

DigitalCommons@University of Nebraska - Lincoln
(<https://digitalcommons.unl.edu>)

Library Philosophy and Practice: Instructions for Authors

Submit articles at: <https://digitalcommons.unl.edu/libphilprac/> (<https://digitalcommons.unl.edu/libphilprac/>)

Library Philosophy and Practice is a peer-reviewed electronic journal that explores the connection between library practice and the philosophy and theory that underlie it. Its scope includes explorations of current, past, and emerging theories of librarianship and library practice, as well as reports of successful, innovative, or experimental library procedures, methods, or projects in all areas of librarianship, set in the context of applied research.

Submit articles to the editors as e-mail attachments, in .doc, .rtf, or .html format. There is no limit on article length. Articles may include illustrations in .gif, .jpg, or .tiff format. Please include an abstract.

Use MLA, APA, or any other style that embeds citations in the article, e.g., (Bolin, 2005), with a list of works cited at the end of the article. Do not use footnote or endnote citations. Please include links to any web resources that are mentioned.

Submit only original articles that have not appeared elsewhere, and which are not currently submitted elsewhere. Please be careful to cite sources that are used in the article, particularly web sources, and to identify direct quotations using quotation marks or a blockquote. All manuscripts are checked using Safe Assignment software before they are sent for peer review.

The editors welcome queries from authors regarding potential articles for LPP.

Editors:

Mary K. Bolin (mbolin2@unl.edu) , Professor and Chair, Technical Services, University of Nebraska-Lincoln Libraries, Lincoln NE 68588-4100

Gal Z. Edkwrigh (galz@uidaho.edu) , Humanities Librarian, Professor, University of Idaho Library, Moscow, ID 83844-2350

Phone: (402) 472-4281 (Bolin); (208) 885-2507 (Edkwrigh)



Rita Salami Otibhor <r.otibhor@futminna.edu.ng>

IS #7517 - Library Philosophy and Practice (e-journal)

message

From: Mary Bolin <editor-libphilprac-7517-2370615@dcunl.bepress.com>
To: Rita Salami <r.otibhor@futminna.edu.ng>
Cc: The Authors <authors-libphilprac-7517@dcunl.bepress.com>

Fri, Jul 31, 2020 at 2:24 PM

Dear Rita Salami,

Congratulations! We are pleased to inform you that your article has been favorably reviewed and will appear in Library Philosophy and Practice. LPP has a cumulative yearly volume. Your article will be published immediately.

Thanks for your interest in LPP.

Sincerely,
Mary Bolin

Mary K. Bolin, PhD
Professor Emeritus
University of Nebraska-Lincoln Libraries
Lincoln NE 68588-4100
mbolin2@unl.edu

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Library Philosophy and Practice (e-journal)

Libraries at University of Nebraska-Lincoln


Winter 2-22-2020

THE ROLE OF INDIGENOUS KNOWLEDGE IN SUSTAINABLE URBAN AGRICULTURE AND URBAN FOOD SECURITY IN MINNA, NIGERIA

Rita Salami

r.otibhor@futminna.edu.ng

Follow this and additional works at: <https://digitalcommons.unl.edu/libphilprac>

 Part of the Library and Information Science Commons

Salami, Rita, "THE ROLE OF INDIGENOUS KNOWLEDGE IN SUSTAINABLE URBAN AGRICULTURE AND URBAN FOOD SECURITY IN MINNA, NIGERIA" (2020). *Library Philosophy and Practice (e-journal)*. 3919.
<https://digitalcommons.unl.edu/libphilprac/3919>

THE ROLE OF INDIGENOUS KNOWLEDGE IN SUSTAINABLE URBAN AGRICULTURE AND URBAN FOOD SECURITY IN MINNA, NIGERIA

Rita Otibhor¹SALAMI, Lami AKAWU² and Paul ABUTU³

¹University Library Services, Federal University of Technology, Minna

*Corresponding Author: Tel. +2348054196878

Email: r.otibhor@futminna.edu.ng

ABSTRACT

As the world continues to urbanise with attendant consequences on food security and poverty level, urban agriculture is becoming increasingly important. Interestingly, most of the urban farmers have consistently applied indigenous knowledge in their farming practices with considerable positive results. This study aimed at examining the role of indigenous knowledge in urban agriculture using Minna, Nigeria as a case study. The objectives were to evaluate the application of indigenous knowledge in agricultural production by the farmers and to assess the extent of the farmers' application of indigenous knowledge to farm management. Applying the field survey approach, the study adopted the systematic random sampling technique to sample 384 respondents to whom structured questionnaire was administered. Descriptive data analysis technique was adopted and data presentation was made with the aid of tables and graphs. It was discovered that majority (56.77%) of urban farmers are married, more than 98% are above 18years old and up to 94% are not educated beyond secondary school level. However, more than 85% earn above N20,000 which implies that they earn considerably above the minimum wage. The dominant indigenous farming practices in the study area are the use of local hoes for soil tillage, sun drying of farm produce, preservation by smoking and storing of produce in silos and barns. It was recommended that the farmers should be enlightened and encouraged to enrol in adult education classes to improve their literacy level, thereby improving their productivity. The need for extension services to the farmers to educate and inform them on the benefits of incorporating blending formal knowledge with indigenous knowledge for better output was also suggested.

Keywords: Indigenous knowledge, Urban agriculture, Food security, Farming, Development

INTRODUCTION

Globally, the current urban population is estimated at 50% and this is predicted to rise to 70% by the year 2030. Urbanisation and population growth have tremendous impacts on urban food security. Agriculture plays an indispensable role in enhancing the standard of living of people by ensuring the sustainable availability of food. The three foremost need of man in the Maslow's hierarchy of human basic needs are food, shelter and clothing. It is

important to note that agriculture is indispensable in satisfying these needs. For instance, agriculture provides the food required for human sustenance; help in providing thatch and timber for shelter construction; and also helps in the production of the raw materials for clothing. The local urban farmers have continued to practice urban agriculture with relative success, irrespective of their poor scientific background in agricultural practice (Siambombe *et al.*, 2018). This implies that their indigenous knowledge of agriculture continues to be essential in the production of food for urban residents. The application of indigenous knowledge in agricultural planning and production as well preservation of agricultural produce has been practised by farmers for centuries (Akullo *et al.*, 2007).

Indigenous knowledge has been studied across several disciplines and in relation to diverse walks of life. The concept has been observed from the perspectives of tannery and dyeing (Zaruwa and Kwaghe, 2014), brewing (Zaruwa *et al.*, 2014) and traditional medicine (Nimoh, 2014; Olaoye, 2014). Similarly, the application of indigenous knowledge to diverse agricultural situations has been explored across the world in general, and in Nigeria in particular. Specifically, the nexus between indigenous knowledge and sustainable agricultural development has been studied by Senanayake (2006) and Wang (2018); while Asaba (2006) and Wole and Ayanbode (2009) were concerned with the impacts of application of indigenous knowledge by rural farmers on food security. Furthermore, while Dey and Sarkar (2011) focused on the role of indigenous knowledge in rural resource conservation, Simonelli (2008) and Siambombe *et al.* (2018) focused on rural farmers' adoption of indigenous knowledge in addressing issues of climate change. The aforementioned scholarly studies have attempted to approach the issue of the nexus between indigenous knowledge and agricultural development from a wide array of perspectives.

Statement of Problem

A major feature in the aforementioned studies is that emphasis has been on rural agricultural production. The problem with the foregoing arguments is that the application of indigenous knowledge has been studied from the spectrum of agriculture generally, or rural farming specifically. Little emphasis has been placed on the relevance of indigenous knowledge to urban farming. The rapid rate of urbanization, especially in the developing countries where Nigeria is located, have engendered growing attention to and practice of urban agriculture. The argument here is that urban agriculture is a significant contributor to urban food security. Thus, an important gap in knowledge (on the relevance of indigenous knowledge to urban farming) has been left unfilled. The self-sustenance and self-reliance of urban areas is seemingly unachievable without urban food production. Therefore, it is important to investigate the significance of indigenous knowledge in urban agriculture, especially in the urban areas of Nigeria.

Similarly, the potentials of indigenous knowledge have been under-explored and underrepresented in the literature. This signals the need to evaluate the extent of application of indigenous knowledge to urban agriculture and the roles it plays in ensure urban agricultural sustainability and food security. It is this fundamental research gap about urban farmers' use of indigenous (especially with reference to Nigeria in general, and Niger State in particular) that this study seeks to cover.

Aim and Objectives

The aim of this study is to investigate the relevance of indigenous knowledge to urban agriculture in Minna, Nigeria. To achieve this aim, the objectives of the study are to:

- i. Evaluate the level of application of indigenous knowledge in agricultural production process by urban farmers in Minna

- ii. Appraise the farmers' application of indigenous knowledge in the preservation of farm produce
- iii. Assess the extent of the urban farmers' use of indigenous knowledge in farm management

The Study Area

Minna is the capital city of Niger State, Nigeria. Minna is originally a Gbagyi settlement known for farming. The original settlers of Minna were located at the Paidia Hills at the eastern part of the present-day Minna. This was for the purpose of security and safety from the invaders, especially the Nagwamatse-led group from Kontagora. However, with the development of rail transport and occupation of the city by colonialists, the tradition of hilltop occupation ceased to be the norm since the colonial masters provided a new form of security to the residents of the city.

Minna has assumed the status of an administrative city since 1976 when it became the capital city of Niger State (Britannica, 2019). The city is located in the North-Central geopolitical zone of Nigeria; it is located between latitude 9°24N – 9°48N and longitude 6°25E – 6°45E. The location of the Minna in Nigeria is shown in Figure 1. Minna has a total land area of 6,789 square kilometres and a population density of 34.48 persons per square kilometres (NISEPA, 2009, as cited in Daniyan and Mohammed, 2018).

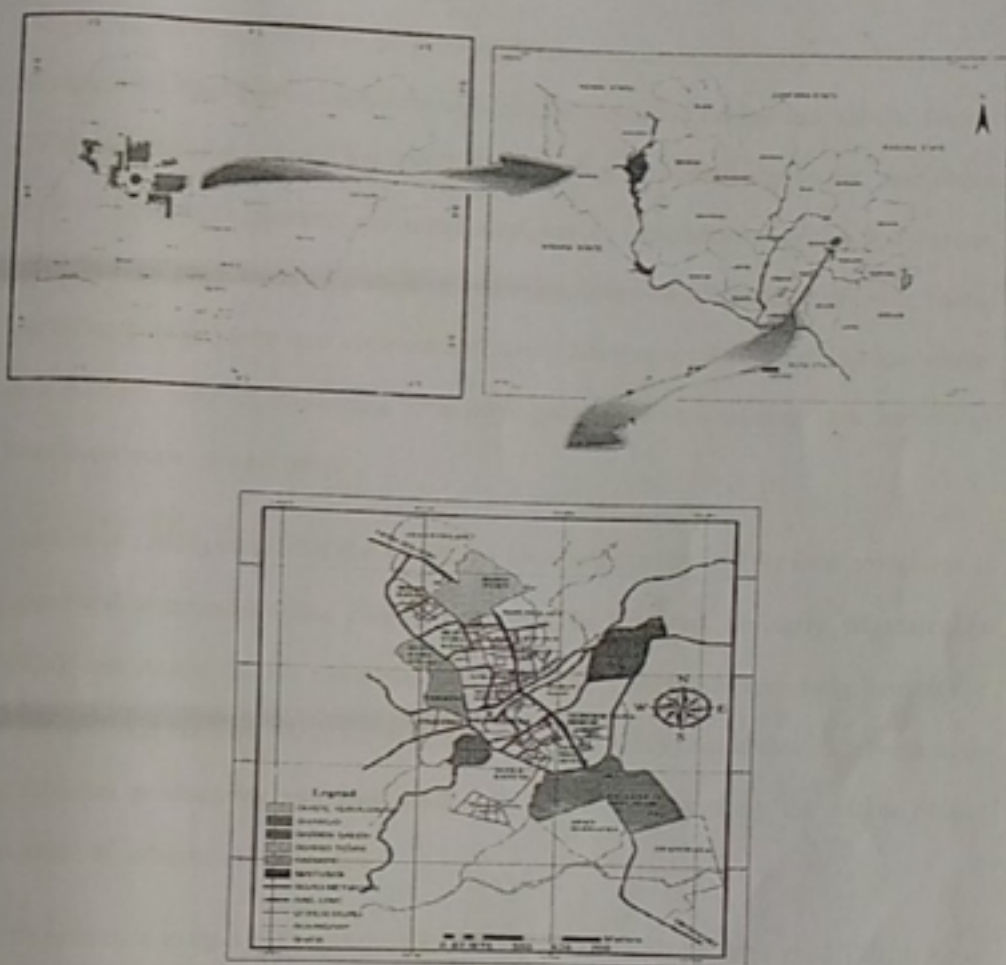


Fig. 1: Location of Minna in Nigeria

Source: Author's digitisation (with modifications from Popoola *et al.*, 2016)

LITERATURE REVIEW

Indigenous knowledge is any kind of knowledge other than the western knowledge. Prior to colonisation, many farmers in Africa have practised agriculture in terms of crop production, animal production, soil tillage and management, as well as preservation of farm produce with relative success. Indigenous knowledge, therefore, is a very important aspect of agricultural history and agricultural development (Anaeto *et al.*, 2013). Akullo *et al.* (2007) observed that indigenous knowledge is used by all categories of farmers.

Indigenous knowledge refers to the knowledge that is accumulated, transferred/transmitted and explored inter-generationally through cultural practices, norms and beliefs. Berkes (2008) and Mafongoya and Ajayi (2017) defines indigenous knowledge as the "cumulative body of knowledge, practice and belief, evolving by adaptation processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with their environment". Jaya (2005) noted that indigenous knowledge also includes adapting knowledge from other places and internalizing such knowledge local knowledge by local people.

Nnadi *et al.* (2013) contended that indigenous knowledge is required for food production if agricultural sustainability and food security must be achieved. Similarly, Mascarenhas (2003) and Asaba (2006) noted that application of indigenous knowledge ensures a continued food security. More so, Wole and Ayanbode (2009) noted that improvement in agricultural productivity and food availability can be measured by the extent of the adoption of indigenous knowledge.

With reference to agro-meteorology, Simonelli (2008) and Siambombe *et al.* (2018) have argued that African farmers have developed elaborate techniques of observing, predicting, interpreting the problems of climate change. In similar vein, Dey and Sarkar (2011) have argued that indigenous knowledge is very relevant in conservation of natural resources, climate adaptation and food production. It should be noted that since indigenous knowledge is a cultural and adaptive system of knowledge, it is dynamic and constantly changing to accommodate new realities (Ross *et al.*, 2011). Viewing indigenous knowledge from the livelihood assets perspective, Senanayake (2006) and Ihenacho *et al.* (2019) contended that indigenous knowledge is the social capital of the poor. Asaba (2006) reported that indigenous knowledge rural livelihoods in particular, and national economy in general.

Indigenous Agricultural Knowledge Across Borders

Indigenous knowledge has assumed a significant status globally in line with the goal of sustainable development. Analytical studies by Senanayake (2006), Abdullah and Hassan (2015) and Wang (2018) unveiled the role of indigenous knowledge in agriculture in achieving sustainable development across the globe. Abdullah and Hassan (2015) further argued that indigenous knowledge is result-oriented and thus, highly indispensable in addressing local problems such as food insecurity and food wasting.

In Africa, Akullo *et al.* (2007) studied the application of indigenous knowledge in agricultural production and farm management in Uganda. They discovered that although indigenous knowledge contributes significantly to agricultural development, the local farmers face the challenge of incorporating their indigenous knowledge into new knowledge in order to produce better results. In addition, Siambombe *et al.* (2018) emphasized that indigenous knowledge has been very instrumental in local farmers' weather prediction in Zimbabwe, thereby aiding the propagation of crops by these farmers with minimal record of losses. Akullo *et al.* (2007) further discovered that the sharing of knowledge by local farmers is selective, thereby limiting the flow of valuable information among the farmers. Despite these limitations, Yongabi and DeLuca (2015) noted that indigenous knowledge is highly promising, maintaining that it has far-reaching potentials towards attaining sustainable agriculture in sub-Saharan Africa.

In Nigeria, indigenous knowledge has been applied to different agricultural problems with relative success. For example, Ihenacho *et al.* (2019) reported that rural farmers in South-Eastern Nigeria apply indigenous knowledge in adapting to, and mitigating climate change impacts. The study by Ihenacho *et al.* (2019) in Nigeria, therefore, upholds the earlier findings by Siambombe *et al.* (2018) in Zimbabwe. In fact, Adedipe *et al.* (2004) has demonstrated the indispensability of indigenous knowledge to agricultural development in

Nigeria. Anaeto *et al.* (2013) further extended the pro-indigenous knowledge arguments by insisting that it is extremely relevant in ensuring the success of agricultural extension services.

METHODOLOGY

This study adopts the survey design and case study approaches to investigate the relevance of indigenous knowledge to urban agriculture in Minna, Niger State, Nigeria. Furthermore, it obtained the needed data from primary and secondary sources. The primary data were collected with the aid of questionnaire. The questionnaires were administered to the farmers in the study area using systematic random sampling technique. The population of Minna obtained from Population Stat (2019) is 439,612. A total of 384 respondents were sampled for the study based on the Taherdoost's (2017) sample size table. Data analysis was conducted with the aid of Statistical Package for Social Sciences (SPSS) and presentation is made with the aid of tables, charts and graphs. On the other hand, secondary data were obtained from books, journal articles and reports. All information obtained from secondary sources are duly acknowledged.

DATA ANALYSIS AND PRESENTATION

Socioeconomic Characteristics of the respondents

Table 1 summarises the socioeconomic characteristics of the respondents. It was observed that 53.65% of the respondents are male while 46.35% are females. This indicates that there is a close gender gap in urban agriculture in Minna, implying that both men and women practice urban farming in the study area. Analysis of the age group of the urban farmers revealed that majority of the farmers are between 38-47years old, followed by those between 18-27years old who accounted for more than 21% of the respondents. Overall, those below 18years old (1.30%) and those above 57years old (2.60%) were found to participate less in urban farming. This implies that urban agriculture is mostly practised by those within the active age groups. Furthermore, less than 9% of the respondents are

single. This implies that more than 91% of the respondents have established a family of their own and takes certain household responsibilities. More so, educational attainment was found to have crucial impact on participation in urban farming. More than 94% of the urban farmers in the study area are not educated above secondary school level. Of this figure, it is important to note that 43.75% have not acquired any form of formal education at all, while 27.34% have attained only primary school level. This is in consonance with earlier findings by Kazmi *et al.* (2014) in Pakistan. Notwithstanding their low level of formal education, it was reported by more than 85% of the farmers that they earn N20,000 and above monthly, implying that they earn more than the current N18,000 minimum wage of Nigeria.

Table 1: Socioeconomic Characteristics of the respondents

	FREQUENCY	PERCENTAGE
GENDER		
Male	206	53.65
Female	178	46.35
AGE		
<18years	5	1.30
18-27years	81	21.09
28-37years	63	16.41
38-47years	180	46.88
48-57years	45	11.72
> 57years	10	2.60
MARITAL STATUS		
Single	33	8.59
Married	218	56.77
Divorced	94	24.48
Separated	22	5.73
Widowed	17	4.43
EDUCATIONAL ATTAINMENT		
Informal Education	168	43.75
Primary School Certificate	105	27.34
Secondary School Certificate	88	22.92
Diploma/NCE	23	5.99
HND/Degree	0	0.0
MONTHLY INCOME		
<N20,000	54	14.06
N20,005 - N30,000	211	54.95
N30,005 - N40,000	72	18.75
N40,005 - N50,000	31	8.07
More than N50,000	16	4.17

Source: Authors' Field Survey, 2019

Indigenous agricultural practices among the respondents

Figure 2 indicates that the most common indigenous agricultural practices among farmers in Minna are planting without tillage, use of local hoe for tillage, use of machete for bush clearing and manual weeding of grasses. Furthermore, up to 90% of the respondents agreed that they use organic manure to enhance their crop yield. This means that indigenous knowledge have been extremely instrumental in the practice of urban agriculture among the farmers in Minna. However, only about 36% of the respondents use locally made/traditional pesticides on their farms, while only 12% of the respondents stated that they adopt the use of ash for treatment of their seedlings. The implication of this is that indigenous knowledge has been applied by the local farmers in undertaking agricultural production in the study area with success.

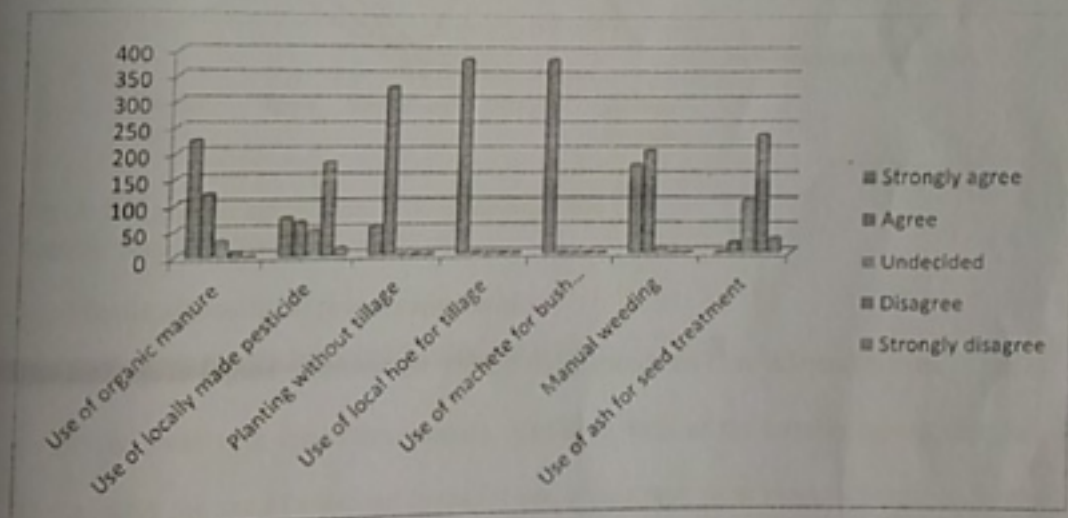


Fig. 2: Indigenous agricultural practices among the respondents

Source: Authors' Field Survey, 2019

Indigenous agricultural processing practices

As can be seen in Figure 3, up to 96% of the respondents agreed that they use sun drying to process their farm produce. Similarly, 92% agreed that they process their food through pounding with locally made mortar. It is also worthy of note that the farmers in Minna

process have adopted frying and roasting for processing their harvested food, especially the livestock and poultry farmers in the study area. However, only about 38% of the farmers uses local grinding stone to process their food. Ultimately, for all the farmers in the study area, the practice of manual harvesting of farm produce with hand is popular. These indicates that indigenous agricultural processing practices has assumed resilience in spite of the enormous modern advancements in agro-processing.

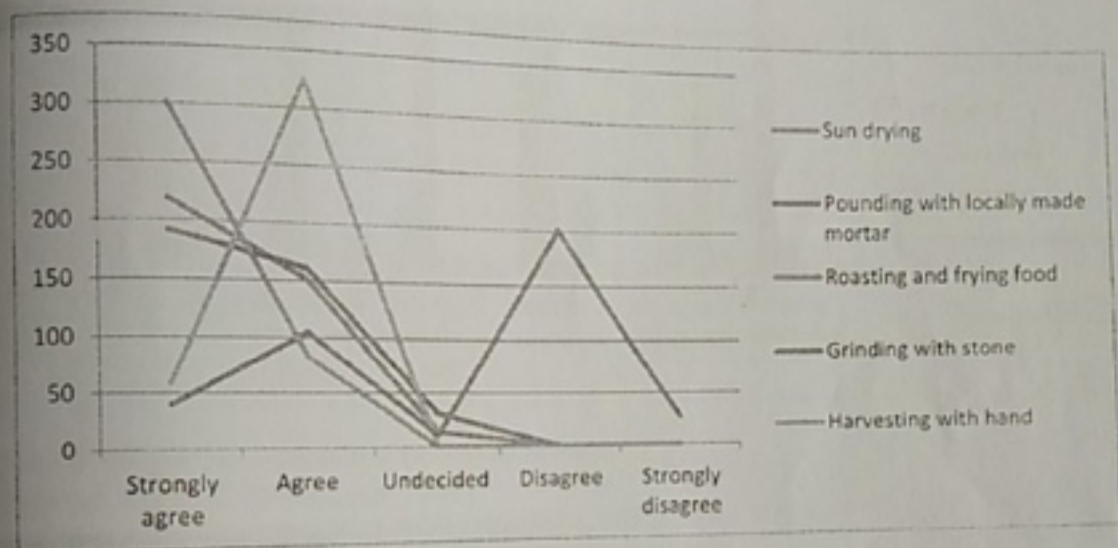


Fig. 3: Indigenous agricultural processing practices
Source: Authors' Field Survey, 2019

Indigenous agricultural preservation ethics

The analysis in Figure 4 shows that 95% of the respondents have adopted the use of sacks for storing/preserving their farm produce. Similarly, 88% of the farmers agreed that they have adopted the use of silos and barns for preserving their farm produce, particularly the grains and tubers. Furthermore, up to 99% of the respondents stated that they bury their crops in moistened soil, especially the yam seedlings. More so, 77% of the respondents apply pepper in preserving their farm produce against insect infestation (this is more popular among the cowpea farmers). Up to 91% of the respondents also stated that they use smoking method to preserve their farm produce. The practice of smoking is more widespread amongst fish and poultry farmers. However, it was observed that up to 55% of

the farmers in the study area are not familiar with the application of wood ash in preserving their farm produce. From the foregoing, it can be deduced that indigenous knowledge has continued to play tremendous role in the preservation of locally produced agricultural produce.

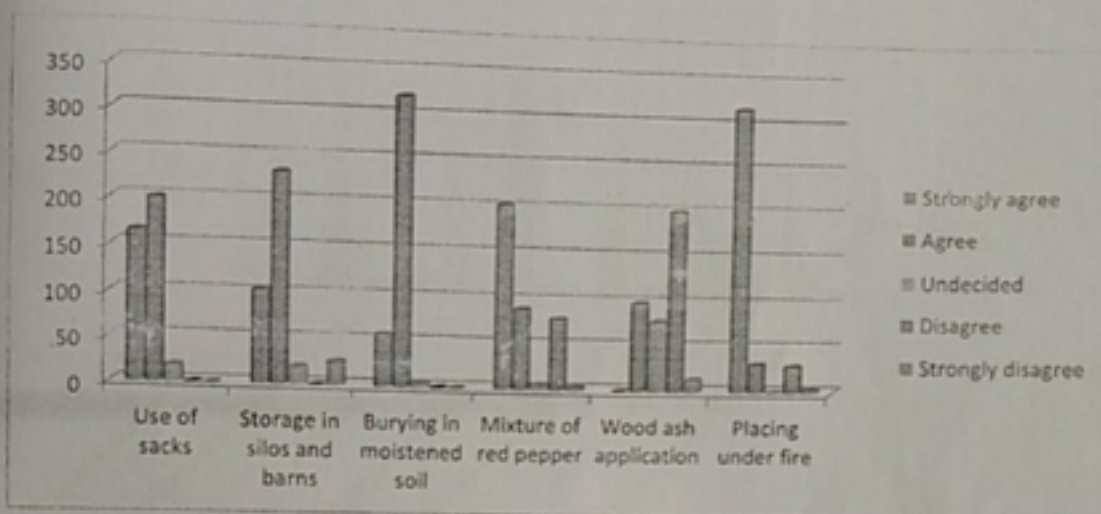


Fig. 4: Indigenous agricultural preservation ethics

Source: Authors' Field Survey, 2019

Perceived benefits of indigenous agricultural knowledge

Figure 5 shows the benefits of applying indigenous knowledge in agriculture based on the perception of the farmers in Minna. Majority of the farmers (up to 52%) did not agree that indigenous knowledge can engender early germination of crops. However, up to 92% of the respondents expressed the opinion that indigenous knowledge can help to enhance the health of crops. With respect to improvement in the yield of crops, up to 56% of the respondents are not sure whether the application of indigenous knowledge improves crops' yield; although up to 95% of the respondents expressed the opinion that a good application of indigenous knowledge can help in improving/maintaining the quality and fertility of the soil. Quite impressively, the respondents opined that indigenous knowledge can help in reducing the incidence of pests and diseases in farms. More so, 71% of the respondents agreed that indigenous knowledge helps to maintain the quality of food irrespective of the

length/duration of storage. Interestingly, 80% of the respondents stated that indigenous storage systems are resilient to climatic conditions. By implication, the farmers in Minna consider indigenous knowledge extremely beneficial in agricultural development.

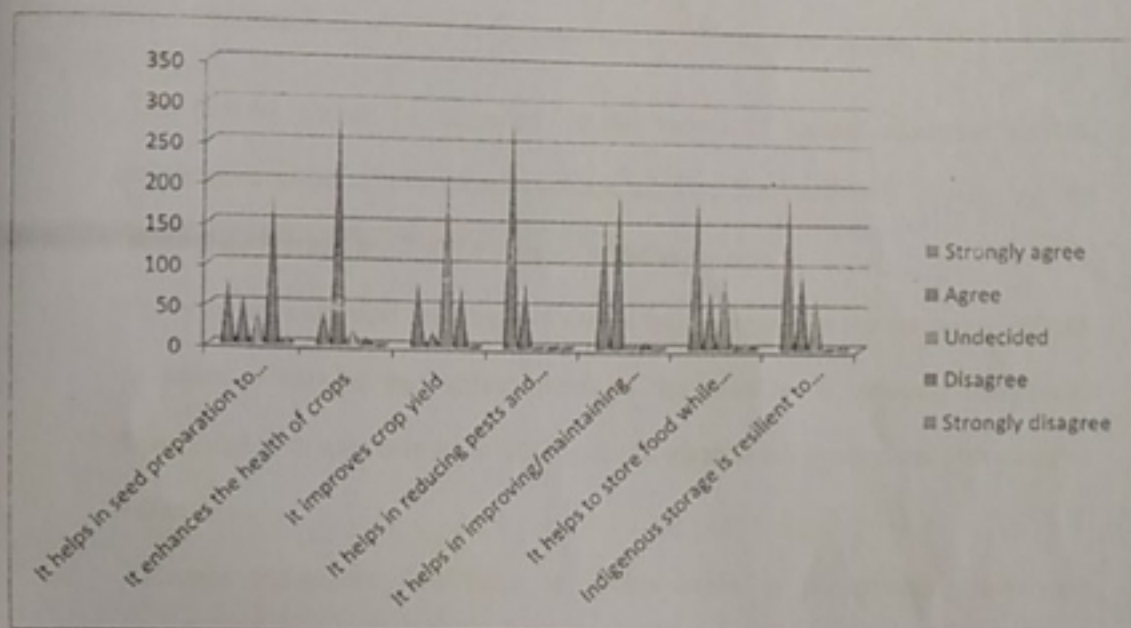


Fig. 5: Perceived benefits of indigenous agricultural knowledge

Source: Authors' Field Survey, 2019

CONCLUSION AND RECOMMENDATION

Indigenous knowledge is fundamental to the achievement of sustainable development in all its ramifications. This is especially so in the case of agricultural development in general, and urban agriculture in particular. The traditional agricultural practices and methods are still relevant and essentially adopted by the urban farmers in Minna, Nigeria. This study has revealed that indigenous knowledge is indispensable in the pursuit of achieving sustainable agricultural development. However, it is worrisome to note that majority of urban farmers do not possess adequate formal education. This low level of formal education may pose negative impact on their productivity as well as the quality of food produced. Poor education may also translate into poor land management practices. Therefore, the farmers in the study area require adequate information on how they can best

apply indigenous knowledge to agricultural production and how the incorporation of modern farming techniques can improve their output. Notwithstanding, indigenous knowledge has attained the status of the primarily applied knowledge in farming in Minna. Stemming from these findings, it is recommended that, among other things:

- i. The farmers should be educated on the values of formal education and be encouraged to enrol into adult education classes. This will help in reducing the inadequate literacy level of the farmers in the study area.
- ii. Furthermore, extension programmes should be organised for the farmers in Minna in order to educate and inform them on the benefits of blending indigenous knowledge with scientific knowledge in the in agricultural production, especially in urban areas
- iii. Although indigenous knowledge is indispensable in preservation, there are advanced modern preservation practices. Indigenous knowledge should therefore be incorporated into modern preservation ethics in order to ensure better result.
- iv. It is also suggested that indigenous knowledge should be integrated into modern farm management to ensure efficiency and maximum productivity.
- v. Further comparative studies on the role of indigenous and scientific knowledge in attaining sustainable agricultural development are recommended.

REFERENCES

- Abdullah, H. J., & Hassan, T. K. (2015). The use of indigenous knowledge in agriculture and its role in sustainable development. *International Journal of Science and Research*, 4(10), 1312-1317
- Adedipe, N. O., Okuneye, P. A., & Ayinde, I.A. (2004). The relevance of local and indigenous knowledge for Nigerian agriculture. Presented at the International Conference on *Bridging Scales and Epistemologies: Linking Local Knowledge with Global Science in Multi-Scale Assessments* ; March 16-19, 2004, Alexandria, Egypt.

- Akullo, D., Kanzikwera, R., Birungi, P., Alum, W., Aliguma, L., & Barwozeza, M. (2007). Indigenous Knowledge in Agriculture: A case study of the challenges in sharing knowledge of past generations in a globalized context in Uganda. *World Library and Information Congress: 73RD IFLA General Conference and Council*. Held between 19-23 August 2007, Durban, South Africa
- Anaeto, F. C., Asiabaka, C. C., Nnadi, F. N., Aja, O. O., Ajaero, J. O., Ukpongson, M. A., & Ugwoke, F. O. (2013). Integrating indigenous knowledge system in extension education: The potential for sustainable agricultural development in Nigeria. *Research Journal of Agriculture and Environmental Management*, 2(11), 332-340
- Asaba, E. B. (2006). Bridging the information and knowledge gap between urban and rural communities through rural knowledge centre: Cases studies from Kenga and Uganda. *International Association of Agricultural Information Specialists (IAALD) Quarterly Bulletin*, 51, 3-4.
- Berkes, F. (2008). *Traditional Ecological Knowledge*. Retrieved from <http://umanitoba.ca> on 2nd December, 2019.
- Britannica (2019). *Minna: Nigeria*. Retrieved from <https://www.britannica.com/place/Minna-Nigeria> on 4th December, 2019
- Daniyan, M. N., & Mohammed, M. (2018). Analysis of trend and dynamics of urban sprawl in Minna Niger State Nigeria. *Proceedings of ICGET 2018*, pp.31-34
- Dey, P., & Sarkar, A. K. (2011). Revisiting indigenous farming knowledge of Jharkhand (India) for conservation of natural resources and combating climate change. *Indian Journal of Traditional Knowledge*, 10(1), 71-79. Retrieved from <http://nopr.niscair.res.in/handle/123456789/11067> on 4th December, 2019
- Ihenacho, R. A., Orusha, J. O., & Onogu, B. (2019). Rural Farmers Use of Indigenous Knowledge Systems in Agriculture for Climate Change Adaptation and Mitigation in Southeast Nigeria. *Annals of Ecology and Environmental Science*, 3(1), 1-11
- Jaya, A. S. R. (2005). Gender-related Impacts and the work of the International Agricultural Research Centre. *CGIAR Study Paper, No. 17*. Washington D.C World Bank.
- Kazmi, T., Chaudhry, A. G., Ahmed, A., & Khan, S. E. (2014). Farmers beliefs about indigenous farming practices and sustainable agricultural development. *Pakistan Journal of Agricultural Research*, 27(1), 51-57
- Mafongoya, P.L., & Ajayi, O.C. (Eds.) (2017). *Indigenous Knowledge Systems and Climate Change Management in Africa*. The Netherlands: CTA, Wageningen
- Nimoh, S. K. (2014). Indigenous Traditional Medicine in Ghana: Tapping into an Under-Explored Resource. In Emeagwali, G. & Dei, G. J. S. (Eds.). *African Indigenous Knowledge and the Disciplines*. Rotterdam (etc.): Sense Publishers. Pp.83-93
- Nnadi, F. N., Chikaire, J., & Ezudike, K. E. (2013). Assessment of Indigenous Knowledge Practices for Sustainable Agriculture and Food Security in Idemili South Local

- Olaoye, R. O. (2014). African Traditional Medicine (TM) and Social Movements in Nigeria. In Emeagwali, G. & Dei, G. J. S. (Eds.). *African Indigenous Knowledge and the Disciplines*. Rotterdam (etc.): Sense Publishers. Pp.95-98
- Population Stat (2019). *Minna, Nigeria population*. Retrieved from <https://populationstat.com/nigeria/minna>
- Ross, A., Kathleen, P. S., Jeffrey, G. S., Henry, D. D., & Richard, S. (2011). *Indigenous Peoples and the Collaborative Stewardship of Nature*. Walnut Creek, CA: Left Coast Press.
- Senanayake, S. G. J. N. (2006). Indigenous Knowledge as a Key to Sustainable Development. *The Journal of Agricultural Sciences*, 2(1), 87-94
- Siambombe, A., Mutale, Q., & Muzingili, T. (2018). Indigenous knowledge systems: A synthesis of Batonga People's Traditional Knowledge on Weather Dynamism. *African Journal of Social Work*, 8(2), 46-54
- Simonelli, M. T. (2008). *Climate Change and Indigenous Knowledge. Higher Educational Handbook Series*. Keynote Publishers Limited, Ilesa, Nigeria.
- Taherdoost, H. (2017). Determining sample size; How to calculate survey sample size. *International Journal of Economics and Management Systems*, 2, 237-239
- Wang, J. (2018). Integrating indigenous with scientific knowledge for the development of sustainable agriculture: Studies in Shaanxi Province. *Asian Journal of Agriculture and Development*, 15(2), 41-58
- Wole, O.M., & Ayanbode, O.F (2009). Use of indigenous knowledge by women in a Nigerian rural community. *Indian Journal of Traditional Knowledge*, 8(2), 287-295.
- Yongabi, K., & DeLuca, L. (2015). Potentials of indigenous knowledge and ethnobiotechnology in sustainable agriculture in sub Saharan Africa. In Kumar, S. (Ed.). *Recent Advances in Ethnobotany*. India: Deep Publications. Pp.41-56
- Zaruwa, M. Z., & Kwaghe, Z. E. (2014). Traditional Tannery and Dyeing (Yirie) Methods: A Science Par Excellence in Northeastern Nigeria. In Emeagwali, G. & Dei, G. J. S. (Eds.). *African Indigenous Knowledge and the Disciplines*. Rotterdam (etc.): Sense Publishers. Pp.29-33
- Zaruwa, M. Z., Ibok, N. U., & Ibok, I. U. (2014). Traditional Brewing Technique in Northern Nigeria: An Indigenous Approach to the Exploitation of Enzymes (Tsiro). In Emeagwali, G. & Dei, G. J. S. (Eds.). *African Indigenous Knowledge and the Disciplines*. Rotterdam (etc.): Sense Publishers. Pp.23-28