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ARAŞTIRMA MAKALESİ **RESEARCH ARTICLE**

Contribution of Sweetpotato Production to Economic Empowerment of Farming Households in Niger-Delta Area of Nigeria

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Abstract

Many farming households in Nigeria are deprived, and poor, hence, the need for economic empowerment intervention. Sweetpotato production, due to its short cycle and low input requirement could be projected on a larger scale for farming households' economic empowerment. However, data regarding ability of sweetpotato farming for farming households' economic empowerment is scarce. Therefore, farming households' sweetpotato production and economic empowerment in Nigeria's Niger-Delta Area was investigated. 364 sweetpotato farming households were chosen through a five-stage sample process. Descriptive statistics, Pearson Product Moment Correlation, T-test, and multiple regression were used to analyze the data that interview schedule was used to collect. Most respondents were female and aged 42.7±11.9 years. Farm size; farming experience; and income from sweetpotato, other crops, and non-crop livelihood activities were 2.6±3.4 hectares; 17.2±12.4 years; and ₦1,327,723.0±1,639,414.0 yearly, ₦2,385,815.0±2,615,273.0 yearly, and ₦1,828,004.0±2,336,270.0 yearly, respectively. The sweetpotato production and economic empowerment were low and high amongst farming households, respectively. Age, farm size and income from sweet potato were significantly related to economic empowerment. The economic empowerment status of high and low sweetpotato producers differed significantly. Between farming households with low and high income from sweetpotato production, their economic empowerment status significantly differed. Farming households' economic empowerment was mostly predicted by farming experience; and income from sweetpotato, and non-crop livelihood activities. Sweetpotato production influenced farming households' ability to prosper economically. Agricultural policies oriented towards improving economic empowerment should be promoted to emphasize increased sweetpotato production.

Keywords: Empowerment status, Rural farming households, Sweetpotato farmers, Empowerment intervention, Potential of sweet potato farming

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*This study was summarized from the Ogheneakpobor OYIBO's PhD thesis.

1. Introduction

Sweetpotato (SP) is a dicotyledonous plant and a storage root crop with herbaceous tuber. It is among the most significant food crops globally, as evident in its rank seventh place in terms of importance globally, after rice, wheat, maize, potato, barley and cassava (Odebode et al., 2021). Nigeria is the second leading SP producer globally (Mwanja et al., 2017). The country accounts for 3.7% of world's sweetpotato production-SPP with an approximately annual production of 3.46 - 3.92 million metric tonnes (FAOSTAT, 2017). In Nigeria, SP tuberous roots, shoots, and leaves are incredibly beneficial for both livestock and people. Thus, producing it is a feasible economic activity for increase food security, the alleviation of poverty, and income generation in rural households.

Sweetpotato is a crop with a lot of nutritional and therapeutic benefits, making it comparable with an extensive range of vegetables and fruits. The crop is a highly nutritious food crop, due to its ability to produce six classes of foods such as vitamins, minerals, fibre, fats, protein and carbohydrates (Oyibo, 2021). This explains why its leaves, shoots and storage roots are valuable sources of oil, vitamins, proteins, low crude fibre, carotene, calcium, iron, sodium, ascorbic acid, dietary insoluble fibre which helps to prevent constipation, lysine and soluble fibre that lowers cholesterol (Abdulkarim and Yunana, 2015). Apart from nutritional value, SP has other economic benefit. The importance of SP is not only seen in human nutrition but also serves in income generation, thus, it has the potential to be a key crop for a living. According to Adeyonu et al. (2019), the crop is notably among the cash and food crops of the crop sub-sector's that contributed 20% to the Nigeria's GDP in 2014. The foregoing suggests the economic role of SP to farming households (FHs) and at national level in emerging and/or developing nations. Therefore, farmers can experience economic empowerment (EE) as a result of producing SP for income generating and nutritional benefits.

Banmeke (2003) viewed EE as the process of enabling a group of underprivileged or socially-marginalised individuals to improve their physical, economic and educational situations, which inevitably results in an improvement in their livelihoods. It entails expanding one's ability to make strategic life choices, especially in the contexts in which this ability had been denied to the individual (Sraboni et al., 2014).

In Nigeria, including Niger-Delta area, rural FHs are responsible for 80% of food production (Akaakohol and Aye, 2014). However, rural households are characterised by food insecurity, limited access to capital and poor income, among others (Adebosin et al., 2013). These deplorable situations of rural FHs call for EE measures in order to improve their social and economic conditions. Several interventions-projects, policies, and programmes-have been made at the national level to economically empower rural households so as to improve their economic and social conditions. The interventions, among others, include the Poverty Alleviation Programmes (PAP), Family Economic Advancement Programme (FEAP), and Nigeria EE and Development Strategy (NEEDS). Despite these interventions by the government, rural households still remain in poverty.

Sweetpotato production (SPP) has the potential of being widely utilised for the EE of Nigerian farmers. Ogundele et al. (2009) identified it as a viable alternative to ensuring empowerment of farmers. This, according to Olapade and Ogunade (2014), is because SP is a crop with low input requirement. Earlier study revealed that it shows no marked seasonality and has the ability to produce reasonable yields in agro-ecological zones where other crops cannot thrive and/or would fail (Olapade and Ogunade, 2014). In spite of these desirable attributes of SP for EE, the crop in Nigeria's Niger-Delta has not gained the desired attention among cultivators/growers. Different nations around the world have employed crops with comparable attributes as EE means. For instance, in The Philippines, Myanmar, Indonesia and Thailand, the use of the production of rice as an intervention has given rice growers empowerment. The intervention in these countries, according to Akter et al. (2017), resulted in better access to income, enhanced ownership of productive resources and increased access to such resources. This indicates that farmers in Nigeria's Niger-Delta can receive EE if SP is given the appropriate policy support. However, there is dearth of information establishing a link between SPP and FHs EE.

The study's objective was to assess the contribution of SPP to FHs' EE. The specific objectives were to: describe the SP FHs demographic traits; establish the SPP level; ascertain how much income earned from SPP, other crops production, and non-crop livelihood activities by SP farmers; and establish the EE level of farmers among SP FHs. The following hypotheses stated in the null forms were tested based on the study's objectives: few chosen demographic traits have no discernible correlation with the EE level of SP FHs; income (SP, other crops,

and non-crop livelihood activities income) has no significant relationship with level of EE of SP FHs; the FHs with high and low SPP do not substantially differ in their EE status; the EE status of FHs with low and high income from SPP is not significantly different; and few chosen independent variables have no discernible contribution on SP FHs' EE status.

2. Materials and Methods

The investigation was conducted in Nigeria's Niger-Delta. The area comprises nine coastal southern Nigerian states. These are Edo, Delta, Bayelsa, Rivers, Akwa Ibom, Cross Rivers, Ondo, Imo and Abia (United Nation Development Programme- UNDP, 2006). The research area is situated between longitudes 6° 00^1 and 6° 28^1 east and latitudes 4°50^1 and 5°19^1 north of the Greenwich Meridian and equator, respectively.

All farmers producing SP in the Nigerian states of the Niger-Delta area consisted of the study's population. The study's respondents were chosen through a sampling procedure done in a multi-phase. Three out of the nine states were selected at random using a simple random sample technique to represent 35% of the states in the Niger-Delta area. These were Bayelsa, Delta and Edo. There are three agricultural development programmes-ADPs zones in each State. From the nine ADP zones, altogether, five zones were purposefully sampled because of prevalence of SPP. These include Edo-North from Edo State, Yenagoa and Sagbama from Bayelsa State, and Delta-South and Delta-Central from Delta State. The blocks in each of the zone that were selected were divided into SP and non-SP producing blocks, using stratified sampling. The blocks producing SP in Delta-South and Delta-Central zones were four and five, respectively; seven and three in Yenagoa and Sagbama zones, respectively; and six in Edo-North zone. In each zone that was chosen, 40% of the blocks that produced SP were randomly sampled using the proportionate sampling technique. The cells that are known for SP production in each of the selected block were identified. Altogether, in the selected blocks, 52 cells were identified. Using proportionate technique of sampling, 25% cells producing SP in each selected block were randomly sampled, resulting in 11 cells producing SP. Using the proportionate technique of sampling, from the SP FHs list in the selected cells, 20% SP FHs on the list of each designated cells were picked randomly for study. The overall randomly picked SP FHs was three hundred and sixty-four (364). Thus, the study's sample size was three hundred and sixty-four (364) respondents. In each selected household, interview with farmers overseeing SPP were conducted.

Primary data through the use of interview schedule were obtained. Utilised interview schedule captured demographics, income from SP and other sources, EE level, and level of SPP information.

The EE of SP FHs is the study's dependent variable. The empowerment Condition Index of Rashid et al. (2016) and the EE scale of Banmeke (2003) were modified to measure EE. Respondents were asked to indicate the extent to which economic changes have occurred. This was assessed by presenting a 17 probable economic changes list to respondents, which included, among other things, increased income, increased food production and enhanced payment of school fees. The response options provided to respondents were None at All (NA), Low Level (LL), Average Level (AL), and High Level (HL), with corresponding scores of 0, 1, 2, and 3 given. Scores per each respondent were summed. The obtained minimum and maximum scores were 17.0 and 51.0, respectively. Index of EE was generated by adding all responses and the mean index was computed. Respondents were categorized into high or low EE using the mean index (37.54 ± 7.40) as benchmark, high EE (37.54-51.00) and low EE (17.00–37.53).

Additional crucial study variables included SPP and income earned from SPP.SPP was measured at ratio level by asking respondents to state the amount of SP produced for the farming years 2016/2017, 2017/2018 and 2018/2019, expressed in Kg. Respondents provided estimations for crop output. Odebode et al. (2021) used the estimated value from rural farmers' memory approach to measure crop output. Farmers' memories' estimated variables were measured and operationalized. The amount of SP produced was calculated and operationalized as follow: an estimated 40kg bag output per plot planted. The given estimated amount was translated to bags made from the entire farmland that was planted, and this was then translated to tonnes (using a 40kg bag of SP equals 0.04 tonnes of SP). The average SP output for the three farming years was computed. 2.53 tonnes was the obtained minimum score, and 872.95 tonnes was the maximum. An SPP index was computed using the sum of all the responses. Respondents were categorised using the mean (53.48 tonnes) into, low production (2.53 – 53.47 tonnes) and high production (53.48 – 872.95 tonnes). Interval level was utilised in obtaining/measuring income from SPP by the respondents being asked to indicate from options, the real amount in Naira value realised from SP per period;

daily, weekly, monthly or annually. Information on daily, weekly and monthly income were converted to annual income. 55.500 naira was the obtained minimum score, and 21.823.667 naira was the maximum. An index of income from SP was calculated by adding all the responses. Respondents were categorised using the mean (1.327.724 naira) into: low income from SP, between minimum score and score a little beneath the mean (55.500-1.327.723 naira) and high income from SP, between mean score and highest score (1.327.724-21.823.667 naira).

Standard deviation, mean, percentages, and frequency counts; and independent samples t-test, multiple linear regression, spearman rho, Pearson Product Moment Correlation-PPMC, and Chi-square were the descriptive and inferential statistics used to analysed the data, respectively. To ascertain EE significant causes, multiple linear regression method was utilised. The utilised model is stated as follow:

$$Y = a + b_1X_1 \dots\dots\dots\dots\dots\dots\dots\dots + b_n X_n + e \quad \text{(Eq. 1)}$$

Where: e = Error term; X_1, X_2……..X_n = regression parameters; b_1, b_2……b_n = regression coefficients; a = constant term or intercept; and Y = EE scores (dependent variable)

The model included the following regression parameters: X_1 = Size of farming household (exact number of people living in the home), X_2 = SP farm size, X_3 = SP farming experience, X_4 = SPP, X_5 = Income from SP, X_6 = Income from other crops, X_7 = Income from non-crop livelihood activities

3. Results and Discussion

3.1. Respondents demographic characteristics

The respondents' average age was 43 ± 12 years (*Table 1*). This suggests that most of the respondents were in their active ages and middle aged, hence, still possess stamina and/or strength to fulfill the labour demands of SPP. This result is consistent with the findings of Ahmed et al. (2014) that above 55.0% of Kano State SP farmers were in their active years and middle aged. The result aligns also with Oyibo (2020) findings, which indicated that more (44.2%) of Delta State rural farmers were middle-aged, with an average age of 46 ± 9 years old. Furthermore, the result supports Akouegnonhou and Demirbaş (2023) findings that most farmers in rural areas were between 41 – 60 years old. *Table 1* results show that female made up the majority of respondents (57.8%). This suggests that in the studied area, more female than male took part in SPP. The finding is consistent with Mmasa (2014) results that female were greater participants in SPP, compared to male in Mwanza, Coast and Shinyanga Regions of Tanzania.

9 ± 5 persons was obtained as the average size of household as depicts in *Table 1*. This suggests that the study area's SP farmers had large household. The finding agrees with big family size of SP FHs, as reported by Abdulkarim and Yunana (2015). Also, this is consistent with Falola et al. (2022) who found that amongst Nigeria's Ekiti State rural farmers producing pigeon pea, the mean size of family was nine persons. Furthermore, household size has implication for production of crop such as SPP and consequently for the FHs EE. Larger household could afford the FHs more SPP with regard to having more household members (as agriculture labour input) produce more output and earning more money for the household with the consequent favourable impact on the household EE. Earlier study by Ashimolowo (2005) found that household empowerment increased with household size.

Table 1 results show that the SPP average farm size was 2.6 ± 3.4 ha. It follows that the study area's SP farmers were majorly smallholder farmers. The finding corroborates Abdulkarim and Yunana's (2015) findings that farmers farm SP on a limited scale. Furthermore, the distribution of SP farm sizes among the respondents is probably going to impact EE, as small holders are likely to have low agricultural production status and/or output of cultivated SP, which reduce or decrease their SPP annual revenue, consequently, may result in less EE. Kurniati (2015) in a research carried out in Indonesia reported that the welfare/ empowerment (wealth) position of farmers increases with their land size. The average years of farm experience in SP cultivation was 17 ± 12 (*Table 1*). It can be inferred that respondents had relatively high number of years of experience farming SP. Hence, respondents were highly experienced in SP cultivation. The result corroborates Abdulkarim and Yunana's (2015) report that over half (60.0%) of farmers growing SP were involved in agricultural production for more than 10 years. The years of experience in farming SP might probably influence EE. Respondents with high number of years of SP farming experience are likely to have high EE, as they are more likely to be efficient in transforming their outputs into income, hence may have high EE. Carr et al. (2015) posits that years of agricultural involvement (years in farming) plays a role in both empowerment and disempowerment.

Table 1. Distribution of respondents' demographic characteristics

Variables	Frequency	%	Mean ± SD
Age (years)			
≤ 20	2	0.5	
21 – 30	61	16.8	
31 – 40	122	33.5	42.7 ± 11.9
41 – 50	95	26.1	
> 50	84	23.1	
Sex			
Male	154	42.3	
Female	210	57.7	
Size of household/family (persons)			
1 – 5	110	30.2	
6 – 10	184	50.5	9 ± 5
> 10	70	19.2	
Size of SP farm (ha)			
≤ 1	120	33.0	
1.01 – 2.00	113	31.0	2.6 ± 3.4
> 2	131	36.0	
SP farming experience (yrs.)			
1 – 10	155	42.6	
11 – 20	112	30.8	17.2 ± 12.4
> 20	97	26.7	

Note: yrs. = years, % = Percentage, ha = hectare, SD = Standard deviation

3.2. Respondents SPP income

The annual mean SP farming income was ₦1.327.723.0 ± 1.639.414.0, according to *Table 2*. The yearly mean income from SPPs is reasonably high and appreciable when compared with what is obtainable among other FHs within Nigeria. Idris-Adeniyi (2021) found the yearly average income from indigenous vegetables production of farm families in Nigeria to be ₦551,787.0. The implication of the fairly high SP income is that producing SP is a reliable and/or good way for rural households to source income. This result corroborates Oyibo and Odebode (2023) who observed that SP income was high with a yearly average income of ₦2.637.552.0 ± 3.362.512.0.

The respondents' highly realised SPP income suggests that they would likely have high EE as a result of producing SP, as high income is inclined to influence individuals' ability/capabilities to take control over various economic aspects of life situations. This agrees with Qurra-tul-ain et al. (2016) assertion that empowerment rises with income.

Table 2. Respondents' distribution according to SPP income

Variable	Frequency	%	Mean ± SD
Annum income from SP (₦)			
≤ 800,000.0	177	48.6	
800,000.1 – 1,600,000.0	88	24.2	1,327,724.0 ± 1,639,414.0
> 1,600,000.0	99	27.2	

Note: % = Percentage, ₦ = Naira, SD = Standard deviation,

3.3. Respondents' categorization based on their SP income

Majority of respondents (69.5%) had low SP income (*Table 3*). It can be inferred that in the studied area there was low level of SP income. Low SP income might negatively influence EE; low SP income will influence individuals' ability/capabilities to take control over various economic aspects of life situations and impede high EE.

Table 3. Categorization of respondents' according to their SP income

SP income	Freq	%	Minimum	Maximum	Mean	SD
Low	253	69.5	₦55,500.0	₦21,823,667.0	₦1,327,724.0	₦1,639,414.0
High	111	30.5				

Note:SP = Freq. = Frequency, % = Percentage, ₦ = Naira, SD = Standard deviation

3.4. Income/earnings from additional sources

Table 4 result shows that, out of the 97.0% of respondents that had other crops production income, the respondents realized an annual mean income of ₦2.385.815.0 ± 2.615.273.0. The annual mean income from producing other crops is notably high and appreciable when compared with what is obtainable among other FHs

within Nigeria. Idris-Adeniyi (2021) found the yearly mean crop income of farm families in Nigeria to be ₦1.199.394.0. The inference of the fairly high other cultivated crops income is that non-SP crop enterprises were reliable income sources for the rural households.

Table 4 also shows that the respondents' non-crop livelihood activities average annual income was ₦1.828.004.0 ± 2.336.270.0. The results suggest that respondents' non-crop livelihood activities earnings were lower than from the production of other crops. In addition, 61.5% respondents did not engage in any non-crop income pursuits. This suggests that crop enterprises were the only source of income for the majority of SP farmers. Also, this implies that most respondents may not have the capacity to supplement their households' income with respect to non-crop livelihood activities income.

Table 4. Respondents' Distribution according to other sources income

Variables	Frequency	%	Mean ± SD
Annum income from other sources (₦)			
Non-SP crop			
None	11	3.0	
≤ 800,000.0	80	22.0	2,385,815.0 ± 2,615,273.0
800,000.1 – 1,600,000.0	91	25.0	
> 1,600,000.0	182	50.0	
Non-crop livelihood activities			
None	224	61.5	
≤ 800,000.0	63	17.3	1,828,004.0 ± 2,336,270.0
800,000.1 – 1,600,000.0	29	8.0	
> 1,600,000.0	48	13.2	

Note:% = Percentage, SD = Standard deviation, ₦ = Naira

3.5. *Respondents SPP*

The data on farmed SP output of the respondents, as shown in *Table 5*, indicates that the average SP output in tonnes per year was 53.5 ± 78.1. The findings pointed to low output of SP; modest-scale SPP. The inference is that in the research area the producers of SP were generally small-holders. Furthermore, the SP output will probably influence EE status. Respondents with lower SP output are likely to be less economically empowered, as lower output often tends to result in lower income. This supports a study by Wouterse (2016), which discovered that lower quantity of agricultural output resulted in less empowerment status due to lower income.

Table 5. Respondents' distribution based on their SP output

SP output (tonnes annum^{-1})	Frequency	Percentage	Mean ± Standard deviation
1 – 10	27	7.4	
11 – 20	89	24.5	53.5 ± 78.1
> 20	248	68.2	

3.6. Respondents categorization according to SPP

The majority of respondents (69.5%) had low SPP, as seen in *Table 6*. It can be inferred that the studied area had low level of SP production. Low SP production might negatively influence EE; low SP production will influence SP income and impede high EE. In variance to this finding, Nwanebo (2012) found medium/moderate SP production.

Table 6. Categorization according to SPP of respondents

SPP (tonnes annum^{-1})	Frequency	Percentage	Minimum	Maximum	Mean	SD
Low (2.53 – 53.47)	253	69.5	2.53	872.95	53.48	78.070
High (53.48 – 872.95)	111	30.5				

Note: SD = Standard deviation

3.7. Economic Empowerment

The results of respondents' extent of economic change in relation to their various life situations are shown in *Table 7*.

3.7.1. Change in food production

Over half of the responders (58.2%) agreed they had high level of increase in food and livestock production, as revealed in *Table 7*. Increase in food and livestock production ranked sixth (2.42 ± 0.77) amongst all the

economic changes. Result for this variable suggests that FHs producing SP have a fair increase in food and livestock production. This could be because earnings from SPP allowed them to attend to their food and livestock production needs. The finding aligns with Banmeke (2003) research on EE of rural farmers, which found that 71.1% of the farmers have increased food and livestock production. Increase in food and livestock production is very important to the EE of FHs. SPP earnings can help FHs in dealing with agricultural production, particularly food and livestock production, related cost.

3.7.2. Change in farming and other forms of business

Result in *Table 7* shows that more than half of responders (57.4%) agreed they had high level of more farm-labour to work with. More farm-labour to work with ranked fifth on the economic changes experienced list with an average score of 2.45 ± 0.73. The finding is a good description of the EE condition of SP farming homes. The results for more farm-labour to work with suggest that the majority of SP FHs re-invested the income they got from SP sales in farm-labour.

3.7.3. Access to capital

Table 7 reveals that a bit below the average (48.1%) of respondents agreed they had high level increased profit, and 33.2% had average level increased profit. Increased profit ranked tenth on the seventeen economic changes list with mean of 2.12 ± 0.76. The result implies a fairly profit increase, which positively influence access to (availability of) capital for production function in agriculture.

3.7.4. Access of credit for households farming

Credit worthiness (2.35 ± 0.81) ranked eighth amongst listed items, according to *Table 7* results. Over half of responders (52.7%) agreed they had high level of credit worthiness. This finding is not unexpected given the trend shown in respondents' average annual SPP income (*Table 2*). It was revealed earlier that respondents' average earned yearly SPP income was ₦1.327.723.0 ± 1.639.414.0. This would lead to credit worthiness.

3.7.5. Access to education by members of FHs

Two key EE obligations usually serve as challenges to most FHs, they are; payment of school fees and prompt purchase of educational materials. In *Table 7*, results reveal that improved/prompt purchase of educational materials (2.52 ± 0.67) ranked second on the economic changes list, with the majority (61.3%) of respondents agreeing they had high improvement in purchase of educational materials. The results suggest that a greater proportion of respondents possessed the financial capabilities to meet up the purchase of educational material. The inference is that many of SP FHs had no issues with meeting their children's educational requirements. According to Ogunbameru and Idrisa (2013), farmers utilized the money they earned from crop production to sponsor their children education either at secondary school level or tertiary education.

3.7.6. Access to healthcare

This aspect of the FHs EE is very important as it affects their life and work. A farmer who is not mentally and physically fit and does not have money or finance to pay for prescribed drugs will not be productive on the farm and in life (Samuel, 2020). The results in *Table 7* reveal that 66.5% of the respondents agreed that they had high level of improved payment for prescribed drugs. Improved/prompt payment for prescribed drugs (2.56 ± 0.69) ranked highest amongst all the economic changes. These results agreed with Ogunbameru and Idrisa (2013), who, in a study on empowerment of rural farmers, found that 94.4% of farmers agreed to have used a portion of income they got from crop production to attend to their family needs; the routine family problem included paying hospital bills of household members. The inference is that SPP earning can help FHs in dealing with healthcare related costs.

Table7. Respondents EE distribution

Categories	High Level	Average Level	Low Level	Not at All	Mean	Rank
Change in food production					**4.5**	
Increase in agricultural production	150 (41.2)	129 (35.4)	39 (10.7)	46 (12.6)	2.1±1.0	11
Increased in food and livestock production	212 (58.2)	100 (27.5)	46 (12.6)	6 (1.6)	2.4±0.8	6
Change in farming and other forms of business					**11.0**	
More land to cultivate (expansion of available land)	207 (56.9)	113 (31.0)	33 (9.1)	11 (3.0)	2.4±0.8	7
More farm-labour to work with	209 (57.4)	112 (30.8)	39 (10.7)	4 (1.1)	2.5±0.7	5
Increase in farm implements	163 (44.8)	154 (42.3)	34 (9.3)	13 (3.6)	2.3±0.8	9
Engaged in more income generating activities	125 (34.3)	130 (35.7)	54 (14.8)	55 (15.1)	1.9±1.0	15
Increased income generating activities	115 (31.5)	156 (42.9)	51 (14.0)	42 (11.5)	2.0±1.0	14
Access to capital					**6.1**	
Increased savings	128 (35.2)	125 (34.3)	84 (23.1)	27 (7.4)	2.0±0.9	13
Increased profit	121 (33.2)	175 (48.1)	60 (16.5)	8 (2.2)	2.1±0.8	10
Increased income	100 (27.5)	174 (47.8)	80 (22.0)	10 (2.7)	2.0±0.8	12
Access to credit for households farming					**5.9**	
Obtain loans more easily	98 (26.9)	116 (31.9)	103 (28.3)	47 (12.9)	1.7±1.0	17
Increased access to fund/credit	104 (28.6)	132 (36.2)	99 (27.2)	29 (8.0)	1.9±0.9	16
More credit worthiness	192 (52.7)	121 (33.2)	37 (10.2)	14 (3.8)	2.4±0.8	8
Access to education by member of households					**5.0**	
Prompt/improved payment of school fees	215 (59.1)	116 (31.9)	31 (8.5)	2 (0.5)	2.5±0.7	3
Improved/prompt purchase of educational materials (exercise books, text books etc.)	223 (61.3)	107 (29.4)	33 (9.1)	1 (0.3)	2.5±0.7	2
Access to healthcare					**5.0**	
Improved/prompt payment for prescribe drugs	242 (66.5)	89 (24.5)	29 (8.0)	4 (1.1)	2.6±0.7	1
Improved/prompt payment of medical/treatment bills	220 (60.4)	103 (28.3)	35 (9.6)	6 (1.6)	2.5±0.7	4

Note: Values enclosed in parentheses represent percentage scores.

3.8. Respondents EE categorization

Table 8 reveals that high EE was present in 51.6% respondents. This suggests many or more SP FHs were relatively high in their EE status. It can be inferred that producers of SP possessed relatively highly economically empowered. This demonstrates that FHs in Nigeria's Niger-Delta have been substantially and appreciably economically empowered through producing SP. This suggests respondents' relatively high or adequate economic ability or capacity to take control of economic aspect of their life situations. The findings correlate with Wouterse (2016) who found a relatively high EE among Niger Republic rural households.

Table 8. Respondents' categorization according to EE

EE	Freq.	%	Minimum	Maximum	Mean	SD
Low (17.00 – 37.53)	176	48.4	17.00	51.00	37.54	7.40
High (37.54 – 51.00)	188	51.6				

Note:Freq. = Frequency, % = Percentage, SD = Standard deviation

3.9. Relationship between a few demographic traits and SP FHs' EE status

The results presented in *Table 9* show that respondents SP FS (r=0.20) was significantly (p<0.05) correlated with EE. This suggests SP producers SP FS and EE status had a significant correlation. Positive relationship of SP FS and EE status implies that SP FHs' EE status improves as SP FS increases. This corroborates the position put forth by Rashid et al. (2016) that the bigger the FS, the more empowered the farmers. Increased SP farm may could translate increased SP output and income and, consequently, high EE status. Increased land increases the quantity of agricultural output (Wouterse, 2016), and this can influence EE status.

Table 9. Chi-square and PPMC evaluations of a few chosen demographic traits and SP farmers' EE

Variables	Df	χ^2	r-value	p-value
Sex	1	0.27	-	0.60
Farm size for SP	-	-	0.20*	0.00
SP farming experience	-	-	-0.09	0.07

Note: *Significant at $p \leq 0.05$, df = Degree of Freedom, χ^2=Chi-square Coefficient, r=Correlation coefficient.

3.10. Correlation between livelihood activities income and SP FHs' EE status

Table 10 Pearson Product Moment Correlation results show that SP income (r=0.24) and other produced crops income (r=0.10) were significantly (p<0.05) associated with SP farmers EE. This suggests that there was a strong relationship between EE and income of other produced crops and SP. Positive correlation of SP and other produced crops income with EE status implied that the SP producers' EE status increases as SP and other produced crops income increases. This implies that an increase in SP and other crops enterprise income would lead to EE status increase. Qurra-tul-ainet al. (2016) discovered a significant and positive contribution of income on empowerment status in Pakistan, which is consistent with this finding.

Table 10. Pearson Product Moment Correlation assessment of livelihood activities income and SP FHs' EE

Variables	r-value	*p*-value
SP income	0.239*	0.00
Other produced crops income	0.103*	0.05
Non-crop livelihood activities income	0.097	0.26

Note: *Significant at $p \leq 0.05$, r = Correlation coefficient

3.11. Difference between the EE status of FHs with low and high SPP

Table 11 reveals a significant difference between EE status of high (40.42 ± 6.15) and low (36.27 ± 7.55) SP farmers (t = -5.10, p< 0.05). This demonstrates that EE of SP FHs does differ significantly across low and high SP farmers. This suggests that higher-producing SP FHs were more economically empowered than lower-producing SP FHs. Therefore, it follows that SPP affects FHs EE. This conforms with the *apriori* expectation. The inference is that SPP have a favourably contribution on the EE of farmers. This supports Wouterse (2016) findings that agricultural production has significant effect on empowerment status.

Table 11. Difference in EE of SP FHs with low and high SPP

Variable	Production status	N	Mean	SD	Mean difference	t-value	Df	*p*-value
EE status	Low	253	36.27	7.55	-4.16	-5.10*	362	0.00
	High	111	40.42	6.15				

Note: df = Degree of Freedom, SD = Standard deviation, *Significant at $p \leq 0.05$.

3.12. Difference between the EE status of FHs with high and low SPP income

Table 12 shows that a significant difference between EE status of FHs with high (40.16 ± 5.99) and low (36.23 ± 7.69) SPP income (t = -4.92, p< 0.05). This displays that the EE of SP FHs does differ significantly across farmers with low and high SP farming income. This means that compared to SP FHs having low SPP income, those having high SPP income were more economically empowered. Hence, it follows that the respondents SPP income affects their EE status. The result conforms with the *apriori* expectation. The inference is that SP enterprise has a positive contribution to the EE of farmers.

Table 12. Difference in EE status of SP FHs with high and low SP income

Variable	SP income	N	Mean	SD	Mean difference	t-value	Df	*p*-value
EE status	Low	243	36.23	7.69	-3.93	-4.92*	362	0.00
	High	121	40.16	5.99				

Note: SD = Standard deviation, *Significant at $p \leq 0.05$, df = Degree of Freedom.

3.13. Contributors to SP FHs EE status

R^2 value was 0.101 (*Table 13*). This indicates that 10.1% of the EE status was explained by the chosen independent factors/variables. Furthermore, Table 13 showed household size (β = -0.209, p< 0.10), SP farming experience (β = 0.086, p< 0.10), SP income (β = 1.469, p< 0.10), and non-crop farm activities income (β = 4.785, p< 0.10) significantly contributed to EE status.

This entails that household size, SP farming experience, SP income and non-crop farm activities income were major contributors to respondents' EE status. The significant and negative contribution of household size to EE status establishes that with increase in the SP producers' family size or number, there is decrease in EE status. The result disagrees with the study of Ashimolowo (2005), which showed that household empowerment increased with

household size. The significance of SP production experience implies that with more production experience, EE status increases. According to Burgess (2014), involvement years in agriculture (years in farming) are a factor in empowerment. Increased SP farming experience implies increase in production and marketing experience, which boosts output and realized SPP income, giving farmers the ability to take control over his or her own economic life situations and EE. This finding disagreed with Carr et al. (2015), who found no significant association between South-West Uganda's smallholder farmers' farm experience and their empowerment. SP and non-crop livelihood activities income influences respondents EE and with high non-crop *vis a vis* SP livelihood activities income, there is significant increase in EE status. This is suggestive that improved non-crop as well as SP livelihood activities income will enhance high level of EE. This agrees with findings of Ballo et al. (2018), that crop production income has a significant and positive influence on FHs welfare status.

Table 13. Regression analysis on particular independent factors contribution to SP FHs EE status

Variables	β- value	t- value	*p*-value
Educational attainment	3.133	1.498	0.14
Household size	-0.209*	-1.848	0.07
Farm size for SP	-0.154	-0.361	0.72
SP farming experience	0.086*	1.865	0.06
Sweetpotato production-SPP	-0.008	-1.011	0.31
SP income	1.469*	1.784	0.08
Other crops enterprises income	-3.541	-0.184	0.85
Non-crop livelihood activities income	4.785*	1.816	0.07
Summary			
R-value	0.32		
R^2	0.10		
Adjusted R Square	0.04		
Standard Error of the estimated	6.22		
F-value	1.72		
P-value	0.09		

Note: *Significant at $p \leq 0.10$.

4. Conclusions

In Nigeria's Niger-Delta Area, SPP influenced FHs EE. Farm size for SP, farming experience, output and SP income enhanced SP FHs EE.

Agricultural programmes and policies aimed at improving EE and improving social and economic conditions should be promoted to emphasize increased SPP. Given the established nexus between SPP and EE, there should be a deliberate focus on rapid development of SP farm enterprise industry in the Niger-Delta area as a strategy to improve social and economic condition and stimulate rural development, particularly now that there is focus on diversification of the economy away from the crude oil-dependence. The study's result showed that FHs involved in SP in the studied area are mainly smallholders and that the EE of FHs increased with farm size and production experience. Therefore, it is recommended that during intervention programmes for SP FHs, SP production experience and farm size be strictly focused. It is suggested that effort be made by empowerment agencies to organize and/or increase campaign, sensitization, workshop and training on increasing/enhancing SPP income (maximization of producers returns on SP investment), as this have potential of contributing to EE.

Ethical Statement

There is no need to obtain permission from the ethics committee for this study.

Conflicts of Interest

We declare that there is no conflict of interest between us as the article authors.

Authorship Contribution Statement

Concept: Oyibo, O., Odebode, S. O.; Design: Oyibo, O., Odebode, S. O.; Data Collection or Processing: Oyibo, O.; Statistical Analyses: Oyibo, O.; Literature Search: Oyibo, O.; Writing, Review and Editing: Oyibo, O., Odebode, S. O.

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