Assessment of Population Dynamics and Farm Labour Use among Smallholder Farmers in Mbaise Area of Imo State, Nigeria

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Article History	Abstract
Original Research Article **Received:** 03-07-2025 **Accepted:** 08-07-2025 **Published:** 25 -07-2025 	*This study focused on the assessment of population dynamics and farm labour use in Mbaise of Imo State, Nigeria. A simple random sampling procedure was used in the selection of 240 smallholder farmers. Primary and secondary data were used for the study. Primary data were collected through the use of structured questionnaires, while the secondary data on births and deaths rates between 2005 and 2014 were obtained from the Local Government Area (LGAs) Headquarters of Mbaise area. Data were analyzed using descriptive statistics and multiple regression analysis. Results showed that the mean age was 42 years. The mean annual income was ₦418,000 as they cultivated a mean farmland of 1.5 hectares. The mean birth and death rates were 11 and 3 persons, respectively, in a month in the area. The highest rate of change in household population was in 2006, with an increase of 90.9%. Estimated multiple regression analysis revealed that the farmers' socio-economic characteristics significantly influenced their demand for labour at a 1% level of probability. Critical variables determining labour demand were education, income, household size, farm size, and nature of farm operation, which had a positive influence. This explains that a unit increase in any of these variables resulted in a unit increase in the farmers demand for farm labour, and all these variables were positively significant except age, which was negative but still significant at 1% level of probability. In the same way, the study identified inadequate production capital and limited availability of farmland as the challenges facing farmer's production. The study concludes that population changes are reshaping the agricultural labour dynamics in the area, and there is an urgent need for policies that support youth engagement in agriculture, labour-saving technologies, and cooperative labour systems to enhance productivity and sustainability. Therefore, the study recommends that the farmers should collectively pool productive resources together through strengthened cooperative societies, as these would enable them to project a collective demand and access farm productive input adequately.* ***Keywords:** Population, Population Dynamics, Rural, Farm Labour, Households, Income.*

Introduction

In order to supply the growing demand for food, fiber, and other agricultural goods, agricultural systems are under increasing strain both globally and primarily in Nigeria as the population continues to expand [(Food and Agriculture Organization (FAO), 2024)]. The availability of labour, the quantity and distribution of agricultural land, and farming productivity can all be directly impacted by the demographic changes that rural communities are going through, such as urbanization, aging populations, and changes in family patterns (Alemu & Zegeye, 2024). In any rural economy, labor has a significant social and economic impact. It provides a living for billions of people globally and is one of the primary factors of production (Lillemets et al., 2025). Nigeria uses a lot of labor in its agricultural production. Human labor is used in more than 90% of non-mechanized production systems and in 50–60% of tasks in mechanized production systems (Koledoye, 2024). One of the biggest obstacles to the development of food crops is labor (Akintobi, 2021). It has been discovered that labor availability affects timely harvesting, improved weed control, precise planting, and crop processing (Olohungbebe et al., 2023). According to Aremu et al. (2024), among other factors, declining farm productivity due to inefficient production techniques, a poor resource base, and "insufficient farm labor" supply have made Nigeria's food insecurity situation worse. Yokoyama (2025) reported that the ageing farm operators, deteriorating health from diseases, and the seasonal nature of farming could all be obstacles to the adoption of a more sustainable agriculture.

The production of food crops in Nigeria has been found to be largely labor-intensive and to be less productive due to the use of crude implements and farm households that are primarily made up of very young children and fairly elderly individuals. These factors make it difficult for these households to increase food crop yields and income, which in turn lowers poverty levels. The labor supply in Imo State's agricultural production may be influenced by population dynamics. Conversely, population dynamics in agriculture examines the effects of changes in the population and agricultural laborers (farmers, laborers, and rural residents) on land use, agricultural productivity, and rural economies (Miladinov, 2023). In contrast to international or intercontinental migration, which refers to movement within a nation, population dynamics in this study are expressed as an index of rural-urban migration, or internal migration. It describes the migration of individuals from rural areas to the nation's cities, particularly its metropolitan areas (Anyanwu et al., 2022). Labor migration and career transitions, such as moving from the primary to the second or third sector, are frequently linked to this change of domicile. There are typically two effects from this migration: one side, or the destination location, sees an increase in population, while the other side has a decrease. With an emphasis on how these changes affect the utilization of resources like land, water, labour, and capital in farming, it examines the relationships between demographic changes, human population increase, and agricultural systems (Milner & Boldsen, 2023). One of the main factors limiting agricultural output in Nigeria is farm labour (Aremu et al., 2024).

The agricultural labour force is impacted by changes in urban migration and birth and death rates (Olson & Stenlid, 2022). Mekuria (2018) observed that population growth brought on by an increase in the birth rate raises the supply of farm labour, which puts a lot of strain on land and lowers food production and farm holdings per household, leading in a low quality of living (FAO, 2024). Dossa & Miassi (2023) asserted that a rise in the death rate causes a decrease in the supply of farm labour, which lowers farm output and ultimately causes household poverty. According to empirical data, the majority of farm labourers are elderly, which has a detrimental effect on agricultural output since it excludes young men and women in their prime working years (Owoeye et al., 2024). Farm drudgery, a lack of social infrastructure in rural regions, low farm income, and generally short life expectancy in rural areas could all be contributing factors to the growing number of people who are not in their prime (Nomor & Tersugh, 2024). Because of this, young adults in their prime who are unable to handle the difficulties posed by the lack of updated agricultural production methods are forced to relocate to cities in pursuit of white-collar occupations and a higher standard of life (Bassie et al., 2022). Agricultural productivity has suffered as a result of this scenario, which has left farming in the hands of elderly, illiterate farmers and few young, active men who were unable to leave the community, possibly because of unforeseen circumstances (Eshetu et al., 2023).

The result of the aforementioned is a decline in the number of young people who are active and full of energy and who can handle the demands of farm operations. One important element affecting agricultural production, especially for smallholder farmers in rural parts of developing nations, is the interaction between population dynamics and farm labour utilization (Wubetie et al., 2024). Addressing issues with food security, labour shortages, and sustainable farming methods requires an awareness of these dynamics in areas like Mbaise, in Imo State, Nigeria, where agriculture is the main driver of the

local economy. The majority of people living in Mbaise, a well-known agricultural region in southeast Nigeria, are smallholder farmers who depend on family labour to produce crops and perform other farm-related tasks. Subsistence farming, which produces important crops such cassava, yam, maize, and cocoyam, is the main driver of the region's economy. The growing needs of agricultural productivity and population changes provide particular difficulties for Mbaise's smallholder farmers. There is concern that, in the Mbaise Area of Imo State, Nigeria, where land is clearly under pressure, the high rate of population growth and change in the region, in the absence of sustainable technological advancement, will increase land pressure and lead to poor agricultural productivity and soil degradation. According to Omotilewa et al. (2021), society would have a higher standard of life if population growth were to stabilize. Effective planning of the agricultural labour supply and adequate use of land inputs would result from a significant reduction in environmental pollution. For smallholder farmers in the Mbaise region of Imo State, human labour is essentially their only option for agricultural labour. It is undeniable that smallholder farmers in the region provide more than 85% of all domestic agricultural inputs (Ibrahim et al., 2024). Therefore, it follows that domestic food production in Mbaise as a whole is a result of human labour. Nigeria's population has grown by 2.8% annually over the last 20 years, with the numbers being unequally distributed throughout the country. This explosive increase is dynamic and appears to be uncontrollable, which has an impact on the availability of farm labour (Akinbami, 2021).

For Nigeria's rural labour force, farm labour is a significant source of employment opportunities. According to studies, despite Nigeria's strong positive rate of population change, the country's agriculture labour supply has steadily decreased by 27.5% since 2000 (Fasakin et al., 2022). According to an FAO (2024) research, the regular farm labour supply in the agricultural sector decreased by 8.3% between 2000 and 2005, or 2% annually throughout that time. The fact that the agricultural sector, with a few exceptions, has the worst poverty conditions exacerbates the declining farm labour supply in the face of a strong positive rate of population change (Komarek & Msangi, 2019). It is clear that a lack of agricultural labour leads to low farm productivity, which in turn causes rural farming communities to become impoverished. Particularly in developing nations like Nigeria, this scenario has been deemed a serious issue (Odozi & Oyelere, 2021). The shifting supply of farm labour, which is directly related to demographic developments, is one of the main issues facing Mbaise. The number of persons actively engaged in farming is declining as younger, physically fit people migrate to cities in pursuit of better educational and economic possibilities (Iheke, 2024). Meanwhile, fewer young people are interested in farming as a career, and the remaining farming population is getting older (Amare et al., 2023). Family-based labour, which has historically been the foundation of smallholder agriculture in Mbaise, is becoming increasingly scarce as a result of this demographic shift. This can result in higher labour costs, irregular labour availability, and difficulties in managing the workforce during busy agricultural seasons like planting and harvesting (Bello et al., 2021). As a result, farmers are increasingly using hired, seasonal, or casual labour.

The reliance on manual, labour-intensive agricultural methods is further exacerbated by the fact that smallholder farmers frequently struggle to obtain contemporary farming technologies or equipment (Muhammad, 2022). Furthermore, when family farms are divided among more and more heirs, population pressures are causing land fragmentation (Akrong & Kotu, 2022). This frequently results in smaller farms, which are less profitable and productive. The productivity and sustainability of smallholder farming in Mbaise are in jeopardy due to a combination of fragmented landholdings, a lack of modern farming methods, and a decrease in labour availability. Therefore, the purpose of this study was to investigate how population dynamics affect the availability of labour for smallholder farmers in the Mbaise area of Imo State. The specific objective of the study were to: describe the socio-economic characteristics of farm households in the study area; ascertain the household births and deaths in the study area per month from 2005 – 2014; determine the rate of change in household population in Mbaise area of Imo State, Nigeria; describe farmers according to sources and level of farm labour used and estimate the socio-economic determinants of farmers demand for labour in the study area.

Methodology

This study was carried out in Mbaise area of Imo State. The area comprised of three (3) Local Government Areas (LGAs) namely; Ahiazu, Aboh and Ezinihitte Mbaise. The study area lies between latitude $05^0 28^1$ N and $05^0 34^1$ N and longitude $07^0 14^1$ E and $07^0 17^1$ E [(Nigerian Meteorological Agency (NiMET), 2020)]. The area is bordered on the North by Owerri North LGA and Ikeduru LGA, on the South by Obowo LGA and Ihitte-Uboma LGA, on the East by Ehime Mbano LGA and Isiala-Mbano LGA, and on the West by Ngor Okpala LGA. Two major climatic seasons of the area are dry season (from October through March) and the rainy season (from April through September) [National Root Crops Research

Institute, Umudike Meteorological Station, (NRCRIMS) (2020)]. The population of Mbaise was put at 962,405 persons [(Nigeria Populations Commission (NPC), 2006)] with an area of 1,960 square kilometers giving a population density of about 491 persons per square km [(National Boundary Commission (NBC) of Nigeria, 2020)].

Simple random sampling procedure was used to select the twenty-four (24) communities with high intensity of agricultural farming activities. From each of the twenty-four (24) communities, ten (10) smallholder farmers were randomly selected from each of the twenty-four (24) communities giving a total sample size of two-hundred and forty (240) smallholders' farmers for the study. Cross sectional data were used for the study collected from both primary and secondary sources. Primary data were collected through the administration of questionnaire to household heads in the selected villages. The secondary data on births and deaths rates from 2005- 2014 were collected from the LGAs Headquarter from the office of the registrar for birth and death registration. Furthermore, secondary information was also obtained from journals, periodicals, newspaper and online information repositories. Both descriptive and inferential statistical techniques were used to analyze the generated primary data. The descriptive techniques used were mean, frequency and percentage. Multiple Regressions was the inferential statistical technique used in the study. The multiple regression was used to examine the determinants of farmers demand for labour for their farm operations. The model was implicitly expressed as follows:

Multiple Regressions Analysis

The multiple regression was used to examine the determinants of farmers demand for labour for their farm operations. The model is implicitly expressed as follows:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}) \qquad (1)$$

The explicit forms are:

$$Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \varepsilon \qquad (2)$$

Where

Y = Number of Labour used in farming operation (Measured in number)

X_1 = Age (Years)

X_2 = Sex (Male = 1, Female = 0)

X_3 = Level of Income (Naira)

X_4 = Level of Education (Years in formal schooling)

X_5 = Household Size (No.)

X_6 = Farming Experience (Years of farming)

X_7 = Farm Size (Hectares)

X_8 = Marital Status (Married = 1, Not married = 0)

X_9 = Nature of Farm Operation (Yes = 1, No = 0)

X_{10} = Distance of the farm land (Yes = 1, No = 0)

ε = Error term

$\beta_O + \beta_{10}$ = Régression coefficients

Results and Discussion

Table 1: Socio-economic Characteristics of Farm Households in the Study Area

Socio-economic Characteristics	F (n = 240)	Percentage (%)	Mean ($\bar{x}$)
Sex			
Male	187	77.9	
Female	53	22.1	

Age (Years)			
25 - 36	32	13.3	
37 – 48	137	57.1	42 years
49 – 60	53	22.1	
>60	18	7.5	
Marital Status			
Married	193	80	
Single	47	20	
Level of Education Years)			
Non Formal Education	6	2.5	
Primary	21	8.75	
Secondary	63	26.25	
Tertiary	150	62.5	
House Hold Size (No.)			
1 – 8	178	74	
9 - 16	62	26	8 persons
Annual Income (₦)			
300 – 401	65	27	
402 – 503	110	46	₦418, 000
504 - 605	65	27	
Farm Size (Hectare)			
0.1 – 1.8	206	86	
1.9 – 3.6	34	14	1.5 hectares
Farming Experience (Years)			
1 – 5	80	34	
6 – 10	106	44	8 years
>10	54	23	
Nature of Farm Operation(Binary)			
Yes	185	77	
No	55	23	
Distance of Farm Land (Binary)			
Yes	167	70	
No	73	30	

Source: Field Survey Data, 2024

The Table 1 shows that most (77.9%) of the smallholder farmers are males. The mean age of the respondents was 42 years with most of the respondents within the age bracket of 37- 48 years. This implies that the respondents are in their productive age and expected to be energetic to contribute to family farm labour. The finding on mean age of the respondents is consistent with the farmers' national mean age of 49 years. In corroboration with the findings, Anaeto (2012) reported that majority of farmers in Nigeria were within the age range of 45 years. But the finding differed from those of Sadiq et al. (2021) who found the mean age of farmers in Nigeria to be within 52 years. Level of education shows that 62.5% of the respondents' attained tertiary education. Education is a vital tool that exposes individuals to various sources of information. The level of education of the respondents will aid them in having access to information on labour availability in the study area. The implication of this finding is that majority of the farmers in the study area have acquired the basic educational qualification necessary for increased food production and farm innovations utilization. This finding is in agreement with those of Aigbokie et al., (2021). Household size shows that the respondents have a mean of eight persons in the household. This implies that the household may will have enough labour supply from the family to cultivate an average of 1.5 hectares. This finding was in line with the findings of Reuben and Brea (2014) who reported that large household size is a proxy to labour availability and reduces the cost of hired labour. Household income was found to be an average of ₦418, 000 in a farming season. The results explains that the respondents do not have enough income to engage the services of hired labour considering the hired labour required and the cost implications. Farm size shows a mean of 1.5 hectares cultivated by the farmers in a farming session. This explains that the farmers do not

have enough farm land to their disposal to improve production level enough for the family and for the market. This finding agreed with those of Anamayi (2024) that Nigerian farmers are mainly smallholders that cultivate small areas of farm land. According to Sara and Scandizzo (2017), relatively small farm holding could constitute a major constraint to technology adoption in agriculture.

Table 2: Household Births and Deaths in the Study area per Month from 2005 - 2014

Birth Rate	F (n = 240)	Percentage	Mean
10 – 19	148	61.7	
20 – 29	86	35.8	11
>29	6	2.5	
Death Rate			
1 – 4	159	66.25	
5 – 8	78	32.5	3
>8	3	1.25	

Source: Field   Survey   Data,   2024

Table 2 revealed that the mean birth rate in the study area in a year during the study was 12. With the period considered, data revealed that on a monthly basis child birth was within the range of 10 – 19 deliveries. The simple interpretation to this is that with the mean birth rate of 12 persons per month, there will be 132 births per year in the three Local Government Areas that made up the study area. This is an impressive number and implies that in the near future, there will be sufficient labour supply for agricultural production *ceteris paribus*. On the other hand, the death rate per month during the study was three (3). Simple arithmetic shows that with this mean figure, a total number of 36 persons would have died each year in the study area. In comparison with birth rate, out of the 132 children born, 96 would be alive to serve the farm labour supply purposes in the near future if all other factors are held constant. This means on a monthly basis, the farmers have 8 persons available to be used as farm labour.

Table 3: Rate of Change in Household Population in Mbaise Area of Imo State, Nigeria

Years	Mean of Birth	Mean of Death	Mean of Net Migration	Δ in Population	% Δ in Population
2005	14	3	4	7	50
2006	11	3	- 2	10	90.9
2007	10	4	3	3	30
2008	12	2	1	9	75
2009	10	3	-1	8	80
2010	15	4	3	8	53.3
2011	14	4	-2	12	85.7
2012	7	2	3	2	28.6
2013	8	3	1	4	50
2014	9	2	2	5	55.6
Average	**11**	**3**	**1.2**	**6.8**	**59.91**

Source: Field Survey Data, 2024

The population dynamics described in Table 3 was about rate of change in household population in the study area. The Table showed that the rate of change in household population in the study area was 50% in 2005, with an increase of 90.9 in 2006 and a decline of 30.0 in 2007 and also with an increase in of 75.0 to 80.0 in 2008 and 2009 respectively. It also came down to 53.3% in 2010 and also increased with 85.7 in 2011 also decreased with 28.6 in 2012 and with a constant increase of 50.0 to 55.6 in 2013 and 2014 . The highest rate of change in household population was recorded to be 90.9% in 2006 and with a steady decline of 30.0% to 28.6% which was recorded in 2007 and 2012; it was also observed that there was fluctuation in rates of change in household population in 2005 to 2014 in the study area.

Table 4: Distribution of Farmers According to Sources and Level of Farm Labour Used

Source of Farm Labour	Never Used		Used Sometimes		Used Often		Mean
	F	%	F	%	F	%	
Family Labour	0	0	69	28.8	171	71.2	2.7*
Hired Labour	0	0	103	42.9	139	57.1	2.6*
Communal Labour	198	82.5	29	12.1	13	5.4	1.2
Mutual Aid Labour	89	37.1	112	46.7	39	16.2	1.8
Exchange Labour	57	28.8	162	67.9	20	8.3	1.9

Source: Field Survey Data, 2025

The distribution of farmers according to sources of labour used in their farm operations is presented in Table 4. The Table shows that majority (71.2%) of the farmers often used family labour for their agricultural production, while 57.1% of the farm households often used hired labour in their farm operations. Only 5.4%, 16.2%, and 8.3% of the farm households often used communal labour, mutual aid labour, and exchange labour respectively in their farm operations. This implies that the mostly used sources of farm labour in the study area were family labour (X=2.7), and hired labour (X = 2.6).

Table 5: Labour used in farm Operations per Year

Labour Status	F (n =240)	Percentage	Mean
Labour Used			
5 – 12	194	80.9	12
13 - 20	46	19.1	
Hired Labour			
1 – 4	202	84.2	3
5 - 8	38	15.8	
Family Labour			
6 – 11	173	72.1	5
12 - 17	67	27.9	

Source: Field Survey Data, 2024

The Table 5 indicates that the farmers used a mean of 12 persons for their farm operations every year. Comparing with Table 2 where the farmers have available to them 8 persons as labour in a year, the farmers have deficit of about 4 persons to make up the required mean of 12 persons needed as labour in a year. The Table further shows that the farmers use a mean of 3 persons and 5 persons for hired and family labours respectively. The farmers are smallholder farmers who cultivate an average of 1.5 hectares of farm land and mostly depend on family labour than hired labour. This finding is consistent with Idiake-Ochee (2019) who found that the larger the size of the household, the larger would be the total labour supply for farm work from the family. This further implies that the farmers will spend less money in paying for hired labour as family labour be paid nothing or less the amount paid for hired labour.

Table 6: Socio-economic Determinants of Farmers Demand for Labour in the Study Area

Socio-economic Factors	B	SE	t-value
(Constant)	0.5412	0.1631	3.3182
Sex	0.2451	0.1562	1.5691
Age	- 0.5127	0.1437	- 3.5678***
Level of Education	0.2238	0.0674	3.3204***
Marital Status	0.1131	0.0921	1.2280
Level of Income	0.5017	0.1103	4.5485***
Household Size	0.2104	0.0644	3.2670***
Farm Size	0.4441	0.1750	2.5377**
Farming Experience	0.1220	0.1068	1.1423
Nature of Farm Operation	0.3167	0.1145	2.7659**

Distance of Farm Land	0.2683	0.1879	1.4278
R^2		0.75	
Adjusted R^2		0.74	

Source: Computer Printout of SPSS (2024); **Statistically Significant at 5%; *** Statistically Significant at 1%

Table 6 had 10 predictor variables (Xs) fitted to the regression model to examine the socio-economic factors that determinants farmers demand for labour (Y) in the study area**.** The result shows that farmers demand for labour is determined by level of education, level of income, household size, farm size and the nature of farm operation which had positive influence. This explains that a unit increase in any of these variables will result to a unit increase in the farmers demand for farm labour. Age had a negative influence on the demand for farm labour. This implies that a unit increase in the age of the farmer, will result to a unit decrease in the demand for labour. It signifies that older farmers are more likely to demand for farm labour than younger farmers. The result further shows that the adjusted R square was 0.74. This explains that the demand for farm labour was accounted for by 74% of the considered socio-economic characteristics of the farmers.

Conclusion and Recommendation

This study assessed the population dynamics and farm labour use among smallholder farmers in the Mbaise area of Imo State, Nigeria. The findings reveal a complex interplay between demographic changes, farm labour patterns, and agricultural productivity. Population growth in the area has contributed to land fragmentation, reducing farm sizes and intensifying the need for efficient labour use. The predominance of aging farmers and the outmigration of youth have led to increased reliance on hired labour, which raises production costs and impacts overall farm efficiency. Furthermore, traditional labour systems such as family labour and communal labour are gradually declining due to socio-economic changes. This trend poses significant challenges for smallholder farmers, particularly in sustaining timely agricultural operations during peak seasons. To improve productivity and ensure sustainable livelihoods, there is a need for policy interventions that support mechanization, encourage youth participation in agriculture, and enhance access to affordable labour-saving technologies. Strengthening rural infrastructure, improving extension services, and providing incentives for cooperative farming could also help mitigate the adverse effects of demographic shifts on farm labour availability. There were fluctuations in rates of change in population between 2005 and 2014 with rates of change in population remaining above 50%. The farmers demand for farm labour was greatly influenced by age, level of education, level of income, household size,

farm size, level of income and nature of farm operation. It was recommended that the farmers should diversify their income sources so as to have enough income for hired labour than dependence on family labour. The study found that education was associated with demand for labour in the area. Therefore, it is important that farmers on their own enroll in local agricultural/extension education as this would increase their understanding on the effective labour use for increased productivity and income in the area. Finally, effective agricultural policies and programmes should focus on granting farmers improved access credit, farm inputs and extension services so as to improve their yield, income and standard of living in the area. Government and non-governmental organizations should implement programs that incentivize youth participation in farming through grants, soft loans, training, and land access. This will help address the aging farming population and reduce the labour shortages caused by rural-urban migration. Smallholder farmers should be supported to adopt appropriate mechanization and farm tools tailored to small-scale agriculture. Subsidizing simple machines like motorized tillers and harvesters can reduce dependence on manual labour. Formation of farmer cooperatives should be encouraged to enable resource pooling for hiring labour, accessing inputs, and adopting mechanized solutions. Cooperatives can also help negotiate better wages and reduce labour costs through group hiring. Finally, Periodic data collection on farm labour availability, migration trends, and population structure will support better planning and policy formulation tailored to the needs of smallholder farmers.

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