

four different types of crops, of which 26.6% of this category of farmers ranked the crops cultivated in the order of banana-maize-vegetable-yam. Also, 28.6% of the respondents cultivated 3 crops, out of which 15.5% of the respondents in the category ranked crops in the order of banana-cassava-vegetable. Only 24.1% of the respondents cultivated 5 crops out of which 36.7% of the respondents in the category ranked their cropping activities in the order of cassava-yam-banana-vegetable-pepper. Very low proportions; 4.9% and 1.5% of the respondents cultivated 2 crops and 6 crops, respectively. Only 3.0% of the

respondents cultivated the seven most common crops in the study area while 6.4% of the respondents did not diversify at all (specialization). Those that are highly diversified cultivated at least four crops; those that moderately diversified cultivated either two or three crops, while those that did not diversify cultivate only one kind of crop among the seven crops studied. Crop diversification is a strategy adopted to ensure farmers secure their livelihood. In all, 93.6% of the farmer engaged in crop diversification (**Table 2**).

Table 2. Pattern of Crop Diversification.

Number of crops	Frequency (n = 203)	%	Crop Mix by Farmer (%)
1	13	6.4	Maize (7.7). 1 banana (7.7), Vegetable (84.6)
2	10	4.9	Banana-cassava (10) Maize-cassava (10) Cassava-banana (10). Vegetable-pepper (10). Vegetable-banana (60)
3	58	28.6	Banana-vegetable-maize (1.7). Vegetable-yam-cassava (1.7). Cassava-pepper-banana (3.4). Maize-yam-banana (3.4). Maize-cassava-banana (3.4). Vegetable cassava-banana (3.4). Maize-sweet potatoes-pepper (5.1). Maize-cassava-vegetable (5.1). Vegetable-maize-banana (5.1). Banana-cassava-yam (6.9). Cassava-banana-vegetable (6.9). Banana-cassava-maize (8.6). Maize-vegetable-pepper (8.6). Maize-banana-cassava (10.3). Vegetable-pepper-banana (10.3). Banana-cassava-vegetable (15.5)
4	64	31.5	Maize-banana-yam-cassava (1.6). Cassava-banana-maize-pepper (3.1). Cassava-banana-maize-yam (3.1). Maize-banana-cassava-yam (3.1). Maize-vegetable-banana-pepper (3.1). Maize-vegetable-pepper-yam (3.1). Pepper-maize-cassava-vegetable (3.1). Maize-banana-vegetable-pepper (4.7). Maize-cassava-yam-banana (4.7). Vegetable-pepper-maize-banana (4.7). Vegetable-pepper-banana-maize (6.3). Cassava-yam-banana-maize (7.8). Vegetable-banana-pepper-maize (7.8). Cassava-banana-yam-vegetable (17.2). Banana-maize-vegetable-yam (26.6)
5	49	24.1	Banana-maize-vegetable-yam-cassava (4.1). Cassava-banana-yam-pepper-sweet potatoes (4.1). Banana-cassava-yam-maize-vegetable (8.2). Maize-vegetable-banana-yam-cassava (12.3). Maize-banana-cassava-yam-vegetable (14.3). Vegetable-pepper-maize-cassava-banana (20.4). Cassava-yam-banana-vegetable-pepper (36.7)
6	3	1.5	Cassava-maize-yam-pepper-banana-sweet potatoes (33.3). Maize-cassava-yam-banana-sweet potatoes-vegetable (33.3). Pepper-cassava-sweet potatoes-yam-maize-vegetable (33.4)
7	6	3.0	Yam-sweet potatoes-vegetable-pepper-maize-cassava-banana (16.7). Maize-vegetable-sweet potatoes-pepper-yam-cassava-banana (83.3)

Source: Field Survey, 2021

Diversity index

Results in **Table 3** show the distribution of farmers according to diversity index. Following Simpson Index of Diversity (SID), respondents with the most diversified cropping activities had SID that approaches 1 and those with the less diversified cropping activities had SID that tends towards zero. Findings show that 6.4% of the farmers had a

diversity index of 0, implying that very few of them were specialized in production of one crop (as established in **Table 2**). Most (66.5%) of the crop farmers had diversity index between 0.51-0.75 with mean crop diversification index of 0.64 (± 0.20), implying that the farmers are moderately diversified in crop production. This supports the result in Table 2 that majority of the farmers (93.6%) diversified between 2 and 7 crop combinations.

Table 3. Distribution of Farmers by Diversity Index.

Diversity Index	Frequency (n = 203)	Percentage
0.00	13	6.4
0.25-0.50	13	6.4
0.51-0.75	135	66.5
>0.75	42	20.7
Mean 0.64 (± 0.20)		

Source: Data Analysis, 2021

Reasons for Crop Diversification

As presented in **Table 4**, most of the respondents had various reasons for crop diversification instead of concentrating on the most profitable crop. Majority (92.0%) of the farmers diversified to ensure food availability and access of farming households to different crops throughout the year, and also reduce the amount spent on food consumption. This suggests that crop diversification is more connected to provision of food for farm households. Also,

majority (91.5%) of the crop farmers indicated they practiced crop diversification to increase the scope of income sources due to the seasonality of agricultural crops. From the results, 77.0% of the farmers diversified because of increase in price and demand for such crops in the previous production year, while 69.5% diversified due to low land fertility and productivity. Also, 60.0% of the farmers diversified due to environmental problem, while 15.0% of the farmers diversified because they inherited the practice from their parents and/or diversification is a societal norm of farming in their areas.

Table 4. Reasons for Crop Diversification.

Reason for crop diversification	Frequency	Percentage
To ensure food availability and access of farming households to different crops	187	92.0
To increase the scope of income sources	186	91.5
Increase in price and demand for such crops in previous year	156	77.0
Low land fertility and productivity	141	69.5
To reduce environmental problem	122	60.0
Practice inherited from parent or societal norm of farming	30	15.0

Source: Field Survey, 2021

Extent of Crop Commercialization

Results on the extent of household crop commercialization are presented in **Table 5**. Most (69.0%) of the respondents sold 50.1% to 75% of their total crop output. Majority (92.1%) of the farmers in the study area were market oriented and sold minimum of 50% of the total crop produced. However, 23.1% of the respondents sold above

75% of their total crop produced. The closer the index is to 100, the higher the degree of commercialization. This implies that 23.1% of the respondents had high levels of commercialization. Meanwhile, 5.9% of the respondents sold 25.1% to 50% of their total crop output, implying that 5.9% of the respondents were less commercialized. Also, 2.0% of the respondents did not sell any of their total output (subsistent). The mean household commercialization index

was 0.66 (± 15.27). This means that on the average, respondents sold 66% of their total crop output. This shows that on the average, farmers in the study area were 66%

commercialized; they participated in the market, and this offers opportunities for increasing their farm income.

Table 5. Household Commercialization Index.

Household Commercialization Index (%)	Frequency	Percentage
0.0	4	2.0
25.1-50	12	5.9
50.1-75	140	69.0
>75	47	23.1
Mean 0.66 (± 15.27)		

Source: Data Analysis, 2021

Constraints to Crop Commercialization

Constraints to crop commercialization by farmers are presented in **Table 6**. All the constraints were identified by more than 50% of the farmers but lack of storage facility (95.6%) and low credit accessibility (81.8%) were identified as the most significant constraints that limit participation of farmers in crop market. Land tenure system was identified by 76.4% of the farmers as a constraint militating against commercialization because land is not readily accessible for crop production as a result of the land tenure system. The activities of middlemen were identified by 68.5% of the farmers as a constraint militating against crop commercialization. Most farmers in the study area depend on middlemen in getting their crops sold. Middlemen serve as bottleneck against crop commercialization due to their activities in ensuring they maximize their own profits. Also, 67.5% of the farmers identified unattractive market price as one of the constraints militating against crop commercialization.

Table 6. Constraints to Crop Commercialization.

Constraints	Frequency	Percentage
Lack of storage facility	194	95.6
Credit inaccessibility	166	81.8
Land tenure system: land acquisition problems	155	76.4
Activities of middle men	139	68.5
Unattractive(low) market price	137	67.5
Bad road	118	58.1
Glut during peak season	116	57.1

Source: Field Survey, 2021

Bad roads were identified by 58.1% of the farmers as a constraint because in most farm areas, good access roads are often lacking and where they are available, they are mostly not motorable throughout the year because there are potholes which make it difficult for vehicles to get to farm sites to evacuate farm produce. In the same vein, glut during peak season was identified by 57.1% of the farmers. Glut during peak season occurs during the harvesting season as most of the farmers take their produce to the market during the same period, creating supply surplus and reduced prices which eventually leads to fall in farmers' income. Glut during peak season may discourage farmers from producing market-oriented crops.

Poverty Status of Farmers

From the results in **Tables 7 & 8**, total per capita farmer expenditure was found to be ₦2,113,632.85. The mean per capita household expenditure was estimated to be ₦10,411.98. The poverty line which represents 2/3 of the mean per capita household expenditure was estimated as ₦6,941.32. This means that any farmer whose per capita expenditure was below ₦6,941.32 was regarded as poor and any farmer whose per capita expenditure was above ₦6,941.32 was regarded as non-poor. From the results, 44% of the respondents were poor while 56% were non-poor. With a poverty line of ₦6,941.32, from Table 8, the incidence of poverty (P_o) or poverty head-count of the farmers in the study area was 0.440. This is the proportion of the farmer that could not afford basic needs. The value indicates that 44% of the respondents in the area were below the poverty line and were therefore relatively poor. The poverty depth or gap (P_1) was estimated at 0.174, which means that 17.4% of the poverty line, that is, ₦1,207.79 was required to move an average poor farmer out of poverty. The poverty severity or intensity was 0.093. This implies that 9.3% of the farmers were severely poor; 9.3% represents the poorest among the poor farmers who require the attention of policy makers in the distribution of the standard of living

indicators, such as health care services, clean water and income generating activities. National Bureau Statistics (2008) put the poverty incidence in South West in 2004 at 43%. Also, National Bureau Statistics [28] in May 2020 put the poverty incidence in Nigeria at 40.1% with 52.1% in the rural sector. Comparing these statistics, it shows that the poverty incidence (44%) obtained for farmers sampled for this study area is supported by the report of National Bureau Statistics (2008; 2020).

Table 7. Per Capita Household Expenditure and Poverty Status of Farmers.

Variable	₦ / Frequency	Percentage
TPCHHEXP	2,113,632.85	
MPCHHEXP	10,411.98	
Poverty line	6,941.32	
1/3 MPCHHEXP	3,470.66	
Poverty Status		
Non-poor	114	56
Poor	89	44

Source: Data Analysis, 2021

TPCHHEXP: Total per Capita Household Expenditure;
MPCHHEXP: Mean per Capita Household Expenditure

Table 8. Poverty Indices among farmers.

Poverty Level	Poverty Index
P ₀	0.440
P ₁	0.174
P ₂	0.093

Source: Data Analysis, 2021

P₀: Poverty Incidence; P₁: Poverty Gap; P₂: Poverty Severity

Effects of Crop Diversification and Crop Commercialization on Poverty status of farmers

The results of Probit regression model to determine the effect of crop diversification and crop commercialization on poverty status among farmers in Osun State are presented in **Table 9**. The χ^2 statistics test the null hypothesis of all estimated coefficients taken together being equal to zero. The likelihood ratio statistics as indicated by χ^2 statistics (115.35) are highly significant (P<0.0000), suggesting the model has strong explanatory power. Practicing crop diversification, years of education, household size, access to credit, market information, being member of farmers' association, access to transport facility, having other occupations, and crop income were the major determinants of poverty in the study area. The coefficients of crop diversification, household size, access to credit and access to transport facility were positive which implies that these variables may likely increase the probability of being poor.

Table 9. Probit Model Result on the Effect of Crop Diversification and Crop Commercialization on Poverty Status.

Explanatory Variables	Coefficients	Standard error	z-Statistics	Prob	Marginal effect
Crop diversification	2.022300	1.008371	2.005513	0.0449	0.41754**
Crop commercialization	-0.009150	0.011958	-0.765243	0.4441	-0.00188
Years of Education	-0.059580	0.030985	-1.922838	0.0545	-0.01230*
Household size	0.417853	0.097169	4.300271	0.0000	0.08627***
Farm size	0.027490	0.067739	0.405816	0.6849	0.00568
Access to credit	2.18034	0.412008	5.291982	0.0000	0.45017***
Market information	-1.016717	0.454291	-2.238029	0.0252	-0.20992
Access to extension service	-0.149596	0.288149	-0.519163	0.6036	-0.03089
Market distance	-0.192783	0.274154	-0.703191	0.4819	-0.03980
Farmers association	-1.953060	0.448234	-4.357235	0.0000	-0.40324***
Access to transport	1.13881	0.428519	2.657552	0.0079	0.23513***
Other occupation	-2.72E-06	6.70E-07	-4.067204	0.0000	-5.62e-07***
Crop income	-8.51E-07	4.08E-07	-2.087509	0.0368	-1.76e-07**
Constant	-1.663085	1.336209	-1.244629	0.2133	-
Log likelihood = -73.6506					

LR chi2 (13) = 115.35; Pro > chi2 = 0.0000; Pseudo R2=0.4392

Source: Data Analysis, 2021

***, **, * = significance @ 1%, 5% and 10% respectively.

Crop diversification

The results show that crop diversification was positively related to poverty status and was significant at 5%. This implies that as crop diversification index increases, the probability of the farmers being poor also increases. This implies that 1% increase in crop diversification index increases the probability of the household being poor by 41.8%, indicating that the more a farmer diversify in crop production, the more the probability that he is a poor farmer. These results show that the more the crop diversification index of a farmer tends towards 1, the poorer the farmer becomes. This implies that poor farmers are those that have higher Simpson index.

Crop commercialization

Results show that crop commercialization had no significant effect on poverty status. However, it had a negative relationship to poverty. The negative relationship means that the higher the farmer's commercialization index, the lower the probability of being poor.

Other socio-economic variables

Years of education of the farmer was significant and it had the expected sign of being inversely related to the probability of the farmer being poor. The coefficient of education, being significant at 10% level, confirms that education has strong impact on poverty status. One-year increase in the level of education of farmer reduces the probability of the farmer being poor by 1.2%. Household size was a significant determinant of poverty status among farmers in the study area. Results show that the marginal effect of household size is significant at 1% level, and increase in household size by 1 person will increase the probability of that household being poor by 8.6%, indicating that larger households have greater probability of being in poverty. Access to credit by farmers was significant at 1% level but contrary to a priori expectation, it was positively related to poverty status. This result shows that access to credit will not probably aid the farmer's escape from poverty. This could be as a result of higher interest rates by most lending organizations in the study area. Also, farmers could be diverting the fund into non-economic activities. Increased credit access by farmers in the study area will increase the probability of the farmers being poor by 45%.

Access to market information was significant at 5% level and negatively related to poverty status. Following a priori expectation, the more the market information available for crop production decision making, the lower the probability of being poor. Farmers that have access to market information have the probability of escaping from poverty increased by about 21%. In line with a priori expectation, belonging to farmers' association is a poverty reducing factor. Results show that belonging to farmers' association decreases the probability of being poor by 40%. This might

be as a result of the fact that most farmers association are involved in many agricultural value-added activities.

Contrary to a priori expectation, access to transportation facility was found to increase the probability of being poor. An improved access to additional transport facility unit will cause a 23.5% increase in the probability of a farmer sinking deeper into poverty. This could be due to poor rural roads which leads to high transportation cost.

Having other occupations in the study area was significant at 1% level and also negatively related to poverty status. A farmer involved in other occupations has about 0.00006% probability of escaping from poverty. In line with a priori expectation, having other job lowers the probability of being poor. Income from crop cultivation was inversely related to the poverty status of the farmers, and significant at 5% level. This shows that as the income from crop cultivation activities increases, the probability of being poor decreases; ₦1 increase in income from crop production reduces the probability of a household being poor by 0.00002%.

CONCLUSION

In this study, the relationship between crop diversification, crop commercialization and poverty status are established. Farmers should diversify less and concentrate on most profitable crops as practicing crop diversification increases the probability of being poor. The findings in this study clearly helps to reach a conclusion that higher crop market participation among farmers should involve making broad production decision not only to satisfy basic community or households needs, but also to produce for the market. This study has shown that having other occupations play a very important role in augmenting crop-income in order to reduce the level of poverty among farmers in the study area. This is an indication that crop cultivation alone may not be an adequate source of revenue for the farmers.

Educating farmers on the benefits of diversifying less and embracing specialization in crop production will enhance crop market participation in order to increase their levels of commercialization, which will help farmers to escape poverty. Also, farmers' associations should be more organized to develop an effective integrated marketing information system. This will help farmers in selling produce at uniform prices. This will also help in reducing excess crop production that causes glut which could cause selling their produce at very low price. All these are with a view to enhancing commercialization and reducing poverty.

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