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## Smallholder Farmers' Participation in Agricultural Development Programmes: Socioeconomic, Cultural, and Institutional Perspectives from Nigeria

By

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### Abstract

*This study examines the socioeconomic characteristics of farmers and their influence on participation in agricultural development programmes in Nigeria. Using descriptive analytical methods, the study analyses key demographic and institutional variables including age, gender, household size, educational attainment, cooperative membership, leadership participation, and access to agricultural institutions. The results indicate that most respondents fall within the economically active age group, suggesting strong potential for engagement in agricultural development initiatives. Male farmers constitute the majority of participants, reflecting gender disparities in access to productive resources and programme opportunities. The findings further show that relatively large household sizes provide family labour for farm activities, while higher levels of education enhance farmers' capacity to access information, understand programme requirements, and adopt improved agricultural technologies. Cooperative membership also plays a significant role in facilitating access to extension services, credit facilities, and institutional support. However, only a small proportion of respondents hold leadership positions within farmer organizations, indicating possible inequalities in decision-making structures. In addition, variations in the accessibility of markets and agricultural institutions highlight infrastructural challenges faced by rural farmers. The study concludes that strengthening farmer organizations, improving institutional access, and addressing gender disparities are critical for enhancing smallholder farmers' participation in agricultural development programmes. These findings provide useful insights for policymakers and development practitioners seeking to improve the effectiveness of agricultural interventions in developing economies.*

**Keywords:** Cooperatives involvement, Rural livelihoods, Institutional access, Extension services, social networks

**JEL** O13, O21, O32

## INTRODUCTION

Agriculture is critical to Nigerian economy, contributing substantially to domestic food production, employment generation, food security, poverty reduction, and rural livelihoods (World Bank, 2023) but is dominated by smallholder farmers. Productivity among the smallholders remains low due to poor infrastructure and inadequate institutional support (Benjamin et al., 2021). To address these shortcomings, governments and development agencies have

introduced several programmes and interventions, such as the Agricultural Development Programme (ADP), Fadama projects, Growth Enhancement Support Scheme (GESS), National Special Programme for Food Security (NSPFS), and the Anchor Borrowers Programme (ABP). These interventions aim to improve productivity, increase rural income, and strengthen food security. However, participation among the smallholder farmers and other beneficiaries have remained uneven and relatively low in many rural communities.

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Several factors influence participation in these interventions including but not limited to socioeconomic characteristics, cultural norms, institutional support, and social networks. Studies have also shown that education, household size, cooperative membership, extension contact, and farming experience are important factors that affect farmers' participation in them (Jamilu et al., 2015; Oyetunde-Usman et al., 2021). Gender disparities also affect participation because female farmers often face restrictions in accessing productive resources such as land, finance, and extension services (FAO, 2022). Other factors that have been found to influence participation include access to extension services, rural infrastructure, market accessibility, and membership in farmer organizations. They play weighty roles in determining participation in these programmes (Awotide et al., 2016). Furthermore, cultural beliefs and traditional leadership structures may either encourage or discourage participation depending on local social arrangements.

Participation by smallholder farmers in the interventions implemented in Nigeria and other developing economies intended to improve productivity and rural welfare have not been as significant as was envisaged thereby reducing their effectiveness and weakening the efforts aimed at achieving sustainable rural development and food security. The factors responsible for the poor participation among rural farmers includes low educational attainment, gender inequality, weak institutional support, inadequate infrastructure, poor access to extension services, limited access to credit facilities and weak market integration (Benjamin et al., 2021). In many rural areas, cultural norms and social structures also limit women's participation in agricultural programmes and decision-making processes (FAO, 2022).

Previous studies have focused largely on technology adoption and productivity, with insufficient attention to the multidimensional determinants of participation in these agricultural and intervention programmes. Consequently, there is limited evidence explaining how the combined influence of socioeconomic, cultural, and institutional factors influences participation among the smallholder farmers in Nigeria and elsewhere. Addressing this gap is essential for improving the effectiveness and inclusiveness of agricultural interventions. The aim of this study is therefore to examine the combined effects of socioeconomic, cultural, institutional and other factors affecting the participation of smallholder farmers in the various agricultural development programmes and interventions implemented in Nigeria between 2005 and 2025 to unravel how these effects can be leveraged to improve effectiveness. The objectives are to:

- i. describe the socioeconomic characteristics of smallholder farmers participating in agricultural development programmes;
- ii. examine the influence of cultural factors on farmers' participation in agricultural programmes;
- iii. assess the effect of institutional factors on participation in agricultural development interventions; and

- iv. examine the relationship between cooperative membership and participation in development programmes.

## Conceptual frameworks

As presented in Fig. 1, the study utilised Institutional and Diffusion of Innovation theories to how formal and informal institutions influence individuals' participation in development programmes and how innovations spread within a social system. Institution shape farmers' opportunities and incentives to participate in agricultural interventions whereas communication channels, education, social influence, and perceived benefits of innovations facilitate the participation (Rogers, 2003). These factors jointly determine the level and intensity of farmers' participation in agricultural interventions.

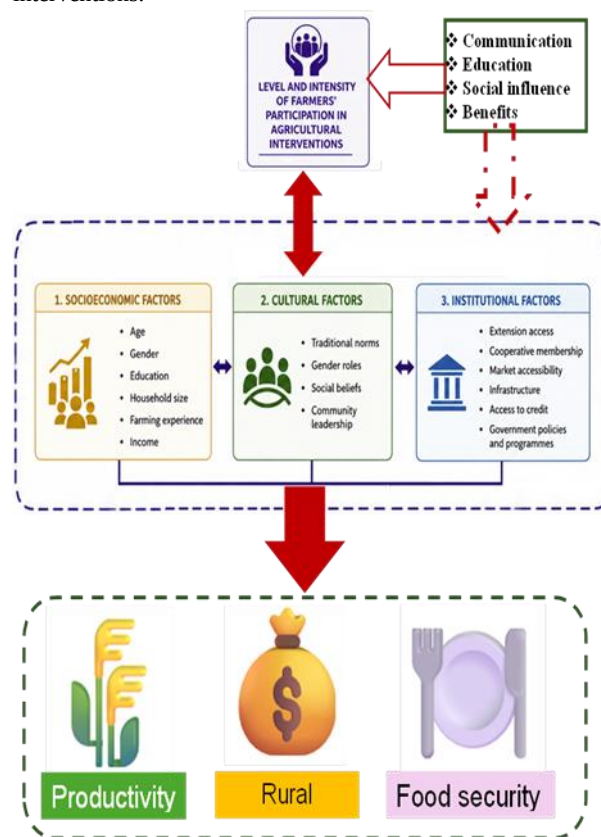


Fig. 1 Conceptual framework of determinants of participation in interventions

Source: Authors construct

## Literature review

Socioeconomic characteristics such as age affects farming experience and willingness to adopt innovations (Omotesho et al., 2019). Similarly, education enhances farmers' ability to access information, understand programme requirements, and adopt improved technologies as posited by Oyetunde-Usman et al. (2021) among smallholder farmers in Nigeria. Other factors like household size (Awotide et al., 2016), gender disparities (FAO, 2022) have been reported as significant effects on participation. However, large household

dependency ratios may reduce disposable income available for programme participation.

In another instance, Jamilu et al. (2015) reported that cooperative membership, social capital and community networks also influence participation. Highlighting that farmers who belong to social groups and cooperatives are more likely to receive information about development programmes and benefit from institutional support. So does community leadership structures and various institutional support architecture (Awotide et al., 2016).

In another study by Benjamin et al. (2021), access to finance was identified as a strong determinant of participation highlighting that a poor farmer with limited capital face difficulties adopting innovations or meeting programme requirements. Also, weak infrastructure, poor road networks, and inadequate market access further reduce participation among rural households. Recent studies on climate-smart agriculture adoption in Nigeria confirm that institutional support, market participation, and social capital significantly influence farmers' participation in agricultural innovations (Mbossoh & Udoh, 2026).

## Methodology

The data for this study is cross-sectional, collected from 12 selected states of Nigeria (Fig. 2).

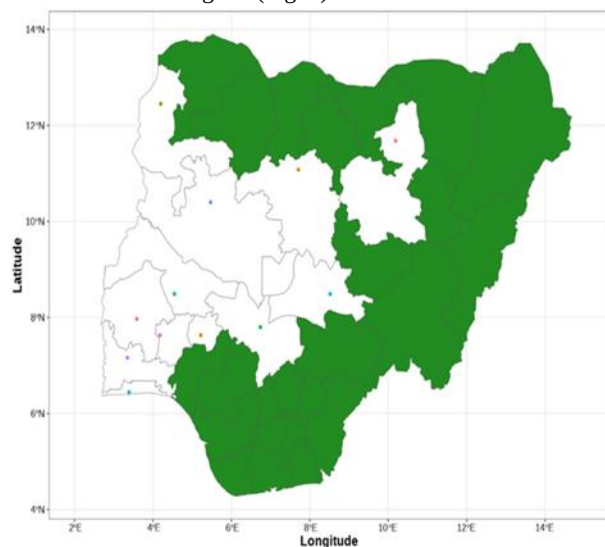


**Fig. 2 Map of Nigeria showing the selected states for this study**

From each state, two LGAs were randomly selected, and two Village Areas were randomly selected from each LGA giving a total of 25 LGAs and 50 villages. The respondents were randomly selected from farming households from the villages. At least 10 respondents were selected from each village and data was collected from 1544 respondents. The data collected from those who benefited or participated in any of the projects or intervention implemented between 2005 and 2025 included awareness and effectiveness of each project or intervention experienced, socio-economic and institutional characteristics, environmental and climatic variables as well as assets and social capital.

The instrument for the data collection was open-source data kit-powered structured questionnaire ([www.kobotoolbox.org](http://www.kobotoolbox.org), 2024) simultaneously administered by trained enumerators via interview schedules in a cordial atmosphere between June and October 2025. The respondents provided all the information requested from them without any compulsion.

The data collected were analysed using descriptive and graphical tools and results presented by means of tables and charts. All the computations and graphical illustrations were carried with R Programming (vers. 4.5.1, R Core Team, 2025) using various packages and codes developed by Nmadu (2025) and Wickham (2016).

## Results and discussion

The results are presented in Tables 1-25 and Fig. 3 respectively. While Fig. 3 presents a treemap of the various socio-economic and environmental variables with the number of respondents who chose or are involved in them.

The results show that the mean age of respondents was 41 years (Table 1), with the largest proportion (33.03%) falling within 34–42 years indicating that most participants are economically active adults, which is typical of smallholder agricultural communities where farming participation peaks among middle-aged individuals. Studies confirm that farmers within this age range are more likely to adopt innovations and participate in development programmes because they combine farming experience with physical capacity and decision-making authority (Adebayo & Adeola, 2020; Oluwatayo & Ojo, 2016).

The gender distribution (Table 3) shows a dominance of adult males (71.24%), while females accounted for 18.39% and youth 5.76%. This pattern aligns with findings that agricultural programmes in Nigeria and other countries often exhibit male-biased participation, largely due to land ownership structures, cultural norms, and unequal access to resources (Meinzen-Dick et al., 2019). Studies on the Fadama and Growth Enhancement Support Scheme (GESS) also found that male household heads are more likely to access intervention programmes than women farmers (Liverpool-Tasie et al., 2017). The relatively low youth participation suggests barriers such as limited land access and capital constraints, despite several youth-focused initiatives such as N-Power Agro.

The results (Table 2, 6) also reveal a mean household size of nine persons, with 67.88% of households having fewer than ten members. Large household sizes are common in rural areas and often provide family labour for farming activities. According to Ajani and Ugwu (2008), larger households may increase labour availability, thereby encouraging participation in labour-intensive agricultural projects.

Cooperative membership among respondents was 51.81% (Table 9, 10), suggesting moderate engagement in farmer organizations. Most members (59.75%) belonged to only one cooperative, while a smaller proportion participated in multiple organizations. Participation in cooperatives is widely recognized as a critical determinant of farmers' access to

extension services, credit, and development programmes (Abate et al., 2014). However, the findings also indicate that 62.77% of cooperative participants were ordinary members (Table 11), with relatively fewer holding governance or executive positions. This suggests that while cooperative structures exist,

**Table 1 Age distribution of the respondents**

| Class internal | Frequency | %     | Rank |
|----------------|-----------|-------|------|
| 34 - 42        | 510       | 33.03 | 1    |
| 42 - 50        | 377       | 24.42 | 2    |
| 26 - 34        | 250       | 16.19 | 3    |
| 50 - 58        | 219       | 14.18 | 4    |
| 18 - 26        | 102       | 6.61  | 5    |
| 58 - 66        | 60        | 3.89  | 6    |
| 66 - 74        | 14        | 0.91  | 7    |
| < 10           | 6         | 0.39  | 8    |
| 74 - 82        | 5         | 0.32  | 9    |
| 10 - 18        | 1         | 0.06  | 10   |
| Mean           |           |       | 41   |

**Table 2 Status of the respondents in the family**

| Status                         | Frequency | %     | Rank |
|--------------------------------|-----------|-------|------|
| Household head and breadwinner | 447       | 28.95 | 1    |
| Member                         | 407       | 26.36 | 2    |
| Household head ONLY            | 357       | 23.12 | 3    |
| Breadwinner ONLY               | 333       | 21.57 | 4    |
| Total                          | 1544      | 100   |      |

**Table 3 Gender of the respondents**

| Gender         | Frequency | %     | Rank |
|----------------|-----------|-------|------|
| Adult male     | 1100      | 71.24 | 1    |
| Adult female   | 284       | 18.39 | 2    |
| Youth          | 89        | 5.76  | 3    |
| Elderly male   | 67        | 4.34  | 4    |
| Elderly female | 4         | 0.26  | 5    |
| Total          | 1544      | 99.99 |      |

**Table 4 Marital status of the respondents**

| Marital status | Frequency | % | Rank |
|----------------|-----------|---|------|
|----------------|-----------|---|------|

| Marital status    | Frequency | %     | Rank |
|-------------------|-----------|-------|------|
| Married           | 989       | 64.05 | 1    |
| Single            | 392       | 25.39 | 2    |
| Divorced          | 84        | 5.44  | 3    |
| Widow(er)         | 43        | 2.78  | 4    |
| In a relationship | 27        | 1.75  | 5    |
| Separated         | 5         | 0.32  | 6    |
| Co-habiting       | 4         | 0.26  | 7    |
| Total             | 1544      | 99.99 |      |

**Table 5 Religious affiliation of the respondents**

| Religious affiliation        | Frequency | %     | Rank |
|------------------------------|-----------|-------|------|
| Islam                        | 1003      | 64.96 | 1    |
| Christianity                 | 499       | 32.32 | 2    |
| African traditional religion | 22        | 1.42  | 3    |
| Idol worshipper              | 17        | 1.1   | 4    |
| None                         | 2         | 0.13  | 5    |
| Other Eastern religion       | 1         | 0.06  | 6    |
| Total                        | 1544      | 99.99 |      |

**Table 6 Household size of the respondents**

| Class internal | Frequency | %     | Rank |
|----------------|-----------|-------|------|
| < 10           | 1048      | 67.88 | 1    |
| 10 - 19        | 437       | 28.3  | 2    |
| 20 - 29        | 40        | 2.59  | 3    |
| 30 - 39        | 8         | 0.52  | 4    |
| 40 - 49        | 4         | 0.26  | 5    |
| 60 - 69        | 4         | 0.26  | 6    |
| 50 - 59        | 2         | 0.13  | 7    |
| 90 - 99        | 1         | 0.06  | 8    |
| Mean           |           |       | 9    |

**Table 7 Educational level attained by the respondents**

| Educational level attained | Frequency | %     | Rank |
|----------------------------|-----------|-------|------|
| Tertiary                   | 737       | 47.73 | 1    |
| Secondary                  | 417       | 27.01 | 2    |

| Educational level attained    | Frequency | %     | Rank |
|-------------------------------|-----------|-------|------|
| Primary                       | 196       | 12.69 | 3    |
| None                          | 126       | 8.16  | 4    |
| Vocational/Skills acquisition | 38        | 2.46  | 5    |
| Qur'anic                      | 19        | 1.23  | 6    |
| Adult/In service              | 11        | 0.71  | 7    |
| Total                         | 1544      | 99.99 |      |

**Table 8 Years spent in formal education**

| Class internal | Frequency | %     | Rank |
|----------------|-----------|-------|------|
| 15 - 18        | 460       | 29.79 | 1    |
| 9 - 12         | 305       | 19.75 | 2    |
| 3 - 6          | 223       | 14.44 | 3    |
| 12 - 15        | 152       | 9.84  | 4    |
| < 3            | 136       | 8.81  | 5    |
| 18 - 21        | 125       | 8.1   | 6    |
| 6 - 9          | 51        | 3.3   | 7    |
| 21 - 24        | 42        | 2.72  | 8    |
| 24 - 27        | 35        | 2.27  | 9    |
| 27 - 30        | 15        | 0.97  | 10   |
| Mean           |           |       | 13   |

**Table 9 Membership of Cooperative societies**

| Cooperative membership | Frequency | %     | Rank |
|------------------------|-----------|-------|------|
| Yes                    | 800       | 51.81 | 1    |
| No                     | 744       | 48.19 | 2    |
| Total                  | 1544      | 100   |      |

**Table 10 Number of cooperative societies joined**

| Number of Cooperatives joined | Frequency | %      | Rank |
|-------------------------------|-----------|--------|------|
| 1                             | 478       | 59.75  | 1    |
| 2                             | 267       | 33.38  | 2    |
| 3                             | 40        | 5      | 3    |
| 4                             | 8         | 1      | 4    |
| 5 and above                   | 7         | 0.88   | 5    |
| Total                         | 800       | 100.01 |      |

| Involvement | Freq | % | Rank |
|-------------|------|---|------|
|-------------|------|---|------|

| Involvement                  | Freq | %     | Rank |
|------------------------------|------|-------|------|
| Member only                  | 526  | 62.77 | 1    |
| Governance and policy making | 140  | 16.71 | 2    |
| Executive functions          | 114  | 13.6  | 3    |
| Advisory functions           | 57   | 6.8   | 4    |
| Others                       | 1    | 0.12  | 5    |
| Total                        | 838  | 100   |      |

**Table 12 Distance to various institutions to the respondent dwelling**

| Institution                | ≤5km  | 5-10km | 10-25km | 25-50km | Above 50km |
|----------------------------|-------|--------|---------|---------|------------|
| School (primary/secondary) | 913   | 126    | 20      | 482     | 3          |
| Health centre              | 624   | 223    | 33      | 654     | 10         |
| Communication mast         | 467   | 418    | 176     | 437     | 46         |
| Bank                       | 326   | 428    | 243     | 433     | 114        |
| Water treatment plant      | 387   | 402    | 234     | 351     | 170        |
| Broadband internet         | 333   | 310    | 254     | 473     | 174        |
| Waste disposal system      | 365   | 373    | 236     | 349     | 221        |
| Community centre           | 603   | 247    | 87      | 554     | 53         |
| Total                      | 4018  | 2527   | 1283    | 3733    | 791        |
| %                          | 32.53 | 20.46  | 10.39   | 30.22   | 6.4        |

**Table 13 Distance to extension services from the dwelling**

| Distance to extension services                               | Frequency | %      | Rank |
|--------------------------------------------------------------|-----------|--------|------|
| Can be reached within a day or 5km away                      | 673       | 43.59  | 1    |
| Within the community (can be reached any time or within 1km) | 343       | 22.22  | 2    |
| Can be reached within a week or 25km away                    | 228       | 14.77  | 3    |
| Hard to reach                                                | 155       | 10.04  | 4    |
| Can be reached within a month or 50km away                   | 73        | 4.73   | 5    |
| Occasionally reached or about 50km away                      | 72        | 4.66   | 6    |
| Total                                                        | 1544      | 100.01 |      |

**Table 14 Sources of Information utilized by the respondents**

| Sources of information | Frequency | % | Rank |
|------------------------|-----------|---|------|
|------------------------|-----------|---|------|

| Sources of information                                                     | Frequency | %     | Rank |
|----------------------------------------------------------------------------|-----------|-------|------|
| Radio, TV, Online, social media                                            | 1040      | 41.3  | 1    |
| Relations/Neighbours/Friends                                               | 718       | 28.51 | 2    |
| Extension agents/Extension guides/Bulletins/Newsletters                    | 361       | 14.34 | 3    |
| Newspapers/Magazines/Documentaries                                         | 234       | 9.29  | 4    |
| Books/Journals /Periodicals                                                | 65        | 2.58  | 5    |
| Research Institutes/Tertiary institutions/Extension Institutes             | 40        | 1.59  | 6    |
| Observations, Experience, Experimentation, Reasoning, Experience of others | 33        | 1.31  | 7    |
| In search of better technology or higher productivity skills               | 27        | 1.07  | 8    |
| Total                                                                      | 2518      | 99.99 |      |

| Variable                           | Always | Never | Often | Rarely | Sometimes | Total |
|------------------------------------|--------|-------|-------|--------|-----------|-------|
| Radio                              | 828    | 15    | 411   | 114    | 176       | 1544  |
| Television                         | 516    | 32    | 532   | 131    | 333       | 1544  |
| Mobile devices (phone/tablet/etc.) | 717    | 32    | 445   | 118    | 232       | 1544  |
| Internet connections/data services | 490    | 78    | 451   | 222    | 303       | 1544  |
| Total                              | 2551   | 157   | 1839  | 585    | 1044      | 6176  |
| %                                  | 41.31  | 2.54  | 29.78 | 9.47   | 16.9      | 100   |

**Table 16 Distance to the nearest market to the respondent**

| Distance to market                            | Frequency | %     | Rank |
|-----------------------------------------------|-----------|-------|------|
| Less than 1km (less than 10 minutes trekking) | 661       | 42.81 | 1    |
| 1km - 2km (30 minutes trekking)               | 597       | 38.67 | 2    |
| 3km - 5km (60 minutes trekking)               | 208       | 13.47 | 3    |
| 6km - 10km (90 minutes trekking)              | 44        | 2.85  | 4    |
| above 10km (120 minutes trekking)             | 34        | 2.2   | 5    |

| Distance to market | Frequency | %   | Rank |
|--------------------|-----------|-----|------|
| Total              | 1544      | 100 |      |

**Table 17 Number of farm plots owned by the respondent**

| Plot number | Frequency | %     | Average size in ha | Rank |
|-------------|-----------|-------|--------------------|------|
| Plot 1      | 772       | 39.21 | 1.92               | 1    |
| Plot 2      | 524       | 26.61 | 2.9                | 2    |
| Plot 3      | 271       | 13.76 | 5.66               | 3    |
| Plot 5      | 223       | 11.33 | 6.91               | 4    |
| Plot 4      | 179       | 9.09  | 8.58               | 5    |
| Total       | 1969      | 100   | 5.19               |      |

**Table 18 Sizes of farm plots owned by the respondent**

| Lower class | Upper class | Frequency | %     | Rank    |
|-------------|-------------|-----------|-------|---------|
| 0.99        | 1.58        | 348       | 22.54 | 1       |
| 1.58        | 2.51        | 342       | 22.15 | 2       |
| 2.51        | 3.97        | 258       | 16.71 | 3       |
| 3.97        | 6.3         | 165       | 10.69 | 4       |
| 6.3         | 9.97        | 97        | 6.28  | 5       |
| 9.97        | 15.8        | 57        | 3.69  | 6       |
| 15.8        | 25.03       | 35        | 2.27  | 9       |
| 25.03       | 39.65       | 16        | 1.04  | 14      |
| 39.65       | 62.8        | 17        | 1.1   | 13      |
| 62.8        | 99.48       | 7         | 0.45  | 16      |
| 99.48       | 157.59      | 4         | 0.26  | 17      |
| 249.64      | 395.44      | 3         | 0.19  | 18      |
| 395.44      | 626.41      | 57        | 3.69  | 7       |
| 626.41      | 992.27      | 38        | 2.46  | 8       |
| 992.27      | 1571.84     | 19        | 1.23  | 12      |
| 1571.84     | 2489.91     | 26        | 1.68  | 11      |
| 2489.91     | 3944.19     | 33        | 2.14  | 10      |
| 3944.19     | 6247.9      | 14        | 0.91  | 15      |
| 9897.13     | 15677.8     | 3         | 0.19  | 19      |
| 24343       | 40134.8     | 1         | 0.06  | 21      |
| 98715.8     | 162755      | 2         | 0.13  | 20      |
| 400312      | 597196      | 1         | 0.06  | 22      |
| 597196      | 984609      | 1         | 0.06  | 23      |
| Mean        |             |           |       | 1290.81 |

Table 19 Method of acquisition of the farm plots owned by the respondent

| Variable | Owned | Family | Inheritance | Rented | Purchased | Leased | Hired | Community | Others | Total | %     |
|----------|-------|--------|-------------|--------|-----------|--------|-------|-----------|--------|-------|-------|
| Plot 1   | 135   | 163    | 218         | 98     | 92        | 40     | 14    | 8         | 4      | 772   | 39.21 |
| Plot 2   | 128   | 114    | 60          | 81     | 74        | 62     | 4     | 1         | 0      | 524   | 26.61 |
| Plot 3   | 83    | 71     | 35          | 28     | 38        | 9      | 5     | 2         | 0      | 271   | 13.76 |
| Plot 4   | 62    | 45     | 24          | 16     | 23        | 8      | 1     | 0         | 0      | 179   | 9.09  |
| Plot 5   | 80    | 35     | 42          | 28     | 21        | 12     | 3     | 1         | 1      | 223   | 11.33 |
| Total    | 488   | 428    | 379         | 251    | 248       | 131    | 27    | 12        | 5      | 1969  | 100   |
| %        | 24.78 | 21.74  | 19.25       | 12.75  | 12.6      | 6.65   | 1.37  | 0.61      | 0.25   | 100   |       |

Table 20 Size of farm plots/Number of trees put to various crops by the respondents

| Crops cultivated | Size (ha) or Number of trees | Mean Size (ha) or Number of trees |
|------------------|------------------------------|-----------------------------------|
| Irish potato     | 20621.3                      | 1213.02                           |
| Cassava          | 15006.68                     | 36.69                             |
| Cashew           | 2731.15                      | 94.18                             |
| Potato (Sweet)   | 1070.96                      | 8.78                              |
| Bananas          | 826.4                        | 17.97                             |
| Garden egg       | 607.62                       | 20.25                             |
| Millet           | 409.21                       | 3.79                              |
| Pineapple        | 311.37                       | 38.92                             |
| Beans (Cowpea)   | 90.89                        | 0.69                              |
| Tomato           | 73.12                        | 0.58                              |
| Oil Palm         | 60.04                        | 1.4                               |
| Sugarcane        | 56.69                        | 2.83                              |
| Pepper (Sweet)   | 55.92                        | 2.54                              |
| Pawpaw           | 40.1                         | 0.74                              |
| Water melon      | 34.84                        | 1.06                              |
| Maize            | 32.61                        | 0.05                              |
| Sweet melon      | 27.49                        | 1.53                              |
| Pepper (Hot)     | 18.34                        | 0.48                              |
| Mango            | 17.08                        | 0.29                              |
| Yam              | 15.72                        | 0.05                              |
| Orange (Lemon)   | 14.74                        | 2.46                              |

| Crops cultivated   | Size (ha) or Number of trees | Mean Size (ha) or Number of trees |
|--------------------|------------------------------|-----------------------------------|
| Orange (Tangerine) | 14.31                        | 2.04                              |
| Lettuce            | 12.28                        | 2.05                              |
| Bitter leaf        | 11.38                        | 0.27                              |
| Rice               | 10.75                        | 0.05                              |
| Sorghum            | 10.67                        | 0.16                              |
| Okra               | 8.32                         | 0.08                              |
| Onion              | 8.09                         | 0.54                              |
| Fluted pumpkin     | 7.77                         | 0.17                              |
| Bambara groundnut  | 7.63                         | 0.85                              |
| Date Palm          | 7.1                          | 1.42                              |
| Orange (Sweet)     | 7.08                         | 0.37                              |
| Egusi melon        | 7.05                         | 0.11                              |
| Spinach            | 6.08                         | 0.76                              |
| Green beans        | 5.77                         | 0.44                              |
| Ginger             | 5.02                         | 0.26                              |
| Spring onions      | 2.47                         | 0.82                              |
| Cocoyam            | 2.01                         | 0.01                              |
| Plantains          | 1.66                         | 0.06                              |
| Banana             | 1.34                         | 0.09                              |
| Potato (Irish)     | 1.18                         | 0.06                              |
| Apple              | 1.12                         | 0.05                              |
| Cucumber           | 0.97                         | 0.03                              |
| Chili pepper       | 0.92                         | 0.04                              |

| Crops cultivated | Size (ha) or Number of trees | Mean Size (ha) or Number of trees |
|------------------|------------------------------|-----------------------------------|
| Groundnut        | 0.46                         | 0                                 |
| Soybeans         | 0.39                         | 0.01                              |
| Coconut          | 0.25                         | 0.01                              |
| Carrot           | 0.16                         | 0.01                              |
| Guava            | 0.01                         | 0                                 |

**Table 21 Livestock holdings by the respondents**

| Livestock              | Number | %     | Rank |
|------------------------|--------|-------|------|
| Broilers               | 21659  | 32.64 | 1    |
| Layers                 | 13705  | 20.65 | 2    |
| Sheep and goat         | 11781  | 17.75 | 3    |
| Local chickens         | 9567   | 14.42 | 4    |
| Cattle (Cow/Bull/Oxen) | 3569   | 5.38  | 5    |
| Turkey                 | 1620   | 2.44  | 6    |
| Guinea fowls           | 1196   | 1.8   | 7    |
| Pigeons                | 1103   | 1.66  | 8    |
| Ducks                  | 758    | 1.14  | 9    |
| Dogs                   | 635    | 0.96  | 10   |
| Swine                  | 514    | 0.77  | 11   |
| Donkeys                | 137    | 0.21  | 12   |
| Horses                 | 113    | 0.17  | 13   |
| Total                  |        | 99.99 |      |

**Table 22 Primary occupations of the respondents**

| Primary occupation                                                                     | Frequency % | Rank |
|----------------------------------------------------------------------------------------|-------------|------|
| Crop farming                                                                           | 590 38.21   | 1    |
| Agricultural Trading business                                                          | 156 10.1    | 2    |
| Civil/Public servant                                                                   | 118 7.64    | 3    |
| Non-Agricultural Trading business                                                      | 96 6.22     | 4    |
| Agricultural Processing                                                                | 76 4.92     | 5    |
| Livestock farming                                                                      | 76 4.92     | 6    |
| Fashion and Tailoring service                                                          | 49 3.17     | 7    |
| Fisheries/Aquaculture production                                                       | 47 3.04     | 8    |
| Private sector worker                                                                  | 44 2.85     | 9    |
| Artisan (e.g. mechanic, electrician, repairer of electronic equipment/GSM, vulcanizer, | 43 2.78     | 10   |

| Primary occupation                                                | Frequency % | Rank |
|-------------------------------------------------------------------|-------------|------|
| blacksmith etc.)                                                  |             |      |
| Handcraft                                                         | 33 2.14     | 11   |
| Retired Civil/Public Servant                                      | 29 1.88     | 12   |
| Commercial motor vehicle/motorcycle/ tricycle driver              | 26 1.68     | 13   |
| Public sector employment                                          | 23 1.49     | 14   |
| Commercial motor vehicle/motorcycle/ tricycle transport owner     | 22 1.42     | 15   |
| Student in School (any type)                                      | 22 1.42     | 16   |
| Forest production and/or harvesting                               | 18 1.17     | 17   |
| Domestic duties                                                   | 13 0.84     | 18   |
| Construction, Mining/quarrying                                    | 12 0.78     | 19   |
| None/Unemployed                                                   | 12 0.78     | 20   |
| Formal Private employment                                         | 8 0.52      | 21   |
| Housewife                                                         | 8 0.52      | 22   |
| Others                                                            | 8 0.52      | 23   |
| Leasing out of property/equipment                                 | 6 0.39      | 24   |
| Health care service provider (Nurses, paramedics, itinerants etc) | 5 0.32      | 25   |
| Medical doctor                                                    | 2 0.13      | 26   |
| Traditional medical practice                                      | 2 0.13      | 27   |
| Total                                                             | 1544 99.98  |      |

**Table 23 Secondary occupations of the respondents**

| Secondary occupation                                                                                    | Frequency % | Rank |
|---------------------------------------------------------------------------------------------------------|-------------|------|
| Crop farming                                                                                            | 501 25.92   | 1    |
| Agricultural Trading business                                                                           | 279 14.43   | 2    |
| Agricultural Processing                                                                                 | 235 12.16   | 3    |
| Livestock farming                                                                                       | 224 11.59   | 4    |
| Non-Agricultural Trading business                                                                       | 161 8.33    | 5    |
| Artisan (e.g. mechanic, electrician, repairer of electronic equipment/GSM, vulcanizer, blacksmith etc.) | 95 4.91     | 6    |
| Handcraft                                                                                               | 77 3.98     | 7    |
| Fisheries/Aquaculture production                                                                        | 53 2.74     | 8    |
| Fashion and Tailoring service                                                                           | 45 2.33     | 9    |
| Civil/Public servant                                                                                    | 39 2.02     | 10   |

| Secondary occupation                                              | Frequency | %      | Rank |
|-------------------------------------------------------------------|-----------|--------|------|
| Traditional medical practice                                      | 30        | 1.55   | 11   |
| Student in School (any type)                                      | 27        | 1.4    | 12   |
| Domestic duties                                                   | 22        | 1.14   | 13   |
| Housewife                                                         | 21        | 1.09   | 14   |
| Private sector worker                                             | 20        | 1.03   | 15   |
| Commercial motor vehicle/motorcycle/ tricycle driver              | 17        | 0.88   | 16   |
| Commercial motor vehicle/motorcycle/ tricycle transport owner     | 17        | 0.88   | 17   |
| Public sector employment                                          | 13        | 0.67   | 18   |
| Construction, Mining/quarrying                                    | 11        | 0.57   | 19   |
| Forest production and/or harvesting                               | 9         | 0.47   | 20   |
| Leasing out of property/equipment                                 | 9         | 0.47   | 21   |
| Others                                                            | 9         | 0.47   | 22   |
| Formal Private employment                                         | 7         | 0.36   | 23   |
| Retired Civil/Public Servant                                      | 6         | 0.31   | 24   |
| Health care service provider (Nurses, paramedics, itinerants etc) | 4         | 0.21   | 25   |
| Medical doctor                                                    | 2         | 0.1    | 26   |
| Total                                                             | 1933      | 100.01 |      |

**Table 24 Incomes from primary occupations by the respondents**

| Lower class | Upper class | Frequency | %     | Rank |
|-------------|-------------|-----------|-------|------|
| 0.97        | 2.5         | 25        | 1.62  | 13   |
| 2.5         | 6.3         | 7         | 0.45  | 18   |
| 6.3         | 15.64       | 26        | 1.68  | 12   |
| 15.64       | 39.25       | 127       | 8.23  | 5    |
| 39.25       | 98.49       | 3         | 0.19  | 21   |
| 98.49       | 247.15      | 18        | 1.17  | 15   |
| 247.15      | 614         | 41        | 2.66  | 8    |
| 3866.09     | 9701.15     | 8         | 0.52  | 17   |
| 9701.15     | 24343.01    | 9         | 0.58  | 16   |
| 24343.01    | 59874.14    | 30        | 1.94  | 11   |
| 59874.14    | 147266.63   | 114       | 7.38  | 6    |
| 147266.63   | 362217.45   | 303       | 19.62 | 2    |

| Lower class         | Upper class     | Frequency | %     | Rank          |
|---------------------|-----------------|-----------|-------|---------------|
| 362217.45           | 984609.11       | 304       | 19.69 | 1             |
| 984609.11           | 2421747.63      | 194       | 12.56 | 3             |
| 2421747.63          | 5956538.01      | 131       | 8.48  | 4             |
| 5956538.01          | 14650719.43     | 88        | 5.7   | 7             |
| 14650719.43         | 36034955.09     | 39        | 2.53  | 9             |
| 36034955.09         | 97953163.61     | 39        | 2.53  | 10            |
| 97953163.61         | 240925905.95    | 25        | 1.62  | 14            |
| 240925905.95        | 592582107.84    | 5         | 0.32  | 19            |
| 592582107.84        | 1457516796.05   | 4         | 0.26  | 20            |
| 23968348874.01      | 58952625459.8   | 1         | 0.06  | 23            |
| 58952625459.8       | 145000060991.8  | 1         | 0.06  | 24            |
| 356642601133.38     | 969455101915.23 | 2         | 0.13  | 22            |
| Mean                |                 |           |       | 1242603971.48 |
| Mean per respondent |                 |           |       | 804795.32     |

**Table 25 Sources of finance utilized by the respondents**

| Sources of finance                              | Frequency | %     | Rank |
|-------------------------------------------------|-----------|-------|------|
| Relations                                       | 1021      | 42.95 | 1    |
| Credit and other informal organisations         | 379       | 15.94 | 2    |
| Money lenders and village merchants             | 312       | 13.13 | 3    |
| Commercial banks                                | 245       | 10.31 | 4    |
| Microfinance and other microcredit institutions | 162       | 6.82  | 5    |
| Governmental and non-governmental interventions | 91        | 3.83  | 6    |
| Bank of Agriculture                             | 81        | 3.41  | 7    |
| Central Bank of Nigeria                         | 45        | 1.89  | 8    |
| International finance and credit institutions   | 21        | 0.88  | 9    |
| Development Banks or finance institutions       | 20        | 0.84  | 10   |
| Total                                           | 2377      | 100   |      |

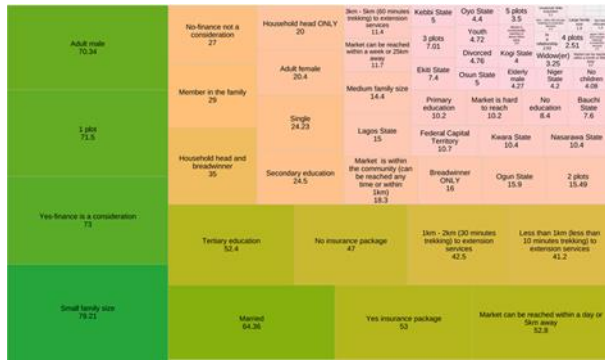


Fig. 2 Treemap of the extent of participation in the programmes and interventions with respect to socioeconomic and cultural factors

NB: Figures represent number of respondents and the size of each box is in relation with the number.

decision-making power may be concentrated among a smaller leadership group, potentially influencing access to programme benefits. Similar institutional dynamics have been reported in Nigerian rural development programmes, where elite capture sometimes affects equitable participation (Platteau, 2004).

Education levels (Table 7) among respondents were relatively high compared with many rural surveys. Nearly 47% attained tertiary education, followed by 27.01% with secondary education, while only 8.16% had no formal education. The mean years of formal education was 13 years, indicating substantial human capital among respondents. Education plays a critical role in technology adoption, understanding programme requirements, and accessing information networks (Feder et al., 2010). Studies evaluating agricultural interventions in Nigeria have consistently found a positive relationship between education and programme participation (Ogwumike & Akinnibosun, 2013). Farmers with higher education levels are more likely to engage with institutional programmes, utilize extension services, and adopt improved agricultural technologies.

The spatial distribution of institutions (Table 12) shows varying accessibility levels. About 32% of infrastructure facilities were located within 5 km, while 30.22% were between 25 and 50 km away. The uneven distribution of institutions such as banks, broadband internet, and water treatment facilities indicates spatial inequalities in rural infrastructure. Furthermore, the accessibility analysis indicates that 52.8% of available markets (Table 16) can be reached within a day or within 5 km, while 18.3% are located within the community. Such accessibility gaps are consistent with findings by Alene and Manyong (2007), who reported that rural infrastructure constraints-especially poor roads and market distance-continue to limit the effectiveness of agricultural programmes.

Distance to intervention locations (Table 13) is a critical determinant of farmer participation. The results show that 42.5% of participants can access extension services within 1–2 km, while 41.2% access extension services less than 1 km

away, indicating that the majority of participating farmers have relatively close access to extension services. Only a small proportion access extension services beyond 6 km. However, 10.2% of participants said that extension services are hard to reach, suggesting spatial inequalities. These findings reinforce the argument that proximity to agricultural services influences farmers' willingness and ability to participate in development programmes. Findings have shown that farmers located closer to extension services, demonstration farms, and project offices are more likely to adopt agricultural innovations and participate in interventions (Abdullah et al., 2019; Anderson & Feder, 2007; Feder, Just, & Zilberman, 1985). Limited accessibility increases transaction costs and discourages participation, particularly among smallholder farmers with limited mobility (Aker, 2011). Further, Davis et al. (2020), asserts that extension coverage in many developing countries remains inadequate due to limited staffing, poor funding, and logistical challenges. In Nigeria, extension agent-to-farmer ratios are often extremely high, sometimes exceeding 1:3000, far above recommended levels (FMARD, 2016). As a result, many farmers rely on informal networks rather than formal extension systems.

In addition, the study indicates that mass media and digital platforms (radio, television, online platforms, and social media) accounted for 41.3% of information sources (Table 14), followed by social networks such as friends and neighbours (28.51%). Extension agents accounted for only 14.34%, highlighting the declining dominance of traditional extension communication channels, although, extension services are relatively within reach as previously highlighted. The frequency of media usage shows strong reliance on radio and mobile devices, with many respondents indicating frequent or constant use. This finding supports recent studies demonstrating the increasing role of digital and mobile technologies in agricultural knowledge dissemination in Africa (Aker & Mbiti, 2010). Mobile phones and radio programmes have become essential tools for spreading agricultural information and mobilizing farmers for intervention programmes.

Marital status (Table 4) of participants indicates that 64.05% of respondents were married, suggesting that most participants belong to stable household units, which may enhance labour availability and farm decision-making. Similar observations have been reported in Nigerian agricultural participation studies where married farmers often have greater incentives to increase production and participate in government programmes (Omonona et al., 2015).

The results (Table 17, 18, 19) further reveal that most farmers operate small-scale farms with one or two plots, accounting for 39.21% and 26.61% respectively, however, most of the plots are not held with secure titles. Smallholder dominance reflects the general structure of Nigerian agriculture, where farms are typically fragmented and less than five hectares (FAO, 2018). Land acquisition methods include ownership (24.78%), family land (21.74%), and inheritance (19.25%). These tenure systems influence farmers' willingness to

participate in development programmes, particularly those involving long-term investments such as irrigation or tree crops.

The mean income per respondent was ₦804,795.32 (Table 22, 23, 24, 25), indicating modest earnings typical of smallholder farming systems. Financing sources were dominated by informal networks, with 42.95% relying on relatives and 15.94% on informal credit organizations. Only 10.31% accessed commercial bank loans, while government or NGO interventions accounted for 3.83%. This pattern reflects credit constraints facing smallholder farmers in Nigeria, where formal financial institutions often require collateral or bureaucratic procedures that many farmers cannot meet (Awotide et al., 2015). Consequently, many farmers rely on informal financing, which may limit their capacity to fully participate in large-scale agricultural development programmes. Programs linked to credit access, such as the Anchor Borrowers' Programme and NIRSAL, appear to have higher insurance participation, supporting the argument that bundling financial services with risk management instruments improves adoption rates (Akinola, 2018). This suggests that integrated financial services can enhance farmers' resilience to production risks. This may be the main reason behind crop production patterns (Table 20) which show a diverse portfolio including cassava, maize, rice, vegetables, and tree crops. Livestock production (Table 21) is dominated by poultry, particularly broilers and layers. Such diversification reflects risk-management strategies commonly observed among Nigerian smallholders (Oluwatayo & Ojo, 2016).

The results (Fig. 2) also reveal that 53% of participating farmers reported having insurance packages, while 47% reported having none. This relatively balanced distribution indicates that risk management instruments are becoming more integrated into agricultural programmes, but coverage remains incomplete. The moderate uptake of insurance reflects broader trends in Nigerian agriculture. Agricultural production is highly exposed to climate variability, pests, and market fluctuations, yet insurance adoption remains relatively low among smallholder farmers due to lack of awareness, high premiums, and limited trust in insurance institutions (Hill, Hoddinott, & Kumar, 2013; Olubiyo et al., 2009).

The results also reveal substantial variation in farmers' participation across agricultural interventions between 2005 and 2025. The most widely participated programmes include:

- Fadama Development Programme (15.3%)
- N-Power Agro Programme (14.2%)
- Agricultural Transformation Agenda (12.4%)
- National Special Programme for Food Security (9.09%)
- Commercial Agriculture Development Programme (5.59%)

The Fadama programme's dominance is consistent with existing findings, which identifies it as one of Nigeria's most successful agricultural development initiatives. The programme emphasizes community-driven development, irrigation infrastructure, and farmer groups, thus improving

productivity and incomes (World Bank, 2017). Similarly, the Agricultural Transformation Agenda and Growth Enhancement Support Scheme were designed to modernize agriculture by improving fertilizer distribution and input access (Liverpool-Tasie et al., 2017). Participation in Anchor Borrowers' Programme (4.85%), RAAMP (3.37%) and International Fund for Agricultural Development Programme (IFAD)-Value Chain Development Programme (VCDP, 0.64%) reflects more recent policy efforts focusing on value chain financing and rural infrastructure development. These programmes aim to address systemic constraints such as market access and financing gaps (CBN, 2020). The spatial distribution also reveals that participation is uneven across states, with certain regions benefiting more from specific programmes. Such disparities have been widely reported in agricultural development studies, often attributed to political priorities, donor focus areas, and variations in institutional capacity (Ogwumike & Akinnibosun, 2013). However, the results also show relatively lower participation in smaller donor-driven projects such as HarvestPlus, ProSAB, and Heifer International interventions, each accounting for less than 1% participation. This suggests that while these programmes may be impactful locally, their geographic coverage and outreach remain limited compared with national initiatives. Similar findings have been reported in studies that argue that donor-funded agricultural projects often face scaling challenges due to funding constraints and institutional fragmentation (Ogunleye et al., 2018).

The results provide insight into the pattern of Nigerian farmers' participation in agricultural projects and interventions between 2005 and 2025, highlighting the prominence of specific programmes, the spatial accessibility of interventions, institutional reach, and complementary risk-management mechanisms such as insurance. These findings reflect broader structural characteristics of agricultural development programmes in Nigeria and align with empirical studies on farmer participation, rural development interventions, and agricultural policy outcomes. Farmer participation is concentrated in a few major national programmes, consistent with existing literature indicating that large-scale, government-led agricultural programmes tend to attract the highest participation because of their broad geographic coverage and financial support mechanisms (Adebayo & Olagunju, 2015; Liverpool-Tasie et al., 2017). The prominence of the FADAMA programme aligns with studies that identify it as one of the most successful rural development initiatives in Nigeria due to its community-driven development approach and emphasis on farmer groups (World Bank, 2016; Nkonya et al., 2012). Similarly, participation in the Agricultural Transformation Agenda reflects the policy shift toward value-chain development and private sector engagement in Nigerian agriculture during the 2011–2015 reform period (Federal Ministry of Agriculture and Rural Development [FMARD], 2016).

## Conclusion

The study examined the socio-economic, cultural, and institutional characteristics influencing farmers' participation

in agricultural projects and interventions in Nigeria. The findings reveal that most participating farmers are economically active adults with a mean age of about 41 years, indicating that agricultural development programmes largely attract individuals within the productive age group. However, participation is strongly dominated by male farmers, while women and youth remain underrepresented. This gender and age imbalance reflects structural challenges such as unequal land ownership, limited access to capital, and socio-cultural barriers that restrict the participation of women and young people in agricultural interventions.

The results also show relatively large household sizes, which provide family labour for agricultural activities and may facilitate participation in labour-intensive agricultural programmes. Education levels among respondents are relatively high, with a significant proportion having secondary and tertiary education. This suggests that human capital plays an important role in farmers' ability to understand programme requirements, access information, and engage with institutional structures supporting agricultural development.

Institutional participation through cooperatives was moderate, with slightly more than half of respondents belonging to at least one cooperative society. While cooperative membership enhances access to credit, information, and development opportunities, the concentration of decision-making authority among a small leadership group may limit inclusive participation and equitable benefit distribution. Spatial accessibility to markets, institutions, and extension services was generally moderate, although disparities still exist. Some farmers must travel considerable distances to access infrastructure and services, which may discourage participation in agricultural programmes.

The study further indicates that information dissemination among farmers is increasingly driven by mass media and digital communication channels such as radio, mobile phones, and online platforms, while traditional extension services play a relatively smaller role. This trend highlights the growing importance of digital technologies in agricultural knowledge dissemination and farmer mobilization.

Farm structure among respondents is predominantly smallholder-based, characterized by fragmented landholdings and insecure tenure arrangements. These land constraints influence farmers' willingness to invest in long-term agricultural innovations and participate in certain development programmes. Income levels remain modest, and access to formal agricultural credit is limited, forcing many farmers to rely on informal financial networks. Such financial limitations can restrict farmers' ability to fully benefit from agricultural interventions.

Participation in agricultural programmes between 2005 and 2025 was concentrated mainly in large national initiatives such as the Fadama Development Programme, Agricultural Transformation Agenda, and N-Power Agro Programme. These programmes recorded higher participation due to their broad geographical coverage and stronger institutional support. In contrast, smaller donor-driven projects recorded

relatively low participation levels, largely because of limited coverage and funding constraints.

Overall, the findings suggest that farmers' participation in agricultural interventions in Nigeria is shaped by a combination of socio-economic characteristics, institutional arrangements, infrastructure accessibility, information systems, and financial capacity. Addressing these structural factors is essential for improving the inclusiveness, effectiveness, and sustainability of agricultural development programmes.

In view of these findings, it is imperative to improve farmers' participation by implementing the following recommendations:

- i. Farmer cooperatives should be strengthened through improved governance, transparency, and leadership training. Encouraging broader participation in cooperative decision-making will help reduce elite capture and ensure that programme benefits are distributed more equitably among members.
- ii. Investment in rural infrastructure such as roads, markets, financial institutions, and communication networks should be prioritized to reduce spatial barriers to programme participation. Improved infrastructure will lower transaction costs and increase farmers' access to agricultural services and markets.
- iii. The agricultural extension system should be strengthened by recruiting more extension agents, improving training, and adopting modern communication technologies. Integrating digital tools such as mobile advisory platforms and radio programmes can complement traditional extension methods and expand outreach.
- iv. Financial institutions and government programmes should develop farmer-friendly credit schemes with simplified procedures and flexible collateral requirements. Integrating credit, insurance, and input support within agricultural programmes can improve farmers' ability to adopt innovations and manage production risks.
- v. Policies aimed at improving land tenure security should be implemented to encourage farmers to invest in long-term agricultural improvements. Secure land rights can increase farmers' willingness to participate in agricultural development projects that require sustained investment.

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