



UTILIZATION OF WEATHER FORECASTS BY FOOD CROP PRODUCERS IN KANO STATE, NIGERIA

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ABSTRACT

The study examined the utilization of weather forecast information by food crop producers in Kano State, Nigeria, with a focus on Gaya, Kura, and Bagwai Local Government Areas. Specifically, the study described the socio-economic characteristics of farmers, assessed their communication behavior and perceptions toward weather forecast information, identified sources of weather forecasts, determined the extent of utilization, and examined constraints limiting effective use. A multistage sampling technique was employed to select 338 food crop producers, and primary data were collected using a structured interview schedule. Descriptive statistics were used to summarize farmers' characteristics and patterns of utilization, while linear regression analysis examined the relationship between farmers' perception of weather forecast information and selected socio-economic variables. Findings revealed that farmers generally perceived weather forecast information as useful for agricultural planning, particularly in decisions related to planting time (34.6%), land preparation (26.8%), and crop selection (8.9%). However, the extent of utilization was moderate, constrained by factors such as limited access to timely forecasts, language barriers (8.7%), inadequate extension support (19.1%), and mistrust due to perceived inaccuracies (19.6%). The study concludes that although weather forecast information has the potential to reduce production risks and enhance food security in Kano State, its effectiveness is limited by communication and institutional challenges. Strengthening extension services, improving the timeliness and localization of forecasts, and simplifying forecast messages in local languages are recommended to enhance utilization among food crop producers.

Keywords: Utilization, Weather Forecast, Food Crop, Producers

INTRODUCTION

The timely and accurate weather forecasts are essential aids for food crop producers to optimize planting, pest management, and harvest scheduling. Agriculture as a major employer of labor in Kano is facing serious setbacks as a result of unexpected weather conditions which have led to great production losses (Oyekale, 2015). However, the farmers in this region face significant challenges due to unpredictable weather patterns. Extreme weather events like floods and prolonged dry spells can devastate crops and threaten food security. Reliable weather forecasts are essential for agriculture, as they provide critical information that helps farmers make informed decisions and optimize their practices. According to Agyekum *et al.* (2018), as well as Balarabe *et al.* (2023), these forecasts can significantly enhance farming outcomes by allowing farmers to plan for weather conditions and reduce risks. Moreover, having access to timely and accurate weather information is crucial for building adaptive capacity in farming communities. (Brown and Antle (2015) emphasize that improving farmers' ability to respond to weather variations is vital for creating resilient agricultural systems. This enhanced adaptive capacity can lead to sustainable farming practices, increased productivity, and better resilience against climate-related challenges.

Kano State is characterized by a tropical wet and dry climate, which presents unique challenges for farmers. The region's agricultural calendar is heavily influenced by the onset and cessation of rains. In recent years, erratic rainfall patterns have led to unpredictable planting and harvesting seasons, making it difficult for farmers to plan their activities effectively. Reliable weather forecasts can provide the critical information needed to navigate these challenges, such as predicting the start of the rainy season, the likelihood of dry spells, and the risk of flooding.



Weather forecasts play a crucial role in agricultural decision-making. Accurate and timely weather forecasts can inform critical agricultural decisions, such as land preparation, crop selection, and the timing of planting and harvesting. By leveraging this information, farmers can better manage their resources, reduce crop losses, and improve yields (Awolala, 2018). Access to weather information can also facilitate the adoption of climate-smart agricultural practices, such as drought-resistant crops and water conservation techniques, enhancing both productivity and resilience in the face of climate change (Brown, *et al* 2015). It is with this background that this study intends to analyze the utilization of weather forecast by food crop producers in Kano State, Nigeria.

While previous research has touched on the importance of weather information in agricultural settings (Awolala, 2018; Balarabe *et al.*, 2023), there is a substantial gap concerning the specific utilization of weather forecasts by farmers in Bagwai, Gaya and Kura, Kano State. Most studies, such as those by Audu *et al.* (2013), have been conducted in southern Nigeria, leaving a void in understanding the unique socio-economic dynamics affecting weather information utilization in Kano State. Additionally, existing literature often overlooks the constraints that hinder farmers from accessing and utilizing weather forecast information.

This study aims to fill critical knowledge gaps regarding the utilization of weather forecast information among agricultural food producers in Bagwai, Gaya and Kura, Kano State, Nigeria.

MATERIALS AND METHOD

The study was conducted in Gaya, Kura and Bagwai Local Government Areas of Kano State, Nigeria. These areas were purposively selected based on their representation of different agricultural zones under the Kano Agricultural Development Programmed (KNARDA), Gaya LGA falls within Zone 3, Kura LGA is in Zone 1, and Bagwai LGA is in Zone 2. A multi-stage sampling procedure **was** employed in this study to ensure adequate representation of food crop producers across agro-ecological zones in Kano State. In the first stage, Kano State was divided into three agricultural zones: zone 1, zone 2, and zone 3 using stratified sampling technique. For this study, one Local Government Area (LGA) was selected purposively from each zone based on the predominance of food crop production activities. The selected LGAs are Kura from zone 1; Gaya from zone 2; and Bagwai from zone 3. In the third stage, three villages each were randomly selected from Gaya, Kura, and Bagwai Local Government Areas making a total of nine (9) communities. The communities include Dan Hassan, Kosawa, and Imawa in Kura LGA and Balan, Gamoji, and Ni'ima in Gaya, Wurobagga, Kiyawa, and Bagwai Central in Bagwai Local Government Area. The population of food crop producers in the selected villages of Gaya, Kura and Bagwai Local Government Area was presented in Table 1, which served as the sampling frame for the study.

Lastly, the sampling frame was subjected to the Raosoft sample size calculator to determine the recommended sample size. The sample size was therefore proportionately (12%) and randomly selected, resulting in 338 respondents, as recommended by the Raosoft calculator, which constituted the sample size for this study.

RESULTS AND DISCUSSION

Personal Profiles of the Food crop producers

The personal profiles of farmers are important human attributes that enhance the adoption of agricultural innovations. They also assist in getting the clear understanding of the behavior of the farmers as well as providing a hint towards explaining their disposition that could improve their productivity (Ayinde, 2007). The personal profiles variables identified for this research include age, household size, farm size, income level, farming experience, marital status, level of education, estimated annual income innovativeness, economic orientation, and cosmopolitans.



Table 1: Socio-Economic Variables of Respondents (Quantitative)

Variable	Frequeny	Percentage	Min	Max	Mean	Std
Age (years)						
17-30	97	28.7	17	80	40.43	13.742
31-43	122	36.1				
44-56	71	21				
57-70	40	11.8				
71-80	8	2.4				
Household size(numbers)						
1-7	149	44.1	1	35	9.51	6.322
8-14	120	35.5				
15-21	51	15.1				
22-35	18	5.3				
Farming experience (years)						
1-12	118	34.9	1	60	20.22	12.925
13-24	105	31.1				
25-36	67	19.8				
37-48	38	11.2				
49-60	10	2.9				
Farm Size (Hectares)						
0.5-1.0	116	34.3	0.5	5.0	1.916	0.9627
1.5-2.0	127	37.6				
2.5-3.0	74	21.9				
3.5-4.0	16	4.7				
4.5-5.0	5	1.5				
Annual Income						
70000-1000000	188	55.6	70000	8000000	150224	131677
1000001-2000000	82	24.3			8.52	8.329
2000001-4000000	50	14.8				
4000001-6000000	16	4.7				
6000001-8000000	2	0.6				

Source: Field survey, 2025

Age of the Food Crop Producers

A farmer's age is said to influence his maturity and decision-making ability (Sani *et al.*, 2014). As indicated in Table 1, the results shows that substantial proportion (45%) of the respondents were within the productive age group of 31–45 years, with an average age of 40 years. This implies that most of the farmers are in their economically active years and are likely to engage in productive agricultural activities. This finding is consistent with the report by Ogunwale *et al.* (2020), where approximately half (50.8%) of the respondents fell within the 40–49 years age range.

Household size of the Food Crop Producers

The result in Table 1 also shows that the respondents (44.1%) had relatively large household sizes, with an average of 10 members, which may provide a readily available source of farm labor. This finding is consistent with Abegunrin *et al.* (2021), who reported that 91.8% of arable crop farmers in Oyo State had household sizes within similar range 10 people.

Farming experience of the Food Crop Producers

The results in Table 1 revealed that the respondents (34.9%) had an average farming experience of 20.22 years (SD = 12.93), with the majority (63.3%) having between 1–20 years of experience. The average farming experience of 20 years further indicates that respondents are well-experienced and capable of relating traditional weather knowledge with modern forecast information. However, a SD of 12.93 indicate an extremely diverse or heterogenous farming population. These findings corroborate that of Ajiboye (2014) who observed a mean of 22.1 years for arable crop farmers in Kano State.

Farm size of Food Crop Producers

In Nigeria's agricultural system, a notable aspect is the significant share of farm production managed by smallholder farmers. The findings reveal that the respondents had a mean farm size of 1.92 hectares (SD = 0.96), with 51.5% cultivating between 2.0-3.0 hectares of land. This demonstrates that farming in the study area is dominated by smallholder farmers with a highly consistent scale of production, a common feature of rural agriculture in Nigeria. The relatively small farm sizes may influence the level of investment in new technologies, including the use of meteorological information systems. Smallholder farmers might rely more on informal weather indicators unless they have easy access to localized and simplified forecast information. This result varies from the findings of Abegunrin *et al.* (2020), who reported that most farmers cultivated less than one hectare of land, and Ashagidigbi *et al.* (2019), who observed that most arable crop farmers operated on less than one hectare due to challenges in land acquisition and allocation.

Estimated annual income of the Food crop producers

The estimated annual income of food crop producers in the study area revealed that about **44% of the farmers earned above ₦1,000,000 annually**, with a **mean annual income of ₦1.5 million**, signifying moderate income levels across the population. This implies a moderate -income farming community with very high wealth inequality due to large SD indicating highly skewed income. This finding is consistent with **Idike and Nwibo (2024)**, who reported that livestock farmers in Ebonyi State had an **average annual income of ₦1,411,300**, with most (40.5%) earning between ₦500,001 and ₦1,000,000 annually. Their study equally noted that such income levels suggest a decent earning capacity and potential for reinvestment in agricultural enterprises. The similarity in income ranges across studies indicates that farmers in Nigeria generally maintain moderate income levels capable of sustaining both household and farm needs.

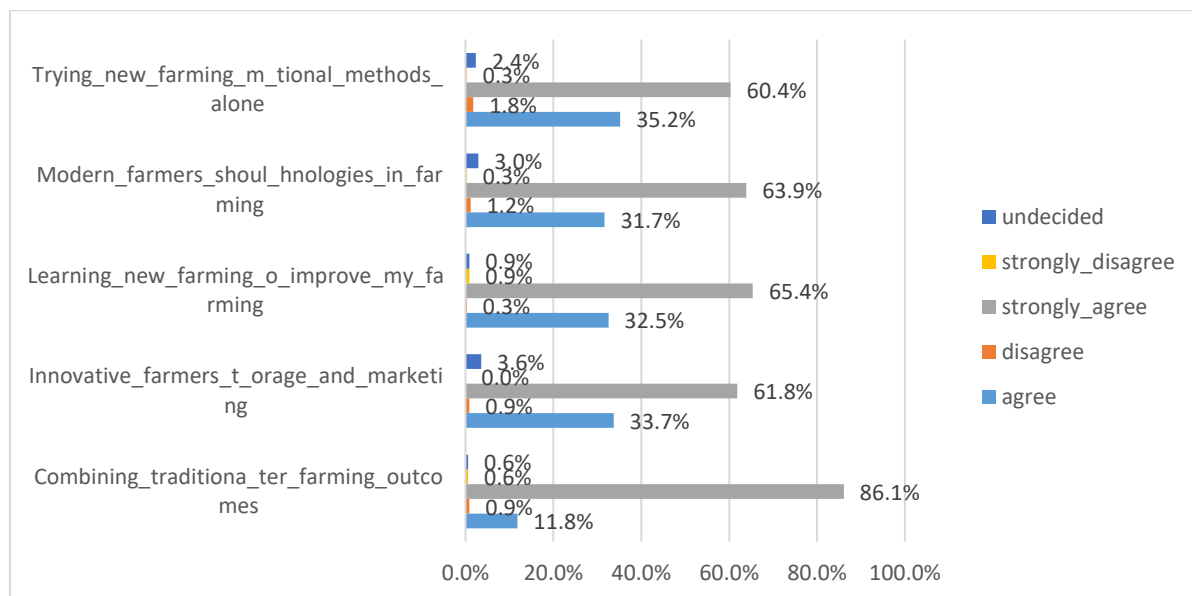


Figure 1: Farmers Innovativeness

The results presented in Figure above reveals a generally positive disposition of farmers toward innovation and the adoption of improved farming practices. A large majority of respondents (95.6%) agreed and strongly agreed that combining traditional farming practices with new methods enhances farming outcomes, with only 1.2% expressing disagreement and 3.2% remaining undecided. Similarly, 95.5% of farmers affirmed that trying new methods of planting, harvesting, storage, and marketing improves their farming activities; while a very small proportion (3.0%) were undecided and (1.5%) disagreed strongly agreed. Furthermore, 95.6% of farmers expressed agreement that modern farmers should adopt improved technologies in farming, reinforcing the perceived relevance of technological

innovation in agricultural production. Across all statements, the proportions of respondents who were undecided or expressed disagreement were consistently low, ranging from 0.6% to 3.6%, suggesting a high level of consensus among farmers. Overall, these findings demonstrate that farmers in the study area possess a positive attitude toward innovation and are generally willing to experiment with and adopt new techniques and technologies aimed at enhancing productivity and performance. This result is consistent with the findings of Ikehi *et al.* (2022), who reported that farmers in Enugu State, Nigeria, exhibited a high readiness to adopt agricultural innovations and recognized their importance in improving farming outcomes.

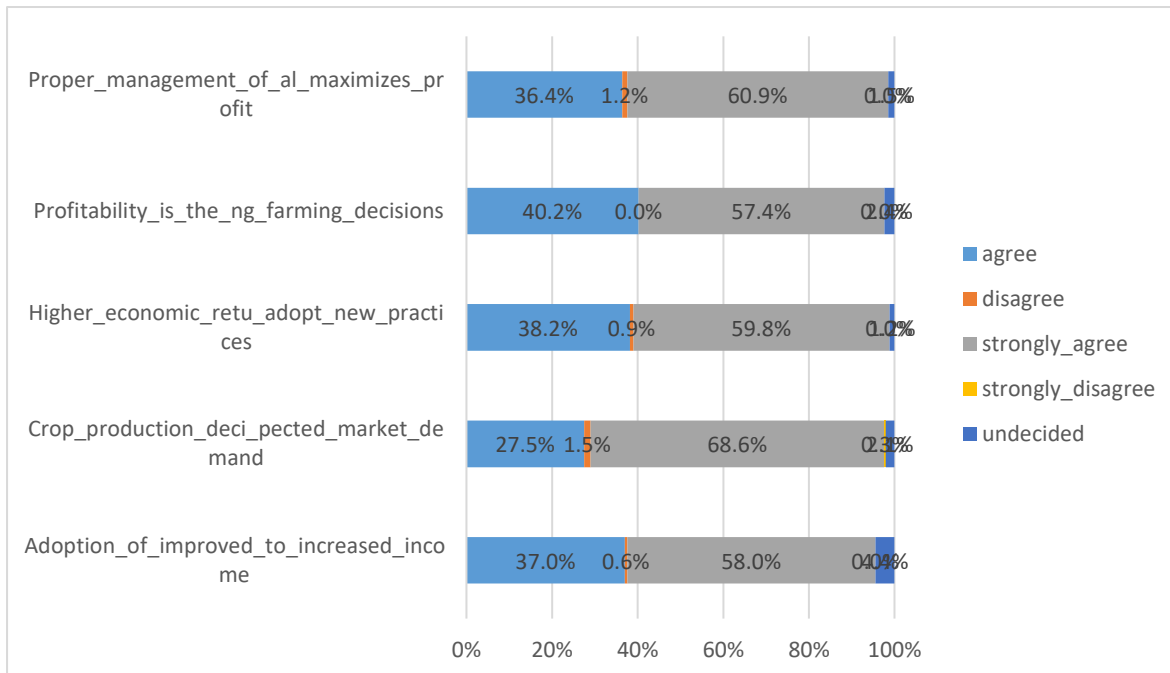


Figure 2: Economic orientation

Economic Orientation

The findings presented in the figure above indicate a strong economic orientation among respondents toward their farming activities. A substantial proportion of farmers either agreed or strongly agreed that profitability guides their farming decisions, accounting for 97.6% of responses, with only 2.4% expressing neutrality. Similarly, 95.0% of respondents affirmed that adopting improved farming practices leads to increased income; while a negligible proportion (5.0%) were undecided and disagreed. In the same vein, 97.1% of respondents agreed and strongly agreed that proper management of resources such as land, labor, and capital maximizes profit, indicating widespread recognition of efficient resource use as a pathway to improved economic outcomes. Furthermore, 98.0% of farmers reported that higher economic returns motivate the adoption of new farming practices, underscoring the role of expected financial benefits in shaping innovation uptake. This observation is consistent with the findings of Onuoha and Umehali (2021), who reported that cooperative farmers in Nigeria adopt agricultural technologies primarily to enhance productivity and profitability. Together, these results reinforce the view that economic incentives and expected returns are critical drivers of technology adoption and improved farming practices among Nigerian farmers.

Table 2: Perception of Farmers toward Weather Forecast Information

Predictor	Beta (β)	t	Sig. (p)
Household Size	-0.119	-2.215	0.027**
Years of Formal Schooling	0.563	11.951	0.000***
Farming Experience	0.108	1.924	0.055*
Farm Size	0.011	0.229	0.819
Estimated Annual Income	-0.008	-0.166	0.869
Market Orientation Score	0.076	1.500	0.135
Innovative Score	0.024	0.408	0.684
Economic Orientation Score	0.102	1.661	0.098*
Cosmopolite Score	0.111	2.379	0.018**

Source: Field Survey, 2025

* P < 10% significant, ** = P < 5% significant, *** = P < 1% Sig,

R Square: 0.374

Adj. R Square: 0.356

Perception of Farmers toward Weather Forecast Information

The multiple regression analysis (Table 2) examined the factors influencing farmers' perception of weather forecast information in the study area. The model was statistically significant ($F(9, 328) = 21.742, p < 0.001$) and explained approximately 37.4% of the variation in perception scores ($R^2 = 0.374$), indicating that the socioeconomic and attitudinal variables jointly contributed meaningfully to how farmers perceived weather forecast information.

The result revealed that years of formal schooling ($\beta = 0.563, p < 0.001$) had the strongest positive and highly significant influence on perception, implying that more educated farmers are better able to interpret and appreciate the relevance of weather forecasts in their farming operations. This corroborates **Ogunjinmi et al. (2023)**, who found that maize farmers' level of education and in Ido Local Government Area of Oyo State significantly enhanced their perception and utilization of weather forecast information.

Cosmopolite orientation ($\beta = 0.111, p = 0.018$) also had a positive and significant effect, suggesting that farmers who are more outward-looking and engage with external information sources and networks tend to value forecast information more. This finding **agrees with** the report of **Ogunjinmi et al. (2023)**, who found that access to reliable information significantly enhanced farmer's perception and utilization of weather forecast information. Similarly, **Ofoegbu et al., (2021)** further emphasize that organizational collaborations significantly influence climate information communication to farmers.

Household size ($\beta = -0.119, p = 0.027$) negatively influenced perception, implying that larger households may limit farmers' attention and willingness to apply weather forecast information due to resource and time constraints. Farming experience ($\beta = 0.108, p = 0.055$) and economic orientation ($\beta = 0.102, p = 0.098$) were both significant at the 10% level, indicating that more experienced farmers and those with stronger economic motivation tend to have slightly higher perception of weather forecast information. This result is in variant with **Abegunrin et al. (2021)** and **Alliagbor et al. (2021)** who reported that household size and farming experience were not statistically significant with the use of weather forecast information.

Other factors such as farm size, estimated annual income, market orientation, and innovativeness were not significant, suggesting that awareness, education, and exposure are stronger determinants of positive perception than purely economic capacity.



CONCLUSION AND RECOMMENDATIONS

This study examined how food crop producers in Gaya, Kura, and Bagwai Local Government Areas of Kano State utilize weather forecast information. The findings indicate that although farmers generally recognize the usefulness and relevance of weather forecasts for agricultural production, their actual level of use remains moderate. Weather information is most commonly applied in decisions related to planting time, land preparation, crop selection, and risk management. However, several factors continue to hinder optimal utilization. These include delays in information dissemination, the technical nature of forecast messages, language barriers, weak extension support, limited access to dependable communication channels, and occasional mistrust stemming from perceived forecast inaccuracies.

Personal profiles and perception of weather forecast information: Given that years of formal education, farming experience, household size, economic orientation, and cosmopolitanism significantly influenced farmers' perception of weather forecast information, targeted capacity-building programs should be implemented to improve farmers' understanding and trust in weather forecasts. Such programs should focus on simplifying forecast messages, using practical examples, and strengthening farmers' ability to interpret and apply weather information in farm decision-making.

Communication behavior of the farmers: Given farmers' strong reliance on interpersonal networks, extension services should adopt community-based communication approaches by working closely with progressive farmers, village leaders, and farmer groups to disseminate weather forecast information. And also there is a need for extension services to promote simple and practical documentation and record-keeping practices that can enhance information preservation, retrieval, and sustained use of weather and agricultural information for improved farm decision-making.

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