

Research Article

Effectiveness of linking vegetable farmers to formal markets in Lagos State, Nigeria

Jonathan Akinsola Akinwale* and Olamide Victoria Oyeyemi

Department of Agricultural Extension and Communication Technology, Federal University of Technology, Akure, Ondo State, Nigeria

*Correspondence: jaakinwale@futa.edu.ng

*ORCID: <https://orcid.org/0000-0003-0376-2804>

Received: June 25, 2020; Revised: October 20, 2020;

Accepted: December 05, 2020; Available online: January 01, 2021

© Copyright: Akinwale and Oyeyemi (2021).



This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/).

ABSTRACT

The study assessed how smallholder vegetable farmers are linked to formal markets in Lagos state, Nigeria. The study specifically described the socioeconomic characteristics of the smallholder vegetable farmers, ascertained perceived benefits from the linkage and constraints in linking smallholder vegetable farmers to formal markets. A random sampling technique was used to sample 120 vegetable farmers from Agbowo and Epe clusters. Data were analysed using descriptive statistics and correlation analysis. The results revealed that smallholder vegetable farmers were relatively young with mean age of 41.5 years, mean household size was 4 persons and they mainly sourced information from friends and fellow farmers. The findings also revealed that the smallholder vegetable farmers had strong linkage with input suppliers ($\bar{x} = 2.50$), International Fertilizer Development Center ($\bar{x} = 2.33$), World Vegetable Center ($\bar{x} = 1.51$) and Center for Inclusive Agriculture and Gender Development ($\bar{x} = 1.46$). Exposure to production technologies and specialized training ($\bar{x} = 4.69$) were the most perceived benefits from the linkage. Level of linkage with farmers and other actors was constrained by lack of basic infrastructure ($\bar{x} = 2.50$) and inadequate credit facilities ($\bar{x} = 2.06$). The study also found a significant correlation between household size and level of linkages. The linkages arising from the arrangement had no doubt exposed the farmers to production technologies and market information. Extension agencies and relevant non-governmental organisations are implored to offer specific trainings to vegetable farmers on value addition to enhance their participation in the formal markets.

Keywords: Formal markets, linkage, perceived benefits, vegetable production

Correct citation: Akinwale, J. A., & Oyeyemi, O. V. (2021). Effectiveness of linking vegetable farmers to formal markets in Lagos State, Nigeria. *Journal of Agriculture and Natural Resources*, 4(2), 273-283. DOI: <https://doi.org/10.3126/janr.v4i2.33920>

INTRODUCTION

Agriculture plays a dominant role toward food security and improved well-being of smallholder farmers in both developed and developing countries. Globally, the production of vegetables and fruits are not commensurate with other food crops. For instance, the world produces five servings of fruits and vegetables instead of the required 15 (Krishna *et al.*, 2018). The shortage in production has resulted into imbalanced diets leading to death of millions of people each year, particularly in developing countries where micronutrient malnutrition is chronic and debilitating

(World Vegetable Centre, 2020). With intensification in vegetable production therefore, malnutrition diseases especially among women and children could be reduced while productivity and income among smallholder farmers would be enhanced.

The smallholder vegetable farmers are within about 52.5% of the world's poorest people whose food, income, and livelihood prospects depend on agriculture. These farmers cultivate an average farm size of 2 hectares with rudimentary tools and basically for household consumption. The subsistence nature of the farm has left the farmers with low purchasing power to purchase modern farm inputs and equipment to enhance their farm operations (Barrett *et al.*, 2011). Farmers are also confronted with numerous challenges ranging from land tenure, lack of access to production inputs such as: credit, quality seed, fertilizer, farm equipment, training and skills development, irrigation, output markets, weather information, agricultural extension services, inadequate access to post harvest technologies and poor rural infrastructure (Hertel and Rosch, 2010). These constraints have prevented the farmers from taking part in the mainstream formal markets due to lack of technical advice on production, inadequate packaging and processing services, poor support infrastructure, deficiency of contractual agreements between actors, insufficient access to finance, meeting high standard product requirement, product bulkiness and post harvest handling of vegetables. Timsina and Shivakoti (2018) recommended to adopt new post-harvest technologies to get benefits in vegetable sector. It has been affirmed that more benefits might be realised if agricultural support services such as; training, seed production and distribution among others are decentralized or handled by private organizations (Grany *et al.*, 2018). These constraints if not adequately addressed will prevent farmers from expanding their production and limit their participation in organised formal markets. It is therefore important for farmers to be equipped with relevant skills to produce high yielding, quality and safe vegetables for emerging agricultural markets. This capacity building will eventually empower farmers to be able to grow and sell rather than grow to sell. Such effort will definitely position the farmers to adapt with the ever dynamic and competitive produce market. This approach according to MaDowell and Hess (2012) will lead to improve agricultural outputs with significant impacts on food security, nutrition, income and wellbeing of smallholder farmers.

A critical look at the Nigeria's retail market shows a gradual and steady penetration of international formal markets. This is evident in the construction of new malls, conversions of informal markets to formal and modern ones. Although only a tiny section of retail trade is formal at present, the advantages of shopping in supermarkets and convenience stores have become increasingly apparent to domestic consumers. Nigeria's modern supermarkets are a mix of domestic and foreign finished products. It is apparent that sales of fruits and vegetables have become regular features in the country's formal markets especially in the major cities. In order to ensure sustainable livelihood, the smallholder farmers have no alternative than to participate in the formal markets. Formal markets assure smallholder farmers (SHFs) of new set of buyers for their produce. For example, a survey of SHFs in Kenya found that those who supplied produce to the supermarkets increased farm productivity by 45%, and reduced poverty levels by 50%. This linkage to retail outlets has consequently increased farmers' ability and willingness to invest in technologies that enhance productivity (Rao *et al.*, 2012).

Against this backdrop, Non-governmental organisations like International Fertilizer Development Center (IFDC), World Vegetable Center and Center for Inclusive Agriculture and Gender Development (CIA-GED) in Nigeria are now collaborating to promote collective action among farmers through provision of specialised training on market requirements and advance payment scheme and institutional supports. These activities are geared toward reducing transaction costs and contributing to making farmers more reliable trading partners for urban markets. It is now expedient to assess how this cooperation is linking smallholder farmers to markets outlets in Lagos State, Nigeria. The specific objectives of the study were to: describe the socioeconomic characteristics of the smallholder vegetable farmers, identify level of linkages between the smallholder vegetable farmers and the actors, ascertain perceived benefits to farmers from the linkage and examine the constraints at linking smallholder vegetable farmers to markets. The study hypothesised that there was no significant relationship between selected socio-economic characteristics of the smallholder vegetable farmers and the level of linkages to markets.

METHODOLOGY

The research was carried out in Lagos State. Lagos State is noted for high concentration of formal markets such as supermarket outlets. A purposive sampling technique was used to select respondents from Agbowo and Epe vegetable farmers' clusters in Lagos State. Then using random sampling, 60 farmers were selected from each cluster. Thus, a total of 120 vegetable farmers formed the sample size for this study. Meanwhile, 103 of the 120 questionnaires were found suitable for data analysis. Level of linkage between farmers and other actors was measured by asking farmers to tick either Yes or No to presence of linkage with the following organisations: World Vegetable Center, International Fertiliser Development Center, Input Suppliers, Center for Inclusive Agriculture and Gender Development, Supermarket Outlets, Lagos State Government and Agro-processors. The level of the linkage was measured on a 4-point Likert type scale of high, moderate, low and none. The values of the response categories were 3, 2, 1 and 0 respectively. These values were added and divided to obtain a mean score of 1.5 which served as the cut-off point. Constraints in linking smallholder vegetable farmers to market were measured on a 3-point Likert type scale with response categories of severe constraints, mild constraints, and no constraints. The values of the responses were 2, 1 and 0 respectively. These values were added and divided by 3 to obtain a mean score of 1 which served as the cut-off point. Data were analyzed using descriptive statistics (percentages, frequencies and means) and correlation analysis.

RESULTS AND DISCUSSION

Socio-economic characteristics of the vegetable farmers

Majority (52.4%) of the vegetable farmers were within the age of 30-39 years. The mean age of the respondents was 41.5 years. This implies that most of the farmers were within their active age. These findings corroborate Agbo *et al.*, (2015) that found the mean age of vegetable farmers in Imo State, Nigeria as 43.7 years. Also, 81.6% of the farmers were male while 18.4% were female. This implies that vegetable production in the study area was male dominated. The tedious nature of farming activities that require strength and vigour may be the reason for the

large proportion of male in the vegetable production. This supports the findings of Muhammed-Lawal *et al.* (2009) that found male farmers performing herculean tasks better than their female counterparts. Furthermore, 18.4% of the farmers were single while 79.6% were married. The mean household size of the vegetable farmers (Table 1) was 4 persons.

Table 1. Socio-economic characteristics of the vegetable farmers (n = 103).

Variables	Frequency	Percentage (%)	Mean
Farmers age (years)			
20-29	12	11.7	
30-39	54	52.4	41.5
40-49	26	25.2	
50-59	11	10.7	
Sex of farmers			
Male	84	81.6	
Female	19	18.4	
Marital status			
Single	19	18.4	
Married	82	79.6	
Widow	2	1.9	
Household size (persons)			
1-3	43	41.7	
4-6	51	49.5	4
7-9	9	8.7	
Level of education			
No formal education	2	1.9	
Primary school	6	5.8	
Secondary school	29	28.2	
National Diploma (ND)	20	19.4	
HND/BSc.	43	41.7	
Postgraduate	3	2.9	
Experience in vegetable farming (years)			
1 – 3	50	48.5	
4 – 6	42	40.8	4
7 – 9	4	3.9	
10 – 12	7	6.8	
Farm size (hectare)			
1-3	48	46.6	
4-6	45	43.7	1.7
7-9	7	6.8	
10-12	3	2.9	

Source: Field survey, 2019

The educational qualification of the vegetable farmers showed that 28.2% had Secondary School Certificate, 19.4% had Ordinary National Diploma (OND), and 41.7% had Higher National Diploma/Bachelor of Science degree. This implies that majority of the vegetable farmers had formal education. It is therefore expected of the farmers to be able to make informed decision as

it affects their farming activities. This is in line with Muhammad-Lawal *et al.*, (2009) that classified farmers' education as an essential ingredient for sustainable agriculture growth and development. Similarly, Reardon and Neven (2004), Schipmann and Qaim (2011) and Sahara *et al.*, (2015) also found high educational level among vegetable farmers in supermarkets value chains. Moreover, the means farming experience and farm size of the vegetable farmers were 4 years and 1.7 hectare respectively. This finding correlates with Adeoye and Balogun (2016) that found the average farm size of cucumber farmers in Oyo state, Nigeria as 1.5 hectare. This implies that majority of the vegetable farmers were smallholder.

Vegetable farmers' sources of information

In sourcing for vegetable related production information, 98.1% of the farmers received information on vegetable production through friends, 68.0% received information through mobile phone, 65.5% received information through the internet, 54.4% received information through radio and 50.5% received information through television (Table 2). The cluster farming has engendered intimacy among the vegetable farmers to the extent that preference is given to obtaining information from fellow farmers among other sources. This implies that the vegetable farmers maintain regular contacts with each other in the pursuit of their farming enterprises. Information from fellow farmers is expected to be reliable and be specific to vegetable production. The technicalities of vegetable production may be the reason for this source of information as it enhances farmer to farmer learning situation. This finding supports Mariyona *et al.*, (2018) that rated traders and neighbouring farmers as the main sources of information among vegetable farmers in Indonesia.

Table 2. Sources of information on vegetable production (n = 103).

Source of information	Yes F (%)	No F (%)	Ranking
Friends	101(98.1)	2(1.9)	1
Mobile phone	70(68.0)	33(32.0)	2
Internet	67(65.0)	36(35.0)	3
Radio	56(54.4)	47(45.6)	4
Television	52(50.5)	51(49.5)	5

Source: Field survey, 2019, F: Frequency

Vegetables farmers' level of linkages with other actors

The level of linkages among relevant stakeholders in vegetable production showed that 99.0% of the farmers indicated linkage with World Vegetable Center, 99.0% with International Fertilizer Development Center, 99.0% with Input Suppliers, 77.7% with Center for Inclusive Agriculture and Gender Development, 53.4% with supermarket outlets, 26.2% with the Lagos state government while 2.9% with the Agro-processors (Table 3). The low level of interaction (2.9%) with Agro-processors may be due to the types of vegetables cultivated by the farmers. It was observed during data gathering that majority of the farmers cultivated vegetables that require no further processing before consumption. Meanwhile, there were high level of linkages between smallholder vegetable farmers and input dealers ($\bar{x} = 2.50$), International Fertilizer Development Center ($\bar{x} = 2.33$), World Vegetable Center ($\bar{x} = 1.51$) and Center for Inclusive Agriculture and Gender Development ($\bar{x} = 1.46$). The high level of linkages with these actors may be as a result

of agricultural inputs that is being bankrolled into the partnership by these actors. This supports the finding of Bhimsen *et al.* (2016) in which project intervention in facilitating input supplies and marketing improves the production and marketing performance of vegetable farmers in Nepal. Meanwhile, there were low level linkages with supermarket outlets ($\bar{x} = 0.84$), Lagos State Government ($\bar{x} = 0.29$) and Agro-processors ($\bar{x} = 0.03$). The low level of linkages suggests weak vertical integration along the vegetable production value chain in the study area. This affirms that the vegetable farmers are currently active only in the downstream sector of the value chain.

Table 3. Vegetables farmers level of linkages with other actors (n = 103).

S/N	Actors	Presence of linkage			Level of Linkages					Mean	Rank
		Yes F (%)	No F (%)	Rank	None F (%)	Low F (%)	Moderate F (%)	High F (%)			
1.	Input Suppliers	102 (99.0)	1 (1.0)	1	1 (1.0)	4 (3.9)	40 (38.8)	58(56.3)	2.50	1	
2.	IFDC	102 (99.0)	1 (1.0)	1	1 (1.0)	4 (3.9)	58 (56.3)	40(38.8)	2.33	2	
3.	World Vegetable Center	102 (99.0)	1 (1.0)	1	1 (1.0)	56(54.4)	38 (36.9)	8 (7.8)	1.51	3	
4.	CIA-GED	80 (77.7)	23(22.3)	4	23(22.3)	20(19.4)	49 (47.6)	11(10.7)	1.47	4	
5.	Supermarket outlets	55 (53.4)	48(46.6)	5	48(46.6)	28(27.2)	22 (21.4)	5 (4.9)	0.85	5	
6.	Lagos State Government	27 (26.2)	76(73.8)	6	77(74.8)	22(21.4)	4 (3.9)	-	0.30	6	
7.	Processors	3(2.9)	100(97.1)	7	100(97.1)	2 (1.9)	1 (1.0)	-	0.04	7	

Source: Field survey, 2019, F: Frequency

Post-harvest operations

Prior marketing, 97.1% of the farmers arranged vegetables into bags or boxes immediately after harvest, 91.3% packaged vegetables into sizeable bags for sale, and 89.3% sorted vegetables before sale. Also, 74.8% of the farmers transported vegetable to the market, 18.4% stored vegetable before marketing, 1.9% washed vegetables and 1.0% cooled vegetable after harvest (Table 4). It was evident from these findings that the vegetable farmers performed less post-harvest activities. The lack of value addition on produce after harvest by the vegetable farmers will invariably limit their ability to attract premium prices and as well as restrict their participation in the formal markets. This supports the finding of Mukarumbwa *et al.*, (2018) that improvement in value addition practices results in increase in urban market participation by smallholder vegetable farmers in Zimbabwe.

Table 4. Post harvest operations (n = 103).

S/N	Post-harvest operation of vegetables	Often (%)	Sometimes (%)	Never (%)
1.	Arranging into bags or boxes	100(97.1)	3(2.9)	-
2.	Washing	2(1.9)	36(35.0)	65(63.1)
3.	Sorting	92(89.3)	9(8.7)	2(1.9)
4.	Cooling	1(1.0)	15(14.6)	87(84.5)
5.	Packaging	94(91.3)	8(7.8)	1(1.0)
6.	Storage	19(18.4)	76(73.8)	8(7.8)
7.	Transportation	77(74.8)	26(25.2)	-

Source: Field survey, 2019

Main buyers of vegetable

The sale outlets for vegetables revealed that 26.4%, 22.3% and 1.0% of the smallholder vegetable farmers sold their garden egg to wholesalers, local consumers and farmer groups respectively. Meanwhile, 53.4%, 49.5%, 47.6% and 17.5% of the smallholder vegetable farmers sold their cucumber to supermarket outlets, wholesalers, local consumers and farmers group or aggregators respectively. Also, 68.0%, 53.4%, 16.5%, 76.7%, 2.9% and 1.0% of the smallholder vegetable farmers sold their tomatoes to wholesalers, supermarket outlets, farmers group, local consumers, processors and cooperative societies respectively (Table 5). The most preferred sales outlet used by the vegetable farmers was through local buyers. The choice may be for convenience or need to avoid incurring further cost before marketing. These findings support Zanello *et al.* (2014) that farmers' preferred buyers who come to farm gate because selling at farm gate reduce proportional transaction costs of farmers.

Table 5. Main buyers of vegetable (n= 103).

S/N	Main buyers	Garden egg		Cucumber		Tomatoes	
		Yes F (%)	No F (%)	Yes F (%)	No F (%)	Yes F (%)	No F (%)
1.	Local consumer	23(22.3)	80 (77.7)	49(47.6)	54(52.4)	79(76.7)	24(23.3)
2.	Farmers' group	1(1.0)	102(99.0)	18(17.5)	85(82.5)	17(16.5)	86(83.5)
3.	Farmers' Cooperative	-	103(100.0)	-	103(100.0)	1(1.0)	102(99.0)
4.	Wholesalers	21(26.4)	82 (79.6)	51(49.5)	52(50.5)	70(68.0)	33(32.0)
5.	Supermarket	-	103(100.0)	55(53.4)	48 (46.6)	55(53.4)	48(46.6)
6.	Agro-processors	-	103(100.0)	-	103(100.0)	3(2.9)	100(97.1)

Source: Field survey, 2019, F: Frequency

Perceived benefits of the linkage to vegetable farmers

Vegetable farmers exposure to production technologies and specialized training ($\bar{x} = 4.69$), reliable market information ($\bar{x} = 4.26$) were the highly ranked benefits. The adequate training and market information from the linkage is expected to translate to increase productivity and income to the farmers. This correlates with the findings of Abulusoro *et al.*, (2014) that identified credit facilities, training and improved technologies as perceived strategies for increase tomato production in Kogi State, Nigeria. Others were increased production ($\bar{x} = 4.23$), improved household income and stable income ($\bar{x} = 4.21$), reduction in marketing risks ($\bar{x} = 4.03$), low

marketing costs ($\bar{x} = 4.00$), strong linkages with relevant actors ($\bar{x} = 3.83$) and guaranteed or stable markets ($\bar{x} = 3.75$), premium price at the point of sales ($\bar{x} = 3.47$), advance payment scheme ($\bar{x} = 3.12$), Meanwhile, provision of agro inputs ($\bar{x} = 2.23$) and financial supports ($\bar{x} = 1.99$) were weak derived benefits from the partnership arrangement (Table 6). This means that the linkage was yet to benefit the farmers in the aspect of input and credit provisions.

Table 6. Perceived benefits derived (n = 103).

S/N	Production incentives	Strongly Agree F (%)	Agree F (%)	Undecided F (%)	Disagree F (%)	Strongly Disagree F (%)	Mean	Rank
1.	Exposure to production technologies and specialized training	74(71.8)	28(27.2)	-	-	1(1.0)	4.6893	1 st
2.	Reliable market information	54(52.4)	34(33.0)	5(4.9)	8(7.8)	2(1.9)	4.2621	2 nd
3.	Increase in production	35(34.0)	62(60.2)	1(1.0)	5(4.9)	-	4.2330	3 rd
4.	Improved household income and stable income	31(30.1)	64(62.1)	7(6.8)	1(1.0)	-	4.2136	4 th
5.	Reduction in marketing risks	26(25.2)	60(58.3)	12(11.7)	4(3.9)	1(1.0)	4.0291	5 th
6.	Low marketing costs	36(35.0)	46(44.7)	9(8.7)	9(8.7)	3(2.9)	4.0000	6 th
7.	Strong linkage with relevant actors	21(20.4)	57(55.3)	11(11.7)	14(13.6)	-	3.8252	10 th
8.	Guaranteed/ stable markets	16(15.5)	56(54.4)	21(20.4)	9(8.7)	1(1.0)	3.7476	11 th
9.	Premium price at the point of sales	12(11.7)	46(44.7)	27(26.2)	14(13.6)	4(3.9)	3.4660	8 th
10.	Advance payment scheme	6(5.8)	47(45.6)	12(11.7)	29(28.2)	9(8.7)	3.1165	7 th
11.	Provision of agro inputs	3(2.9)	6(5.8)	23(22.3)	51(49.5)	20(19.4)	2.2330	9 th
12.	Financial supports	1(1.0)	5(4.9)	15(14.6)	53(51.5)	29(28.2)	1.9903	12 th

Source: Field survey, 201, F: Frequency

Vegetables farmers' constraints at linking with other actors in vegetable production

Factors limiting the linkage among actors as indicated by the farmers were; lack of basic infrastructure (e.g. road, storage facilities) ($\bar{x} = 2.50$), inadequate credit facilities ($\bar{x} = 2.06$), lack of trust between buyers and producers ($\bar{x} = 1.84$), meeting production requirements ($\bar{x} = 1.74$), low bargaining position ($\bar{x} = 1.74$), distance from supermarket outlets ($\bar{x} = 1.55$), limited input resources ($\bar{x} = 1.44$), transportation costs ($\bar{x} = 1.34$), poor market information ($\bar{x} = 1.16$) and inadequate incentives from other players ($\bar{x} = 1.16$). Inadequate credit facilities for the farmers depict the general state of inadequate financing and support facilities to agriculture sector in Nigeria. These findings agree with Akpan *et al.* (2015), who identified inadequate credit facilities as one of the perceived constraints to youth's involvement in agricultural activities.

Table 7. Vegetables farmers' constraints at linking with other actors in vegetable production.

S/N	Constraints	Severe constraints F (%)	Mild constraints F (%)	No constraints F (%)	Mean
1.	Limited input resources	63 (61.2)	34 (33.0)	6 (5.8)	1.4466
2.	Inadequate incentives from other players	86 (83.5)	17 (16.5)	-	1.1650
3.	Low bargaining position	26 (25.2)	77 (74.8)	-	1.7476
4.	Poor market information	88 (85.4)	13 (12.6)	2 (1.9)	1.1650
5.	Lack of trust between buyers and producers	25 (24.3)	69 (67.0)	9 (8.7)	1.8447
6.	Inadequate credit facilities	18 (17.5)	61 (59.2)	9 (8.7)	2.0583
7.	Lack of basic infrastructure (e.g. road, storage)	13 (12.6)	25 (24.3)	65 (63.1)	2.5049
8.	Meeting production requirements	40 (38.8)	50 (48.5)	13 (12.6)	1.7379
9.	Transportation costs	70 (68.0)	31 (30.1)	2 (1.9)	1.3398
10.	Distance from supermarket outlets	25 (45.5)	30 (54.5)	-	1.5455

Source: Field survey, 2019, F: Frequency

Hypotheses Testing

The Correlation analysis showed that age ($p=0.995>0.05$), educational qualifications ($p=0.569>0.05$), years of vegetable farming ($p=0.885>0.05$), farm size ($p=0.308>0.05$) were not significantly associated with the level of linkages. It implies that age, educational level, years of vegetable farming and farm size did not influence level of linkages in vegetable production (Table 8). Meanwhile, there was a significant relationship between household size of the vegetable farmers and the level of linkages ($p=0.042<0.05$). This suggests that household size influence the level of linkage.

Table 8. PPMC result of the relationship between the selected socio-economic characteristics and the level of linkages with other actors

Variables	p-value	Decision
Age	0.997	NS
Education level	0.569	NS
Household size	0.042	S
Years of vegetable farming	0.885	NS
Farmers farm size	0.308	NS

Source: Field survey, 2019

*Significant <0.05

S= Significant, NS= Not Significant

CONCLUSION

The linkages have benefited the farmers in the aspects of exposure to production technologies and market information. Meanwhile the vegetable farmers still utilised local market mainly for sales of their produce. This gap may be as the result of farmers not performing essential value addition before engaging in marketing operation. It is therefore recommended for the actors to provide adequate orientation to the farmers on the economic benefits of exploring other marketing outlets. Also, agricultural extension services should provide adequate training to the farmers on the aspect of value addition so as to enable the vegetable farmers access formal markets.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the Center for Inclusive Agriculture and Gender Development, the World Vegetable Centre and the International Fertiliser Development Centre for providing the platform to interview the participating vegetable farmers. Special appreciation also to the vegetable farmers in Agbowo and Epe clusters for their willing participation in this survey.

Author contributions

J. A. Akinwale designed the study, developed the outline and designed the analytical tools; O. V. Oyeyemi collected data, analysed data and wrote the first draft of the manuscript. All authors read and approved the final manuscript.

Conflict of interest

The author declares that there is no conflict of interest regarding the publication of this paper.

REFERENCES

- Abolusoro, P. F., Ogunjimi, S. I., & Abulosoro, S. A. (2014). Farmers' perception on the strategies for increasing tomato production in Kabba-Bunu Local Government area of Kogi State, Nigeria *Agrosearch* 14(2), 144-153. doi: 10.4314/agrosh.v14i2.5.
- Adeoye, I. B., & Balogun, O. L. (2016). Profitability and efficiency of cucumber production among smallholder farmers in Oyo State, Nigeria. *Journal of Agricultural Sciences*, 61(4), 387 – 398. doi: 10.2298/JAS1604387A.
- Agbo, F. U., Iroh, I. I., & Ihemezie, E. J. (2015). Access to credit by vegetable farmers in Nigeria: A case study of Owerri Agricultural zone of Imo State, Nigeria. *Asian Journal of Agricultural Research*, 9(4), 155-165. doi: 10.3923/ajar.2015.155.165.
- Akpan, S. B., Patrick, I. V., James, S. U., & Agom, D. I. (2015). Determinants of Decision and Participation of Rural Youth in Agricultural Production: A Case Study of Youth in Southern Region of Nigeria. *Russian Journal of Agricultural and Socio-Economic Sciences*, 7 (43), 45-46.
- Barrett, C. B., Bachke, M. E., Bellemare, M. F., Michelson, H. C., Narayanan, S., & Walker, T. F. (2011). Smallholder participation in contract farming: Comparative evidence from five countries. *World Development*, 40(4), 715-730. doi: 10.1016/j.worlddev.2011.09.006
- Bhimsen, G., Punya, P. R., Resham, B. T., Durga, M. G., Ganesh, M. G., & Krishna, B. K. (2016). Impact of PRISM approach on area production and income of vegetable growers in Kaski and Kapilvastu district of Western Nepal. *Greener Journal of Agricultural Sciences* 6(10), 320-325. doi: <http://doi.org/10.15580/GJAS.2016.10.110716200>.
- Hertel, T. W., & Rosch, S. D. (2010). Climate Change, Agriculture and Poverty. Policy Research Working Paper 5468. Washington DC: World Bank.
- Grany, M. S., Edilegnaw, W., & Gerald F. O. (2018). Analyzing the value chain for African leafy vegetables in Limpopo Province, South Africa. *Cogent Social Sciences*, 4(1), 1-16. doi: <https://doi.org/10.1080/23311886.2018.1509417>
- Krishna, K. B., Dias, G. M., Veeramani, A., Swanton, C. J., Fraser, D., Steinke, D., Lee, E., Wittman, H., Farber, J. M., Dunfield, K., McCann, K., Anand, M., Campbell, M., Rooney, N., Raine, N., Acker, R. V., Hanner, R., Pascoal, S., Sharif, S., Benton, T. G., &

- Fraser, E. D (2018). When too much isn't enough: Does current food production meet global nutritional needs? *PLoS ONE*, 13(10), 1-16. doi: <https://doi.org/10.1371/journal.pone.0205683>
- MaDowell, J. Z., & Hess, J. J. (2012). Accessing Adaptation: Multiple Stressors and Livelihoods in the Bolivian Highlands under a Changing Climate. *Global Environment Change*, 22 (1), 342-352. doi: 10.1016/j.gloenvcha.2011.11.002
- Mariyona, J., Dewi, H. A., Daroini, P. B., Latifah, E., Zakariya, A. Z., & Afari-Sefa, V. (2018). Marketing Aspects of Vegetables: Comparative study of four regions in East Java and Bali. *Agriekonomika* 7(1), 46-56. doi: 10.21107/agriekonomika.v7i1.3410
- Mukarumbwa, P., Mushunje, A., Taruvinga, A., Akinyemi, B., & Ngarava, S. (2018). Analysis of factors that influence market channel choice of smallholder vegetable farmers in Mashonaland east province of Zimbabwe. *International Journal of Development and Sustainability* 7 (1), 734 – 754
- Muhammed-Lawal, A., Omotesho, O. A., & Falola, A. (2009): Technical Efficiency of youth participation in Agriculture: A case study of the Youth-in- Agriculture Programme in Ondo State of Nigeria. *Journal of Agriculture, Food and Environment*, 5(1), 20-26.
- Rao, E. J. O., Brummer, B., & Qaim, M. (2012). Farmer participation in supermarket channels, production technology, and efficiency: The case of vegetables in Kenya. *American Journal of Agricultural Economics*, 94(4), 891-912.
- Reardon, T., & Neven, D. (2004). The Rise of Kenyan Supermarkets and Evolution of their Horticulture Product Procurement Systems. *Development Policy Review*, 22(6), 669-699. doi: 10.1111/j.1467-7679.2004.00271.x
- Sahara, S., Minot, N., Stringer, R., & Umberger, W. J. (2015) Determinants and effects of small chilli farmers' participation in supermarket channels in Indonesia. *Bulletin of Indonesia Economics Studies*, 51(1) 445–460. doi: <https://doi.org/10.1080/00074918.2015.11110851>
- Schipmann, C., & Qaim, M. (2011). Supply chain differentiation, contract agriculture, and farmers' marketing preferences: The case of sweet pepper in Thailand. *Food Policy*, 36, 667-677. doi: <https://doi.org/10.1016/j.foodpol.2011.07.004>
- Timsina, K.P., & Shivakoti, G.P. (2018). Vegetables production and marketing: practice and perception of vegetable seed producers and fresh growers in Nepal. *Agriculture and Food Security*, 7(11). DOI: <https://doi.org/10.1186/s40066-018-0161-9>
- World Vegetable Centre (2020) Healthy Diets. Accessed February 20, 2020 from <https://avrdc.org/our-work/enhancing-consumption>
- Zanello, G., Srinivasan, C. S., & Shankar, B. (2014). Transaction Costs, Information Technologies, and the Choice of Marketplace among farmers in Northern Ghana. *The Journal of Development Studies*, 50(9), 1226-1239. doi: <https://doi.org/10.1080/00220388.2014.903244>.