



**ANALYSIS OF FARMER'S KNOWLEDGE, ATTITUDE AND PRACTICES TOWARDS
THE ADOPTION OF GINGER PRODUCTION TECHNOLOGIES IN
SOUTHERN KADUNA, KADUNA STATE NIGERIA**

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ABSTRACT

The study examined farmer's knowledge, attitude and practices towards the adoption of ginger production technologies in southern Kaduna, Kaduna State Nigeria. Multistage sampling technique was employed in selecting 215 respondents from the study area. Data were obtained through the administration of structured questionnaire to the respondents, both descriptive and inferential statistics were used in analyzing data. The result revealed that most of the respondents were within their active ages of production as indicated by the mean age of 39 years. Majority (76.6%, 71.1% and 70.2%) of the respondents were male, married and had attended tertiary levels of education with a mean household size of 6 persons, 16 years of farming experience, 2.4ha of farm size and income of ₦784,839.45. In addition, the findings showed that the major technologies adopted in ginger production were combination of organic and inorganic fertilizer (91.7%), harvesting (91.7%), fertilizer application (90.8%) and weeding (90.8%) which were ranked 1st and 3rd, respectively. The result further shows that respondents had a full knowledge and agreed on ginger production technologies as indicated by mean scores above the mean threshold values of 2.0 and 3.0, respectively. The findings also showed that respondents attitudes toward ginger production were; it requires capital outlay ($\bar{X}=4.3$), it is easy to cultivate ($\bar{X}=4.0$), it has good medicinal value ($\bar{X}=4.2$), result to high yield ($\bar{X}=4.1$) and had high market value ($\bar{X}=4.3$) as indicated by the mean scores above the threshold value of 3.0. Based on the finding of the study it is concluded that respondents has were aware and had good knowledge of improved practices as well as positive attitudes to facilitate the adoption of ginger production technologies. It is recommended that ginger producers should form and participate actively in cooperatives so as to increase their accessibility to production inputs, government should subsidized cost of inputs for ginger producers.

Keywords: Farmer, Knowledge, Attitude, Practices, Ginger.

INTRODUCTION

Ginger (*Zingiber officinale* Rosc.) is an important commercial crop grown for its aromatic rhizomes which is used both as a spice and a medicine. It is marketed in different forms such as raw ginger, dry ginger, bleached dry ginger, ginger powder, ginger oil, ginger oleoresin, ginger ale, ginger candy, ginger beer, brined ginger, ginger wine, ginger squash, ginger flakes etc. Ginger root and ginger oil are also used as preservative and flavoring agent. Ginger is one of the oldest and most important spices used in different kinds of food preparation (Jakkawad *et al.*, 2017). Ginger possesses a warm pungent taste and a pleasant odor; hence it has a wide use as a flavoring in numerous food preparation, beverages, ginger bread, soups, pickles and many soft drinks. Ginger is the most widely grown by all farming communities in the Jaba region. Indeed, it is the main cash crop that all small holder farmers in the region are willing and deeply involved in cultivating due to high profit. This made some farmers in the area to devote all their farmlands to ginger production as against subsistence crops such as guinea corn or maize. In terms of local consumption, however, it is the least among all the other cultivars. This is because; over 95% of its produce is exported to various countries of the world as export commodity (Ahmed, 2018). There are two major varieties of ginger grown in



Nigeria which differ in the colour of their rhizomes namely, the reddish and yellow varieties. The yellow variety appears to be widely planted than the reddish variety.

It is believed that the adoption of new agricultural technology, such as the high yielding varieties that kickstarted the green revolution in Asia, could lead to significant increases in agricultural productivity in Africa and stimulate the transition from low productivity subsistence agriculture to a high productivity agro-industrial economy (Onyeneka, 2017). In this regard, Mendola (2007) observes that the adoption of high yielding varieties has had a positive effect on household well-being. In addition, empirical studies (Diagne *et al.*, 2009; Bellon *et al.*, 2006 and Evenson and Gollin, 2003) show that gains from new agricultural technology influenced the poor directly, by raising incomes of farm households and indirectly, by raising the employment and wage rates of functionally landless laborers, and by lowering the price of food staples. Nigeria ranked first in terms of the percentage of total hectares of ginger under cultivation but her contribution to total world output is too low compared to other countries. This could be attributed to the fact that most of production is undertaken by smallholder and traditional farmers with rudimentary production techniques and low yields. In addition, the smallholder farmers are constrained by many problems like inadequate attention towards farming of the crop as a business enterprise, therefore not adequately focused on profit maximizing motive. This entails a little change of the economic behaviour of the farmer, his social relationships and local knowledge with little commercialization. Therefore, improving ginger production by farmers from subsistence to commercial production is long overdue as these resource poor farmers are faced with production and post-production challenges ranging from non-use of improved varieties, manual land preparation, inadequate inputs, local processing techniques, inadequate credit/capital, which often results in low production/ha and poor ginger quality. There appears to be relative decline in ginger yield while soil erosion seems to be on the increase in this area. This has led ginger farmers to put enormous pressure on the available land, to the extent of farming on marginal land, which may be unsustainable. Although, there are several studies in the area that have attempted to describe the farming practice of ginger in Southern Kaduna such as Sati and Bala (2017), and Ibrahim (2018) among others, there exist no single attempt to describe the knowledge, attitude and practices of farmers towards the adoption of ginger production technologies in the area. Based on the aforementioned problems, this study wish to be conducted.

The broad objective is to analyse farmer's knowledge, attitude and practices towards the adoption of ginger production technologies in Southern Kaduna, Kaduna State Nigeria. The specific objectives of the study were to:

- i. Describe the socioeconomic characteristics of the respondents;
- ii. identify or examine the knowledge level of farmers about ginger production technologies;
- iii. examine the attitude of farmers towards ginger production technologies; and
- iv. Describe the level of adoption of ginger production technologies;

METHODOLOGY

Study Area

The study area is the Southern Kaduna region of Kaduna State comprising of five local government areas, namely: Jaba, Jema'a, Kachia, Kagarko, and Zangon Kataf Local Government Areas. The study area is located between latitude 9°5' to 10°10' North and longitude 7°16' to 8°35' East. The region has an estimated land area of has estimated land area of 531km² (Ganiyu *et al.*, 2021), with a projected population of 1,903,365 people in 2023 at 3.5% growth rate (NPC 2023). The distinctive geographical location of these areas that lies around the escarpment of Jos plateau, largely characterized with hilly undulating topography; cold and warm micro climate; and dense mountain/guinea Savanna vegetation, made the region favourable for the cultivation of wide varieties of cultivars ranging from trees to cereals and tuber crops. The climate of the area is tropical continental with distinct seasonal regimes, oscillating between cool to hot dry and humid to wet (dry and wet seasons). The rainy season starts from April and ends in October with a mean annual rainfall of 2000mm. August and September are the wettest months and the annual average temperature ranges from 23°C to 28°C. The months of November to March are the dry season periods. The primary



occupation of over 75 percent of the active population is farming (Ibrahim, 2018), with ginger as the main cash crop.

Sampling Technique and Sample Size

A multistage sampling procedure was employed for the study. In the first stage the Southern Kaduna region of the State was purposively selected because of the intensity of ginger cultivation. In the second stage three local government areas (Kachia, Jaba and Kagarko) was randomly selected from the Southern region of Kaduna State. The third stage involved a random selection of three districts from each local government areas. A sampling frame or registered farmers from, (Kachia, Jaba and Kagarko) was obtained from KSDP with a total of 501 (Table 1)

Table 1: Sample Size Selection Plan of the Study

LGA	DISTRICT	SAMPLE FRAME	SAMPLE SIZE (43%)
Kachia	Gidan Tagwai	53	23
	Kurmin Musa	56	24
	Kurmin Gwaza	58	25
Kagarko	Dagon Kurmi	56	24
	Kenyi	51	22
	Kubacha	61	26
Jaba	Kwoi	52	22
	Daddu	61	26
	Ankun	53	23
Total		501	215

Source: Field Survey, 2024

Data Collection and Analysis

The instruments used for the data collection was a well-structured questionnaire. Data were collected through the administration of the structured questionnaires to respondents with the assistance of trained enumerators. Data was then analysed using both descriptive and inferential statistics.. Descriptive statistics such as the frequency distribution, percentages, mean score and ranking was used to achieve objectives

RESULTS AND DISCUSSION

Socio-economic Characteristics of the Respondents

The result from Table 2 depicts the socioeconomic characteristics of the respondents, the finding revealed that 29.8%, 20.2% and 18.3% of the respondents were within the ages of 20-39, 40-49, and 50-59 years, respectively. The result also shows that 1.9% of the respondents were within the ages of 60-69 years with a mean age of 39 years in the study area. This finding implies that most of the respondents were within their active ages of production in agriculture implying that such respondents could be willing to adopt technologies in ginger production to boost their levels of income and also improve their living standards. The biological designation or identification of respondents is referred to as sex, which is the state of being male or female. The result from the Table showed that majority (76.6%) of the respondents were male while 23.4% of the respondents were female. This finding implies that most of the respondents were male, this is not unconnected to the cultural and religious believe of the respondents which to extend prohibits women participation in some tedious farming activities in northern Nigeria.

The results in the Table revealed that majority (71.1%) of the respondents were married while 3.2% and 1.8% 23.9% of the respondents were single. Widowed and divorced, respectively. This finding implies that most of the respondents were married and had certain levels of responsibilities hence the need to adopt improved ginger production technologies among the respondents cannot be over emphasized. This result is in line with Onwunali *et al.* (2023) which revealed that ginger farming in the study was dominated by married individuals. The result in Table 2 shows that majority (70.6%) of the respondents had tertiary level of education. The finding further shows that 20.2%, 9.2% and 0.5% of the respondents had secondary, primary and NCE levels of education in the study area. This



finding implies that most of the respondents had attended one form of education or another which helps to improve their knowledge, attitude, practice and adoption of ginger production technologies in the study area. Hassan *et al.* (2020) reported that educated male farmers dominated crop production in North West. The result in the Table above also showed that more than half (54.6%) of the respondents had a household size of 1-5 persons, while 35.3%, 8.7% and 1.4% of the respondents had a household size of 6-10, 11-15 and 16-20 persons, respectively with an average of 6 persons. This implies that most of the respondents had a relatively large household size and this could be of advantage in the area of supply for farm labour. This finding is in agreement with a conducted in Anambra and Enugu States by Nwaekpe *et al.* (2022) which revealed that the mean household size of respondents was 6 persons.

The results also revealed that 42.2% and 33.9% of the respondents had farming experience of 1-10 years and 11-20 years. The result also shows that 15.6%, 6.9% and 1.4% of the respondents had a farming experience of 21-30 years, 31-40 years and 41-50 years, respectively with an average 16 years. This finding implies that most of the respondents had relatively good number of years in ginger production which could influence their knowledge and attitude to adoption of technologies in the study area. The farming experience of 7-13 years indicated good average knowledge of ginger cultivation base on the positive relationship between experience and production (Alfred *et al.*, 2018). The result in the Table also showed that majority (82.1%) of the respondents had a farm size of 0.5-3.0, while 14.7%, 2.8% and 0.5% of the respondents had a farm size of 3.5-6.0, 9.5-12.0ha and 6.5-90ha, respectively with a mean of 2.4ha. the result shows that respondents had a mean farm size of. This finding implies that most of the respondents had relatively small farm size which shows that their production of ginger is relatively a small-scale production in the study area. The results support those of Nmadu and Marcus (2012) and Abah *et al.* (2015) who reported average size of land under cultivation by ginger producers was 0.36 hectares.

The result in the Table also showed that majority (74.8%) of the respondents had an income of ₦50,000-₦950,000. The finding also showed that 10.6%, 7.3% and 3.7% of the respondents had an income of ₦951,000-₦1,550,000, ₦1,551,000-₦2,550,000, ₦2,551,000-₦3,550,000 and ₦3,551,000 and above, respectively with average of ₦784,839.45. This finding implies that most of the respondents had relatively high-income levels in the study area. This is contrary to the findings of Mazzza *et al.* (2019) who reported low income among respondents. The result in the Table 2 shows that more than half (58.7%) of the respondents had no access to extension contact, while 41.3% of the respondents had contact with agent to extension contact in the study area. This finding implies that most of the respondents had no contact with extension agents which could ultimately lead to negative effects on respondents' attitudes and knowledge to adoption of ginger production technologies in the study area. This result agrees with the of Michael (2010) on the Evaluation of farmers' response to extension services on ginger production in of Kaduna State, which reveals that majority of the respondents in the study area had no contact with extension agent. The result in the Table reveals that more than half (56.4%) of the respondents were not members of cooperatives in the study area. The result also shows that 43.6% of the respondents belong to one form of cooperatives or another in the study area. This finding implies that more than half of the respondents were not members of any cooperative which results to low access to inputs thereby resulting to low level knowledge and adoption of production technologies among the respondents in the study area. This result is in line with the findings of Nwaekpe *et al.* (2022) which reported that most of the respondents in the study area were not members of any form of cooperative.



Table 2: Socio-economic Characteristics of the Respondents

Age (Years)	Frequency	Percentage	Mean
20-29	44	20.2	39
30-39	65	29.8	
40-49	65	29.8	
50-59	40	18.3	
60-69	4	1.9	
Total	218	100.0	
Male	167	76.6	
Female	51	23.4	
Total	218	100.0	
Marital Status	Frequency	Percentage	
Single	52	23.9	
Married	155	71.1	
Divorced	4	1.8	
Widowed	7	3.2	
Total	218	100.0	
Educational Background	Frequency	Percentage	
Primary	20	9.2	
Secondary	44	20.2	
Tertiary	154	70.6	
Total	218	100.0	
Household size	Frequency	Percentage	Mean
1-5	119	54.6	6
6-10	77	35.3	
11-15	19	8.7	
16-20	3	1.4	
Total	218	100.0	
Farming Experience	Frequency	Percentage	Mean
1-10	92	42.2	16
11-20	74	33.9	
21-30	34	15.6	
31-40	15	6.9	
41-50	3	1.4	
Total	218	100.0	
Farm Size (Hectares)	Frequency	Percentage	Mean
0.5-3.0	179	82.1	2.4
3.5-6.0	32	14.7	
6.5-9.0	1	0.4	
9.5-12.0	6	2.8	
Total	218	100.0	
Level of Income(₦)	Frequency	Percentage	Mean
50,000-950,000	163	74.8	784,839.45
951,000-1,550,000	23	10.6	
1,551,000-2,550,000	16	7.2	
2,551,000-3,550,000	8	3.7	
3,551,000 and above	8	3.7	
Total	218	100.0	
Contact with Extension Agent	Frequency	Percentage	
No	128	58.7	
Yes	90	41.3	
Total	218	100.0	
Membership of Cooperative	Frequency	Percentage	
No	123	56.4	
Yes	95	43.6	
Total	218	100.0	

Source: Field Survey (2024)

Level of Knowledge on Ginger Production Technologies by the Respondents

This refers to the knowledge level of respondents on ginger production technologies in the study area. The result in Table 1 reveals that respondent had full knowledge on use of improved seeds ($\bar{X}=2.2$), use of ginger sett for production ($\bar{X}=2.5$), combination of organic and inorganic manure ($\bar{X}=2.7$) and good agronomic practices ($\bar{X}=2.5$) as indicated by the mean score above the threshold value of 2.0. The findings also revealed that use of planting depth of 10cm ($\bar{X}=2.4$), suitable soil type ($\bar{X}=2.5$), seed treatment ($\bar{X}=2.4$), recommended spacing ($\bar{X}=2.3$), plant protection measures ($\bar{X}=2.3$) and harvesting ($\bar{X}=2.7$) as indicated by the mean scores above the threshold value of 2.0 in the study area. The result further showed that respondents had full knowledge of fertilizer application ($\bar{X}=2.7$), weeding ($\bar{X}=2.8$), use of chemicals ($\bar{X}=2.6$), processing ($\bar{X}=2.5$) and storage ($\bar{X}=2.6$) as indicated by the mean scores above the threshold value of 2.0. This finding implies that most of the respondents had full knowledge on ginger production technologies in the study area, which helps in increasing their yield, income and improve their standard of living in the study area.

On the other hand, the result shows that respondents had little or no knowledge on irrigation management ($\bar{X}=1.9$) in ginger production as indicated by the mean score less than the threshold value of 2.0 in the study area. This could be attributed to the facts that most of the respondents were seasonal farmers depending on rainfall for their ginger production in the study area, it could also be attributed to the high cost of irrigation facilities and low technical know-how on operating irrigation facilities in the study area.

Table 2: Level of Knowledge on Ginger Production Technology

Variables	Mean	Remark
Use of improved varieties	2.2	Full knowledge
Use of ginger sett for production	2.5	Full knowledge
Combination of organic and inorganic manure	2.7	Full knowledge
Good agronomic practices	2.5	Full knowledge
Use of planting depth of 10cm	2.4	Full knowledge
Suitable soil type	2.5	Full knowledge
Seed treatment	2.4	Full knowledge
Recommended spacing	2.3	Full knowledge
Plant protection measures	2.3	Full knowledge
Harvesting	2.7	Full knowledge
Fertilizer application	2.7	Full knowledge
Weeding	2.8	Full knowledge
Use of chemicals	2.6	Full knowledge
Processing	2.5	Full knowledge
Storage	2.6	Full knowledge
Irrigation management	1.9	No knowledge

Source: Field Survey (2024)

Attitude of Respondents toward Ginger Production Technologies

The result from Table 2 depicts the attitudes of respondents toward ginger production technologies in the study area, the findings showed that respondents agreed that ginger production is easy ($\bar{X}=4.0$), requires little inputs ($\bar{X}=3.6$), saves cost and result to high yield ($\bar{X}=4.1$), good in intercropping with cereals ($\bar{X}=3.9$) and had high market value ($\bar{X}=4.3$) as indicated by the mean scores above the threshold value of 3.0. The result also shows that respondents agreed that ginger is easy to process ($\bar{X}=3.9$), easy to store ($\bar{X}=4.1$), local variety are preferable ($\bar{X}=3.7$), improved varieties are expensive ($\bar{X}=3.8$), inadequate inputs discourages farmers ($\bar{X}=3.9$) and it requires capital outlay ($\bar{X}=4.3$) as indicated by the mean scores above the threshold value of 3.0 in the study area. These were followed by reduction in fertilizer usage ($\bar{X}=3.5$), good medicinal value ($\bar{X}=4.2$) and good for industrial purposes ($\bar{X}=4.4$). This finding implies that all the respondents agreed on the mentioned attributes of ginger in the study area and that these attributes increase their knowledge toward adoption of ginger production technologies.



Table 3: Respondents' Attitude toward Ginger Production Technologies

Variables	SA	A	UD	D	SD	Mean	Remark
It is easy to cultivate	97(44.5)	69(31.7)	18(8.3)	27(12.4)	7(3.2)	4.0	Agreed
It involves little input	67(30.7)	75(34.4)	19(8.7)	42(19.3)	15(6.9)	3.6	Agreed
It saves cost and yield more	94(43.1)	81(37.2)	19(8.7)	14(6.4)	10(4.6)	4.1	Agreed
It is mostly intercropped with cereals	87(39.9)	84(38.5)	22(10.1)	14(6.4)	11(5.0)	3.9	Agreed
It has high market value	125(57.3)	66(30.3)	15(6.9)	4(1.8)	8(3.7)	4.3	Agreed
It is easy to process	86(39.4)	69(31.7)	27(12.4)	25(11.5)	11(5.0)	3.9	Agreed
It is easy to store	92(42.2)	83(38.1)	20(9.2)	15(6.9)	8(3.7)	4.1	Agreed
I prefer local variety to the improved	77(35.3)	61(28.0)	26(11.9)	42(19.3)	12(5.5)	3.7	Agreed
More expensive than local varieties	93(42.7)	51(23.4)	26(11.9)	34(15.6)	14(6.4)	3.8	Agreed
Discouraged due to input unavailability	74(33.9)	90(41.3)	20(9.2)	25(11.5)	9(4.1)	3.9	Agreed
It requires more capital outlays	108(49.5)	88(40.4)	7(3.2)	10(4.6)	5(2.3)	4.3	Agreed
It will reduce the need for fertilizer usage	75(34.4)	51(23.4)	16(7.3)	60(27.5)	16(7.3)	3.5	Agreed
It has medicinal values	118(54.1)	58(26.6)	16(7.3)	20(9.2)	6(2.8)	4.2	Agreed
It is needed for industrial use	126(57.8)	66(30.3)	13(6.0)	8(3.7)	5(2.3)	4.4	Agreed

Source: Field Survey, 2024 Mean score <3.0=Disagree ≥3.0=Agreed *Figures in parenthesis are percentages

Adoption Level of Ginger Production Technologies by the Respondents

The result from Table 3 depicts the adoption levels of ginger production technologies in the study area, the finding shows that the major technologies adopted in ginger production were combination of organic and inorganic fertilizer (91.7%), harvesting (91.7%), fertilizer application (90.8%) and weeding (90.8%) which were ranked 1st and 3rd by the respondents, respectively. According to Statista (February 2022), the quantity of ginger produced in Nigeria in 2020 was over 734,000 metric tons, while output in the study area was about 2.69 metric tons.

The findings also indicated that some of the technologies adopted were by storage (89.9%), use of chemical (86.7%), recommended spacing practice (81.7%), plant protection measures (80.3%) and processing (80.35%) which were ranked 5th, 6th, 7th and 8th respectively. Other technologies adopted by the respondents in ginger production were assessment of soil type (78%), practice of good agronomic practice (75.7%), seed treatment (74.3%), use of 10cm planting depth (73.4%), use of ginger sett (72%), use of improved varieties (64.2%) and irrigation management (54.1%) which were ranked 10th, 11th, 12th, 13th, 14th, 15th and 16th respectively. This finding implies that respondents were actively involved in all the aspects of ginger production technologies which helped increase their adoption level in the study area. This is in line with Ejechi *et al.* (2018) who reported that the respondents used an array of ginger production technologies in Southern Kaduna of Kaduna State.



Table 4: Adoption Level of Ginger Production Technology

Variables	Percentage*	Rank
Combination of organic and inorganic manure	91.7	1 st
Harvesting	91.7	1 st
Fertilization	90.8	3 rd
Weeding	90.8	3 rd
Storage	89.9	5 th
Use of chemicals	86.7	6 th
Recommended Spacing	81.7	7 th
Plant protection Measures	80.3	8 th
Processing	80.3	8 th
Soil type	78.0	10 th
Good agronomic practices	75.7	11 th
Seed treatment	74.3	12 th
Use of planting depth of 10cm	73.4	13 th
Use of ginger sett for production	72.0	14 th
Use of improved ginger varieties	64.2	15 th
Irrigation Management	54.1	16 th

Source: Field Survey, 2024 *Multiple response

CONCLUSION AND RECOMMENDATIONS

Based on the result of the finding it can be concluded that majority of the farmers in the study area had full knowledge of most of the ginger production technologies. Furthermore, the result showed that majority of the farmers had a positive attitude towards ginger production technologies that will facilitate the adoption and improved ginger production technologies in the study area.

From the findings of this study the following recommendations were made:

- iii. Through the use of extension agents, farmers should be encouraged to form cooperative as this will enable them to obtain credit/loans that will help with the production of ginger.
- iv. More capital investment from both Government and private enterprise will enable mechanize production of ginger which will in turn reduce its high cost of labour and translate into a high yield.
- v. Government and NGOs should train and retrain the extension agents for good service delivery to target farmers in the study area.
- vi. Farmers should be encourage to adopt and sustain more ginger farming technologies.
- vii. Government and other private organisations should help the ginger farmers by linking them directly to interventional marketers either through e-marketing or other channels.

References

- Ahmed, M. I. (2018). Ginger Farming Practice in Jaba Region, Kaduna State, Nigeria. *Dutse Journal of Pure and Applied Sciences*, 4(2): 155-168.
- Ayodele, T. J. and Sambo, B. E. (2014). Ginger (*Zingiber officinale* Roscoe) Production Efficiency and Constraints Among Small Scale Farmers in Southern Kaduna, Nigeria. *Journal of Agricultural Science*, 6(8): 141-148.
- Bellon, M. R., Adato, M., Becerril, J. and Mindek, D. (2006). Poor Farmers' Perceived Benefits from Different Types of Maize Germplasm: The Case of Creolization in Lowland Tropical Mexico. *World Dev*, 34(1): 113-129.
- Diagne, A., Adekambi, S. A., Simtowe, F. P. and Biao, G. (2009). The Impact of Agricultural Technology Adoption on Poverty: the Case of NERICA Rice Varieties in Benin. Paper contributed to the 27th Conference of the International Association of Agricultural Economists, August 16-22, 2009, Beijing, China.
- Evenson, R. E. and Gollin, D. (2003). Crop Variety Improvement and its Effect on Productivity: The Impact of International Agricultural Research. CABI, Wallingford, UK.



- Ibrahim, A.M. (2018). Ginger Farming Practice in Jaba Region, Kaduna State, Nigeria. *Dutse Journal of Pure and Applied Sciences*, **4**(2): 155-168.
- Jakkawad, R. S., Sawant, C. R. and Pawar, B. (2017). Knowledge and Adoption of Ginger production Technology in Aurangabad District. *Trends in Biosciences*, **10**(12): 5111-5114.
- Kumar, V., Sisodia, S. S. and Ranawat, Y. (2017). Opinion of Farmers toward Improved Ginger Production Technology in Udaipur District of Rajasthan, India. *Int.J.Curr.Microbiol.App.Sci*, **6**(9): 2207-2212.
- Lalhlimpuii, A. and Bose, D. K. (2023). Knowledge of Farmers towards Improved Cultivation Practices of Ginger in Serchhip District of Mizoram. *Journal of Experimental Agriculture International*, **45**(8): 1-6.
- Meijer, S. S., Catacutan, D. and Ajayi, O.C. (2015). The Role of Knowledge, Attitudes and Perceptions in the Uptake of Agricultural and Agroforestry Innovations among Smallholder Farmers in Sub-Saharan Africa. *Int. J. Agric. Sustain.*, **13**(1): 40–54.
- Mendola, M. (2007). Agricultural Technology Adoption and Poverty Reduction: A Propensity Score Matching Analysis for Rural Bangladesh. *Food Policy*, **32**:372-393.
- Onyeneke, R. U. (2017). Determinants of Adoption of Improved Technologies in Rice Production in Imo State, Nigeria. *African Journal of Agricultural Research*, **12**(11): 888-896.
- Onyeneke, R. U. (2017). Determinants of Adoption of Improved Technologies in Rice Production in Imo State, Nigeria. *African Journal of Agricultural Research*, **12**(11): 888-896.
- Sati, S. A. and Bala, G. (2017). A Comparative Analysis of Ginger Cultivation Methods in Kurmin-Jatau, District of Jaba Local Government Area, Kaduna State, Nigeria. *Asian Journal of Soil Science and Plant Nutrition*, **1**(1):1-18.
- Sundresha, B. R., Nanjappa, D., Kumar, V. R. and Narayan, M. T. L. (2020). A study on Knowledge Level of Ginger Growers in Hassan District in India. *International Journal of Current Microbiology and Applied Sciences*, **9**(7): 3041-3021.
- Umeh, O. J., Igwe, K. C. and Anyim, A. (2018). Farmers Knowledge of the Role of Extension Services in Akwa-Ibom State Nigeria. *Journal of Agricultural Extension*, **22**(3): 87-96
- Wasil, A. H., Shah, J. A., & Haris, N. B. M. (2022). The Relationship between Knowledge, Attitude, and Practice toward Organic Fertilizer Adoption among Almond Smallholder Farmers in Uruzgan, Afghanistan. *International Journal of Academic Research in Business and Social Sciences*, **12**(10): 2895 – 2914.