=216)

Labour	Frequency	Percentage (%)	Mean
Hired	177	81.90	
Family	39	18.10	
Tasks			
Weeding	56	31.64	
Harvesting	35	19.77	
Post-harvesting	64	36.16	
Mandays (daily)			
1-5	68	31.48	6.60
6-10	148	68.52	

Source: Field Survey, 2011[26]

Cost of melon production inputs

The result of Table 4 showed that the average cost of land preparation was ₦20,000.00/ha while the inputs (seeds, fertilizer and agrochemicals) cost ₦3,791.67/ha. The average cost of labour was ₦26,000.00/ha.

Table 4: Distribution according to cost of Production factors (n = 216)

Variables	Average cost (₦/ha)
Land	20,000.00
Labour	26,000.00
Inputs (fertilizer, seeds and agrochemicals)	3,791.67
Total	**49,791.67**

Source: Field Survey, 2011 [26].

Challenges to melon production

The result in Table 5 showed that all the respondents ranked climatic change (unpredicted rainfall pattern and flooding) as the first and most serious problem (mean score = 108.00) confronting melon production in the study area. The result supported the findings of Lawal-Adebowale and Oyegbami that Nigerian farmers largely depend on rainfall for their farming activities but with the persistent variation in rainfall pattern over the years, it had become difficult for the farmers to sustain their production pattern and the situation is further heightened by the contemporary climatic change in which rainfall pattern, sun/heat intensity, evaporation and evapo-transpiration rates and humidity have markedly varied over the years [22]. This is followed by limited agricultural extension service support (mean score = 107.66), non-availability of shelling and extraction device (mean score = 107.33) and pest and diseases (mean score = 107.20). Similarly, melon production was seriously inhibited by high cost of inputs (seeds, fertilizers and agro-chemicals), lack of storage facility for the melon, and high cost of agrochemicals (herbicides, pesticides and insecticides). Other constraints were limited credit facility, market information problem and transportation problem. This finding corroborates that of Philip *et al*., that credit is an important input for expansion of agriculture [23].

Table 5: Distribution according to constraints to melon production (n = 216)

Constraints	HC	MC	LC	Mean Score	Rank
Limited availability of arable land	1(0.50)	58(26.90)	157(72.60)	46.00	12th
Inadequate labour supply	29(13.4)	31(14.40)	156(72.20)	50.83	11th
Limited credit facility (inaccessibility & non-affordability)	189(87.50)	27(12.50)	0(0.00)	103.50	8th
Pests and diseases prevalence	211(97.70)	5(2.30)	0(0.00)	107.20	4th
Limited agricultural extension services support	214(99.10)	2(0.90)	0(0.00)	107.66	2nd
High cost of inputs (seeds & fertilizers) supply	209(96.80)	7(3.20)	0(0.00)	106.83	5th
High cost of agro-chemicals (insecticides, pesticides & herbicides)	203(94.00)	13(6.00)	0(0.00)	53.67	7th
Non-availability of shelling and extraction device	212(98.10)	4(1.90)	0(0.00)	107.33	3rd
Lack of storage facility	206(95.0)	10(4.60)	0(0.00)	106.33	6th
Market problem (no access to market information, agro-industries & guaranteed market)	179(82.90)	17(7.90)	20(9.30)	98.50	9th
Climatic change (unpredicted rainfall pattern and flooding)	216(100.00)	0(0.00)	0(0.00)	108.00	1st
Preference for other crop cultivation over melon	0(0.00)	29(13.40)	187(86.60)	40.83	13th
Transportation problem	162(75.00)	45(20.80)	9(4.20)	97.50	10th

Source: Field Survey, 2011 [26].

HC – High constraints; **MC –** Moderate Constraints; **LC –** Low Constraints

Test of resource inputs and socio-economic characteristics influence on melon output

Hypothesis 1: Resource inputs and socio-economic characteristics of the respondents have no significant influence on melon output (yield).

Results of regression analysis were presented in Table 6. Out of the three models (Linear, Semi-log and Cobb-Douglas); it was found that the Double-log model (Cobb-Douglas model) had the best fit based on its value of Durbin-Watson. It had Durbin-Watson value of 1.56, which was the lowest among the three

models. It at the same time, recorded high R-square (0.97) and high F-statistic (453.30) significant at 1% level of significance just like the other models. The choice was not really dependent on R-Square because in modern econometrics, it had been advised that choice of best fit model among competing models should not be based on the strength of R-square but rather on considerations of signs of the coefficients with respect to economic theory and lowness of Durbin-Watson [24]. The Double-log model fit most of these criteria. The high R-Square (0.97) indicated that 97.00% of the variation in output of melon in the sample was brought about by variation in the explanatory variables used in the model. The significant F-statistic affirmed that the null hypotheses 1 in the sample remained rejected at 1% level of significance. That is, alternate hypothesis (Ha_1): Resource inputs and socio-economic characteristics of the respondents have significant influence on melon output is accepted. The coefficient of age in years was significant at 1% level of significance and positively signed ($t = 0.19$, $p < 0.05$). The positive relationship implies that the more experienced and energetic the melon farmers are, the more the output of melon would be. Farm size was significant at 1% level of significance ($t = 0.99$, $p < 0.05$). This means that the more hectarage of land cultivated the more the output realized by the farmers. Every 1.00% increase in farm size will give an increase of 0.99% in output. The farmers with large farm sizes are more likely to produce more melon than their counterparts with smaller farms. This confirms what Onoja and Achike, reported in the literature, that the expected relationship between output and land is that, as more land is brought under production, output is increased. Marital ($t = 0.03$, $p < 0.05$), social ($t = 0.11$, $p < 0.05$) and occupational status ($t = 0.04$, $p < 0.05$) also returned positive signs at 5% level of significance indicating their relevance in enhancing melon productivity in Oyo State [16]. It can therefore be said that marital, social and occupational status have the power of giving melon farmers an edge over their counterparts since their level of affluence and positions in the community will give them access to land and other farm inputs which might help them to increase their productive capacities. However, the negative sign of household size at 5% level of significance implied that large household size do not translate to higher melon production ($t = -0.06$, $p < 0.05$). This is contrary to *an priori* expectations that large household size eases labour problems thereby leading to higher yield. This is possible because most of the family members especially children and wives go after their personal businesses (schooling and trading) outside the farms. The results agrees with Nwaru, who reported the same negative relationship between household size and technical efficiency in food crop production in Imo State, Nigeria [25]. Furthermore, the production factors such as land preparation ($t = 0.35$, $p < 0.05$) and fertilizer ($b = 0.02$, $p < 0.05$) were positively significant at 1% level of significance while labour ($t = 0.05$, $p < 0.05$) was positively significant at 10% level of significance to melon output. From the results, labour as a factor of production has influence on output of melon as indicated by the coefficient ($t = 0.\ 05$, $p < 0.05$). This implies that as labour input increases manday by 1%, the output increases by 0.05%. In this study, majority (81.90%) of households surveyed used hired labour in carrying out different activities of melon production. From the results, seeds as a variable show a negative relationship to yield as reported by the coefficient ($t = -0.17$, $p < 0.05$), but significant at 10% level of significance. This means that, as respondents increase the use of seeds from previous harvest for cultivation by 1%, the yield realized decreases by 0.17%. Thus, seeds have significant influence on the output of melon in the study area. Finally, the output of melon is negatively related to agrochemicals ($t = -0.00$), crop production techniques ($t = -0.12$) and constraints ($t = -0.13$) as shown by the negative coefficients at $p < 0.05$. This means that 1% increase in non-application of agrochemicals and constraints of melon; the yield is expected to decrease by 0.00%, 0.12% and 0.13% respectively. The results were insignificant at all levels. This shows that the non-application of agrochemicals and constraints are impediment to increasing output of melon.

Table 6: Factors influencing melon output (Yield)

Variables	Linear	Semi-log	Double-log
Constant	-34.73	-2.75.92	-2.96
	(-0.70)NS	(-1.04)NS	(3.31)**
Age	1.05	37.44	0.19
	(4.81)***	(3.62)***	(5.43)***
Household size	-3.89	-16.01	-0.06
	(-3.204)**	(-2.80)**	(-3.12)**
Farm size	125.85	201.30	0.99
	(59.30)***	(47.49)***	(69.23)***
Marital status	4.52	10.84	0.03
	(1.29)NS	(2.37)*	(2.03)**
Social status	33.55	52.75	0.11
	(2.71)**	(3.48)**	(2.17)**
Occupation status	6.30	7.34	0.04
	(1.57)NS	(1.04)NS	(1.68)*

Land	0.01	48.74	0.35
	(4.18)***	(2.48)*	(5.27)***
Labour	1.54	3.99	0.05
	(1.73)*	(0.52)NS	(1.92)*
Fertilizer	0.02	4.11	0.02
	(12.00)***	(9.00)***	(12.50)***
Agrochemical	-0.01	1.02	-0.00
	(-0.58)NS	(0.75)NS	(-0.64)NS
Seeds	-0.05	-9.08	-0.17
	(-1.36)NS	(-0.32)NS	(-1.80)*
Constraints	-0.79	-39.61	-0.13
	(0.24)NS	(-1.58)NS	(-1.60)NS
Model Fit Tests			
R-square	0.96	0.94	0.97
Adjusted R-square	0.96	0.94	0.97
F-Statistics	342.00	219.07	453.49
Prob(F-Statistics)	(0.00)***	(0.00)***	(0.00)***
Durbin-Watson	1.57	1.85	1.56

Source: Field Survey, 2011 [26]

Please note, all the values in parenthesis are t - values.

*= significant at 0.10, level ** = significant at 0.05 level, ***= significant at 0.01 level

NS = Not-significant at 0.05 level

CONCLUSION

The family labour was relative scarce while cost of production was high with meager returns from the melon output per ha. Thus, it can be concluded that resource inputs and socio-economic characteristics had direct influence on the melon output in the study area. Also, constraints constituted serious hindrances to melon production in the study area.

Recommendation

Based on the findings of this study it is hereby recommended that:

i. Government should supply subsidized production inputs for melon in the study area.
ii. Extension agents should design and provide necessary supports that can boost melon production in the study area.
iii. Financial institutions should provide affordable financial support for melon farmers in the study area

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