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Rural Cassava Farmers' Agro-climatic Information Needs in Osun State, Nigeria

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AAF: Interpretation of data and first draft (20%)

Abstract

*This research assessed the rural cassava farmers' agro-climatic information needs in Osun State, Nigeria. A multi-stage sampling procedure was used in selecting 210 respondents. Data were analysed in percentage and mean. Results revealed that radio/television ($\bar{x}$= 1.56) and personal experience with nature ($\bar{x}$= 1.41) were the most frequent sources of agro-climatic information. Many (65.2%) displayed high knowledge of cassava agro-climatic issues. Three-quarters (75.00%) of the respondents were favourably disposed to agro-climatic information. Furthermore, sources of best climate change adaptive cassava varieties planting materials for the region ($\bar{x}$=4.34) and appropriate timing for cassava planting to beat the adverse effects of climate change ($\bar{x}$=4.19) topped the list of needed agro-climatic information.*There is a significant relationship between *age (r= 0.972), years of formal schooling (r= 0.073), perception (r= 0.854) and their agro-climatic information needs. It was concluded that sources of best climate change adaptive cassava varieties planting materials and appropriate timing for cassava planting were prominent needed agro-climatic information. Climatic change adaptive and mitigating measures that represent most of the agro-climatic information needs of cassava farmers should be provided by both governmental and non-governmental agencies through the most frequent sources of agro-climatic information.*

Introduction

Agro-climate information is pivotal in assisting farming communities in managing climate variability and change. It could be transformed into specialized products, encompassing projections, trends, economic analyses, and services catered to various sectors, thereby facilitating farming society's adaptation to shifts in climate variability and change (Arnell and Freeman, 2021). This information contributes to formulating effective adaptation strategies to cope with the evolving environment (Kendon, McCarthy, Jevrejeva, Matthews, and Legg, 2019), especially in farming like cassava cultivation.

The absence of agro-climatic information constitutes vulnerability, as it creates a void susceptible to being filled with erroneous and misleading content. Addressing agro-climatic information needs could empower users, like rural cassava farmers, to make informed decisions regarding the climate change challenges they encounter (Parson, Rey, Tanguy and Holman, 2019). In essence, the quantity of available information about their immediate needs significantly influences rural farmers' decision-making processes contextually applicable within their specific local milieu, especially among those who rely on sufficient rainfall for healthy crop production since they engage in rain-fed agriculture. In Nigeria, especially in Osun State, cassava is a major crop and its cultivation is essential to the local economy. In the state, cassava is distributed and used traditionally; the majority of the crop is processed and eaten locally by farming communities, with very few going into industries. The majority of the State's cassava growers are smallholders who cultivate the crop on one to three hectares of land at a time.

The scientific community has diligently amassed agro-climatic information, yielding a substantial repository of climate change research and scientific data on cassava cultivation, in Nigeria and Osun state specifically, that could be employed for climate risk management. However, a gap persists between the generated information and the specific needs of cassava farmers, for informed decision-making.

The study assessed the rural cassava farmers' agro-climatic information needs in Osun state, Nigeria, specifically, it:

i. identified rural cassava farmers' sources of agro-climatic information;
ii. determined the knowledge level of cassava farmers on agro-climate issues;
iii. determined the respondents' perception of agro-climatic information; and
iv. examine the respondents' agro-climatic information needs.

Hypotheses of the Study

Hypothesis I

No discernible correlation exists between some socioeconomic attributes of the respondents and their agro-climatic information needs.

Hypothesis II

No discernible correlation exists between respondents' perception and their agro-climatic information needs.

Methodology

The research was done in Osun state located between latitude 7.2000° N and 8.0000° N and longitude 4.3000° E and 5.6000° E. The state has an estimated population of

4,862,049 and a land area of approximately 1,487,500 hectares (14,875 square kilometres).The state is divided into three senatorial zones which are: Osun-East, Osun-West, and Osun-Central Zones.

The research design employed was a simple survey design, based on the use of the quantitative method. The design investigated the correlation between dependent and independent variables. The study population comprised all rural farmers involved in cassava cultivation with at least 3 years of experience in Osun State. A multistage sampling procedure was utilised to choose study participants. Initially, two LGAs were carefully chosen on purpose from each senatorial zone based on the abundance of rural communities. This amounted to six LGAs. In the subsequent stage, two rural communities were selected on purpose, based on the prevalence of cassava cultivation, from each selected LGA, resulting in twelve communities. At the final stage, a proportionate sampling technique was employed to select two hundred and ten cassava farmers as reflected in Table 1. The sampling entities for this investigation were households engaged in cassava cultivation.

Table 1: Distribution of respondents by sample selection

Senatorial Zones	Selected LGAs	Selected Communities	Names of Selected Communities	Selected Number of respondents.
Osun-West	Iwo	2	Oloba	11
			Bataara	13
	Olaoluwa	2	Ikoriifin	20
			Bode Osi	17
Osun-Central	Ifelodun	2	Eko Ajala	18
			Eko Ende	23
	Odo Otin	2	Agbeyin	10
			Ore	24
Osun-East	Atakumosa-East	2	Ipole	20
			Bolorunduro	15
	Ife-East	2	Iyanfoworogi	24
			LaadinLakoro	15
Total		**12**		**210**

Source: Field survey, 2023

An organised and validated interview schedule was employed to get pertinent data from the participants. The quantitative data collected was subjected to appropriate statistics analysis with the aid of Statistical Product and Service Solution (SPSS) version 23 software, and presented in frequency counts, percentages, means and standard deviation. Chi-Square and correlation analyses were used to draw inferences. The respondents were asked to indicate the sources of agro-climatic information available to them in making decisions related to cassava farming operations in the past three years. Their responses were against a 3-point rating scale of never (0), occasionally (1), and frequently (2). Any of the sources with scores of 0, 0.01 - 1.00, and 1.01 - 2.00 is rated as never, occasionally, and frequently respectively. The knowledge level was measured by respondents' responses to the "what", "how"

and “when” of some agro-climate issues relating to cassava cultivation. Their reactions were measured using a knowledge assessment survey comprising yes (1) and no (0). The total knowledge score was generated and used to categorise knowledge into 3 levels: Low Knowledge = 0-5, Average Knowledge = 6-10, and High Knowledge= 11-15 through an equal interval approach as used by Adeloye, et al. (2022). The respondents’ perception of agro-climatic information needs was measured by asking them to indicate their agreement with perception statements about agro-climatic information in decision-making related to cassava farming operations. This was scored on a Likert rating scale of strongly agree (SA) = 5, agree (A) = 4, undecided (U) =3, disagree (D) = 2 and strongly disagree (SD) = 1 for affirmative declarations, and negative utterances the opposite as used by Adeloye, et al. (2022). The agro-climatic information needs were measured by the responses of the respondents to a list of agro-climatic information generated from literature and interaction with cassava farmers during a reconnaissance survey against a 4-point rating scale of not needed (0), slightly needed (1), moderately needed (2), and highly needed (3).

Results and Discussion

Sources of Agro-climatic Information

The result in Table 2 shows that the respondents identified radio/ television ($\bar{x}$= 1.56) as the highest-ranked source of agro-climatic information followed by personal experience with nature ($\bar{x}$= 1.41), fellow farmers, friends and families ($\bar{x}$= 1.34), topped the list of sources of agro-climatic information. It can be inferred from the result that radio/ television, fellow farmers, friends and families, and personal experience were the main sources of information about agro-climatic issues; this might be connected to their accessibility and affordability; this also implies that radio/ television and contact/ fellow farmers, family, together with friends could be exploited by extension agencies in reaching local farmers with relevant information on their farming activities. These findings concur with Aliyu et al. (2019) and Ozioko et al. (2022) who found that radio has the largest listenership and the ability to reach a significant number of farmers and other rural residents more quickly than other forms of communication in Nigeria. Others were mobile phone apps ($\bar{x}$= 0.95), personal prayers ($\bar{x}$= 0.94), extension workers ($\bar{x}$= 0.91), internet ($\bar{x}$= 0.67), local weather stations ($\bar{x}$= 0.63), dreams and visions ($\bar{x}$= 0.42), community leaders ($\bar{x}$ = 0.37), consultation with religion leaders ($\bar{x}$ = 0.34) and consultation with oracles ($\bar{x}$= 0.27) in descending order.

Table 2: Sources of agro-climatic information

Sources	Mean	Standard deviation
Radio/ television	1.56*	0.23
Personal experience with nature	1.41*	0.15
Farmers, families and friends	1.34*	0.44
Mobile phone apps	0.95*	0.28
Personal prayers	0.94*	0.22
Extension workers	0.91*	0.01
Internet	0.67	0.07
Local weather stations	0.63	0.12
Dreams and visions	0.42	0.09
Community leaders	0.37	0.08
Consultation with religious leaders	0.34	0.11
Consultation with Oracles	0.27	0.13

Source: Field survey, 2023 **Grand mean** 0.89 *****Means above the cut off

Knowledge of Cassava Farmers on Agro-climatic Issues

Results in Table 3 show that the vast majority of the respondents were knowledgeable in parameters relating to cassava agro-climatic issues such as “change in rainfall patterns, duration and intensity affect cassava growth and yield” (91.0%), “climate change affect soil fertility and nutrient availability in cassava farm” (89.5%), “agro-climatic information cannot reduce risks and losses in cassava farms” (89.0%) and “the optimal planting season for cassava, given changes in weather patterns” (84.3%) among other cassava agro-climatic knowledge parameters.

The result indicates a generally high knowledge of agro-climatic issues in cassava farming among the respondents; this might be connected to various sources of information about agro-climatic issues accessible to them and their personal experience with nature over the years. However, there are still areas where knowledge could be improved, such as adaptive and mitigation measures against the effect of climate change on cassava farming (promotion of climate-resilient agricultural practices and adaptive crop varieties). These findings underscore the significance of climate education and extension services to equip farmers with the necessary knowledge to make informed decisions and enhance their agricultural productivity in the face of climate change. It can be inferred that the farmers' awareness level is likely to drive them towards adopting adaptation approaches to enhance their productivity. This aligns with the discoveries made by Petrova (2024) and Tamayo-Vera et al. (2024), which indicated that farmers are indeed aware of climate change.

Table 3: Knowledge of cassava farmers on agro-climatic issues

Knowledge parameters	Percentage
Agro-climatic information cannot reduce risks and losses in cassava farms.	89.0
What is the optimal planting season for cassava, given changes in weather patterns?	84.3
What is the best soil for cassava production?	74.3
There are newly emerging cassava weeds, pests and diseases due to climate change.	53.3
Changes in rainfall patterns, duration and intensity affect cassava growth and yield	91.0
Climate change affects soil fertility and nutrient availability in cassava farm	89.5
Have you heard of drought-resistant cassava varieties?	52.4
Rainfall patterns in my area have changed over the last five years	74.3
Climate change affect adversely the yield and economic viability of cassava	79.0
Variations in flooding pattern, duration and intensity cannot reduce the growth and yield of cassava	69.0
Variations in harmattan pattern and intensity have adverse effect on cassava farming	81.4
Variations in daylight and night length have adverse effects on cassava farming	76.2
Alteration in the cassava farming calendar is a measure to mitigate the effect of climate change	71.4
A high human population makes a location vulnerable to climate change	70.0
A heavy concentration of industries makes a location vulnerable to climate change	71.9

Source: Field survey,2023

Level of Knowledge

Results in Figure 1 reveal that many (65.2%) of the respondents displayed high knowledge, few (21.6%) displayed average knowledge, and very few (13.2%) displayed low knowledge of cassava agro-climatic issues. This finding implies that there is a high knowledge of cassava agro-climatic issues among the respondents; this might be connected to their sources of information on agro-climatic issues. This finding is in tandem with that of Anabaraonye, et al. (2019) who opined that there is adequate knowledge of climate change among rural farmers in Nigeria.

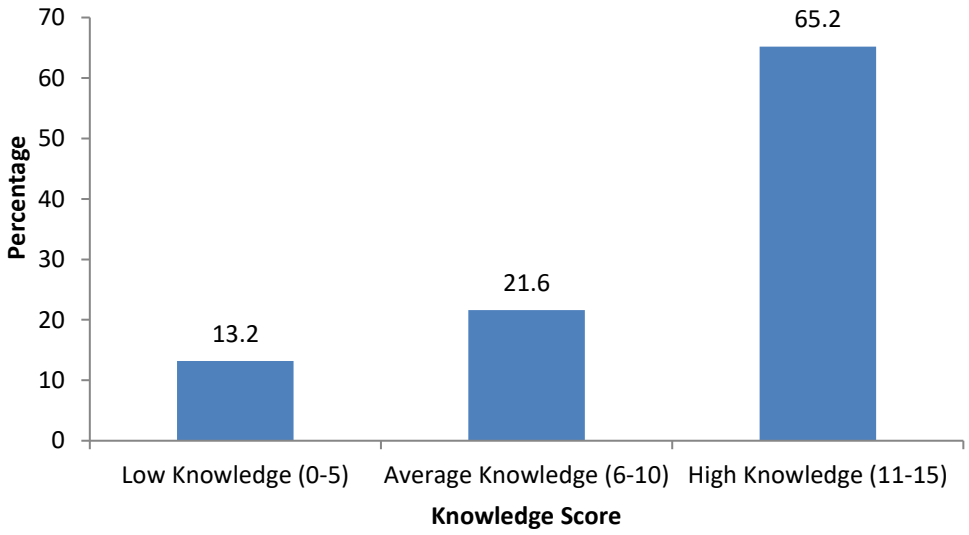

Figure 1: Level of respondents' knowledge of cassava agro-climatic issues

Perception of Agro-Climatic Information

Results in Table 4 showed that using the ranking mean scores, respondents' perceptions of agro-climatic information vary. When contrasting the grand mean score (3.27) with the individual perception mean score, results revealed respondents strongly agreed with the following perception statements: training or support on how to interpret or use agro-climatic information can optimize cassava farming operations ($\bar{x}$= 4.76), agro-climatic information can help me make better decisions about cassava farming ($\bar{x}$= 4.48), agro-climatic information helps to adapt and mitigate the effect of climate change on cassava farming ($\bar{x}$= 4.39), and agro-climatic information helps in reducing risks and losses on cassava farms ($\bar{x}$= 4.33). Similarly, the respondents agreed with the following statements: agro-climatic information indirectly increases the yield of cassava. ($\bar{x}$= 3.51), agro-climatic information is useful for cassava farming operations. ($\bar{x}$ = 3.47), agro-climatic information improves the quality of cassava produce ($\bar{x}$= 3.45); agro-climatic information accurately reflects weather patterns and climate conditions ($\bar{x}$ = 3.33), and agro-climatic information helps in preventing/mitigating emerging pests and disease infestation on cassava farms ($\bar{x}$= 3.28). They were indifferent to the following sets of perception statements: agro-climatic information is very reliable ($\bar{x}$= 2.29) and I rely on agro-climatic information to make decisions about cassava farming operations ($\bar{x}$= 2.20); while they disagreed with agro-climatic information is easy to understand and apply on cassava farms. ($\bar{x}$= 1.29). The result in Figure 2, shows that three quarter (75.00%) of the respondents were favourably disposed to agro-climatic information, a few (16.67%) were indifferent to

agro-climatic information, while very few (8.33%) were unfavourably disposed to agro-climate information. Mitter, Larcher, Schonhart, Stottinger, & Schmid (2019) stated that climatic information is temporally congruous with farmers' perception, which can enhance support for climate action policy and adaptation strategies.

Table 4: Perception of respondents on agro-climatic information

Variable	Mean	Standard deviation
Training or support on how to interpret or use agro-climatic information can optimize cassava farming operations.	4.76	2.02
Access to agro-climatic information indirectly increases the yield of cassava.	3.51	1.23
Agro-climatic information can help me make better decisions about cassava farming.	4.48	2.21
Agro-climatic information is useful for cassava farming operations.	3.47	1.67
Agro-climatic information improves the quality of cassava produce	3.45	1.55
Agro-climatic information helps to adapt and mitigate the effect of climate change in cassava farming.	4.39	1.41
Agro-climatic information helps in reducing risks and losses in cassava farming.	4.33	1.92
Agro-climatic information accurately reflects weather patterns and climate conditions.	3.33	1.34
Agro-climatic information is very reliable	2.29	1.29
Agro-climatic information could help in preventing/managing emerging pests and diseases on cassava farms.	3.28	0.87
Agro-climatic information is easy to understand and apply on cassava farms.	1.29	0.31
I rely on agro-climatic information to make decisions about cassava farming operation	2.20	1.04

Source: Field survey, 2023 **Grand mean = 3.27**

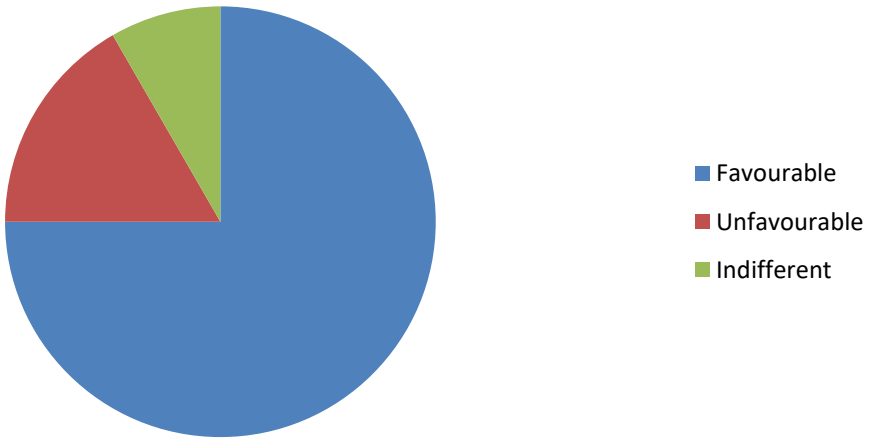

Figure 2: Level of perception to agro climate information
Source: Field survey, 2023

Agro-Climatic Information Needs

Results in Table 5 reveal that sources of best climate change adaptive cassava variety planting materials for the region ($\bar{x}$= 4.34) topped the list of needed agro-climatic information by the respondents, followed by appropriate timing for cassava planting to beat the adverse effect of climate change ($\bar{x}$= 4.19), appropriate timing for cassava harvesting to beat the adverse effects of climate change ($\bar{x}$= 4.17) in the descending order. Others were, soil moisture levels for optimizing cassava yields in changing climate conditions ($\bar{x}$= 4.16), cassava production adaptation and mitigation measures to changing climate conditions ($\bar{x}$= 4.13) and the impact of climate change on cassava production ($\bar{x}$= 4.04) among others; In contrast, government policies and programmes in mitigating climate change in cassava production ($\bar{x}$= 4.04) ranked least on the list.

These results imply that the majority of agro-climatic information needs of the respondents were climate change adaptive and mitigating measures in cassava production; this might be connected to the inevitability of adverse effects of climate change. This result is in tandem with that of Anabaraonye, et al. (2019) and Maas, et al. (2020) who reported that forecasting and monitoring of rainfall, sunshine, drought and climate change-compliant management practices were the needed agro-climatic information among farmers in Imo state, Nigeria. Information on government policies and programmes in mitigating climate change in cassava production ranked least, this might be connected to the fact that there is a disconnect between the public extension service delivery and the rural farmers because of the too-large extension agent and farmers ratio. This could also be because proper channels were not been used for the local farmers.

Table 5: Agro-climatic information needs of the respondents

Agro-climatic information	Mean	Standard deviation
Sources of best climate change adaptive cassava varieties planting materials for the region.	4.34	1.21
Appropriate timing for cassava planting to beat the adverse effects of climate change	4.19	2.11
Appropriate timing for cassava harvesting to beat the adverse effects of climate change	4.17	1.93
Soil moisture level for optimizing cassava yields in changing climate conditions	4.16	1.11
Cassava production adaptation and mitigation measures to changing climate conditions	4.13	1.34
Impact of climate change on cassava production	4.04	1.77
Reducing risks and losses in cassava production in the face of climate change	4.03	1.24
Management of emerging cassava pests and diseases as a result of climate change	4.02	1.18
Flood prevention and control in cassava farms	4.01	1.38
Drought management in cassava farms	3.99	1.65
Water resources management and irrigation strategies during drought in cassava farms.	3.92	1.89
Government policies and programmes in mitigating climate change in cassava production	3.85	2.23

Source: Field survey, 2023

Relationship between Selected Socioeconomic Characteristics and Agro-Climatic Information Needs

Table 6 shows that there is a significant relationship between selected socio-economic characteristics such as age (r=0.972), household size(r=0.343), years of formal schooling (r=0.073), and cassava farming experience (r=0.385), together with perception (r= 0.854) and their agro-climatic information needs. This statistical significance suggests that these variables influence the information needs of the farmers; the more their age, household size, years of formal schooling, and farming experience, together with more favourable perception the more their agro-climatic information needs. This is in line with the findings of Aliyu, et al. (2019) and Owusu, et al. (2020) who asserted that socio-demographic variables are significant predictors of climate change information need.

Table 6: Influence of socioeconomic characteristics of respondents on their agro-climatic information needs

Variable	Pearson Correlation coefficient (r)
Age	0.972**
Household size	0.343**
Years of schooling	0.073*
Cassava farming experience	0.363**
Cassava farm size	0.070
Perception	0.854*

**P≤ 0.01 level (2-tailed), *P≤ 0.05 level (2-tailed).
Source: Field survey, 2023

Conclusion and Recommendations

Radio, television and personal experience with nature were the most frequent sources of agro-climatic information. There was high knowledge among the respondents of agro-climatic issues relating to cassava farming, and a majority of the respondents were favourably disposed to agro-climatic information. Furthermore, sources of best climate change adaptive cassava variety planting materials, appropriate timing for cassava planting, and appropriate timing for cassava harvesting to beat the adverse effects of climate change topped the list of needed agro-climatic information by the respondents. Climatic change adaptive and mitigating measures that represent most of the agro-climatic needs of cassava farmers should be provided by both governmental and non-governmental agencies through the most frequent sources of agro-climatic information.

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