



Role of Knowledge, Attitude, on the Adoption of Improved Pearl Millet by Farmers in North-east, Nigeria

Mohammed Galadima, Salim Hassan, Norsida Man and Ibrahim Abdul Abu

Abstract: *In Developing Countries Like Nigeria, An Effective Progression On Appropriate Improved Technologies Is Associated With Its Acceptance Among Farmers. This Study Investigated The Role Of Knowledge, Attitude, With Its Relationship And Influence Towards Adoption Of The Improved Pearl Millet By Farmers In North-East Nigeria. Purposive And Systematic Sampling Technique Was Used In Selecting 477 Pearl Millet Farmers In North-Eastern Nigeria. Respondents Information Were Collected Through Self-Report Questionnaire. Descriptive, Correlation And Regression Analysis Was Used To Analyzed The Data. Findings Revealed That, Respondents Level Of Knowledge Indicates High Level. While, Attitude Recorded Moderate Level. Also, Findings On The Adoption Level Among Respondents Recorded High Level. Furthermore The Outcome On The Relationship Between Knowledge, Attitude Towards Adoption Revealed Positive Relationship At ($P < 0.01$). Also, From The Results Of The Regression Analysis, It Revealed That Knowledge ($B = 283$) Contributed Most Towards Adoption. While, Attitude Did Not Contribute Towards Adoption. Hence, The Adj. R^2 Of 0.366 Indicates That Knowledge Had Significantly Contributed With 36.6 % Of The Variance Towards Adoption. Thus, The Study Suggest That, Pearl Millet Growers Should Be Encouraged Towards Developing Positive Attitude Towards Improved Pearl Millet Technologies. More So, Stakeholders In Collaboration With Change Agents Are Required To Strictly Focus On Programmes, With The Emphasis Towards Developing Farmers Attitude, Which Could Influence Adoption Of The Improved Pearl Millet And Other Relevant Areas Of Improvement In North-East, And Other Pearl Millet Producing Regions In Nigeria.*

Keywords: *Adoption, Attitude, Correlation, Knowledge, Relationship, Role*

I. INTRODUCTION

In a developing country such as Nigeria, a significant progression of appropriate improved technology provides a means of acceptance and eventual adoption among farmers. Adoption of improved technologies, especially

improved pearl millet seed as the name implies, is a necessary precondition for plant breeding, thus creating a beneficial effect on farm households (1& 2). Nonetheless, the effect can be achieved by growing the crop, improving the quality and reducing the risk of production.

Some studies, however, indicated that the critical determinant of accepting and subsequently adopting new agricultural technologies is the learning process through which knowledge is processed, disseminated and implemented [3,4,5,6 &7]. Indeed, [8] reported that the advantage of

improved technology towards agricultural development is realized in the relationships to increase farmers productivity, higher income, and standards of living.

Nevertheless, the acceptance and subsequent adoption of improved agricultural technologies available to farmers has been largely determined by the need to increase production output and income. Thus, adoption, as a name suggests, is a decision by an individual or a group to accept and use technological innovation as the best course of action available [9&10]. Agricultural growth and development, therefore, depend mainly on the adoption of improved agricultural technologies, associated with climate-friendly seeds and modern agricultural practices to mention but a few [11& 12]. Hence, knowledge as well as attitudes which influence the adoption of the technological progressions by small-scale farmers who make up the majority in sub-Saharan Africa, including Nigeria, has remained very sluggish. [13].

Indeed, the acceptance and subsequent adoption of improved agricultural technologies available to farmers has been largely determined by the need to increase production output and income. Thus, adoption, as a name suggests, is a decision by an individual or a group to accept and use technological innovation as the best course of action available [9&10]. Agricultural growth and development, therefore, depend mainly on the adoption of improved agricultural technologies, associated with climate-friendly seeds and modern agricultural practices to mention but a few [11&12].

However, knowledge in this research refers all relevant information on the adoption practice towards improved pearl millet technology among farmers in North-east, Nigeria, which was not only limited to the information on improved technology alone but, practices such as the land preparation, sowing, thinning, fertilization, pest control, herbicide, harvesting, grading, packaging technology, transportation, and storage technology that involves the cultivation of improved pearl miller [14,15,16&17].

Manuscript published on November 30, 2019.

* Correspondence Author

Mohammed Galadima*, student in the field of Agricultural Extension, Department of Agriculture Technology, Universiti Putra, Malaysia

Dr Salim Hassan, currently a Senior Lecturer in the Department of Agriculture Technology, Agriculture, University Putra, Selangor, Malaysia.

Assoc. Prof. Norsida Man, currently the Head of Department Agriculture Technology, Faculty of Agriculture, Universiti Putra, Malaysia.

Professor Ibrahim Abdul Abu, currently a Professor in the field of Agricultural Extension, in the Department of Agricultural Extension Services, Faculty of Agriculture, University of Maiduguri, Borno State, Nigeria.

© The Authors. Published by Blue Eyes Intelligence Engineering and Sciences Publication (BEIESP). This is an [open access](https://creativecommons.org/licenses/by-nc-nd/4.0/) article under the CC-BY-NC-ND license <http://creativecommons.org/licenses/by-nc-nd/4.0/>

Role of Knowledge, Attitude, on the Adoption of Improved Pearl Millet by Farmers in North-east, Nigeria

Hence, in this research farmers level of knowledge was measured and categorized based on three level: low, moderate and high. While, farmer's attitude on the other hand, has to do with the behavior change among farmers

towards the adoption of improved pearl millet technology, which could be evaluated as low, moderate and high level as in the context of this study.

Indeed, Pearl millet as the subject of this research is a small-seeded cereal crop which has been grown for decades in the "sudano-Sahelian zone" of North Eastern Nigeria for its nutritive and food security values [18]. The main crop producers are small-scale farmers who have continuously grown local and low yielding unimproved Pearl millet which may include among others Maiwa, Buduma, Buduma-Damasak, Ex- Gashua, Ex-Tukur, and Zango [19]. Hence, the adoption of improved pearl millet technology, such as the High Yielding Varieties (HYV), such as SOSAT C-88, LCIC MV-1 LICC 9702 MV-2 to mention but few, which could lead to significant increases in agronomic productivity thereby stimulating the transition from low productivity subsistence agriculture to a high productivity agro-industrial economy which was observe to be very low [20]. Though, in the North-east, the acceptance and subsequent adoption of the improved pearl millet which has the abilities of yielding over 2.5-3-4 tons/ha-1 appears to be very little because of perceived high number of farmers who still grow the traditional varieties that only yields an output of 1-1.5 tons/ha-1 or below as a result of inadequate knowledge on the technologies, which could influence farmers attitude. It should thus, be noted that improved Pearl millet has higher yielding capacity that mature earlier (60 to 70 days as against 70 to 100 days for traditional varieties) (19& 21). In addition, the authors confirmed that, the crop is resistant to Striga spp, drought, pest and diseases, respond optimally to fertilizer and other management practices and more importantly, the grain size is larger while the panicle is more compact. With all these qualities; yet, farmers' adoption level remained very low.

Indeed, [22] confirmed that 40% yield is attributed to the practice of improved pearl millet technology but, yet farmers in the region continue to use the conventional local seeds that may lead to a decrease in about 40% yield. More so, farmers in North-eastern region were equally faced with numerous kinds of challenges ranging from high poverty level, ignorance and level of illiteracy resulting from insurgency [23,24,25,26&27]. Thus, these situations among others create the need for this research, which was aimed to response to questions on farmers' level of knowledge, attitude and adoption, the relationship between knowledge, and attitude towards adoption and also determination of the contribution of knowledge, and attitude towards adoption of the improved pearl millet technology among farmers in North-eastern Nigeria.

II. MATERIALS AND METHODS

This research was conducted in the North East region of Nigeria. The region covers a total land mass of about 241,076 km, which is approximately (26% of National total) occupying an arable land of about 7.9 million hectares with an average farm size of about 1.59 hectares. The average annual rainfall in the area is about 1500mm and could be as low as 500mm. Hence, the weather is often, dry and hot all over the year [28]. The inhabitants of the region were estimated at

twenty-six million, two hundred and sixty-three thousand, eight hundred and sixty-six persons (26,263,866) as at 2016 based on the estimates by [29]. The zone is bounded by the North Central and North-West zones of the nation while, the international borders are with Cameroon, Chad Republic and the Republic of Niger. The climate favors the production of varied crops, which include legumes (groundnuts and beans); cereals (maize, millet, sorghum, and rice), solanecious crops (peppers, tomato, garden eggs). The zone also provides a large livestock market. Hence, the North-eastern region is also known for their rich fishing and mineral deposits. The region also comprises of varied ethnic groups with majority been Fulani and Hausa.

The study used descriptive- correlational design. Hence, the design in question was used in similar studies as confirmed in the work of [30]. Purposive and systematic sampling technique was used to select respondents for the study, where three States (Bauchi, Borno, and Yobe) and Three (3) Local Government areas each, were purposively selected based on their higher level of participation in pearl millet farming in the region, making a total of 9 Local Government areas. Sample size was determine using [31] at 95% confidence interval to calculate the appropriate sample size and 398 was obtained out 100,700 study population. In the third stage, to avoid missing and unreturned questionnaires, 20 % of the relative sample was added using systematic sampling technique and the final sample size stood at 477. Thus, the figure in question serve as the acceptable sample size, which the research used to administer questionnaires to collect data, for subsequent analysis.

Nevertheless, data was collected through the use of self-report questionnaire to the farmers. Hence, out of Four Hundred and seventy-seven (477) questionnaires

distributed, Four Hundred and Fourty two (442), representing (92.66%) questionnaires were retrieved and duly answered, with a complete valid case and recorded as return rate. While, thirty-five representing (7.33%) were Unreturned questionnaires. Accordingly, the (442) valid return questionnaires were thus, used for data analysis in the study. Hence, the data were analysed and computed using Descriptive, Correlation and Regression analysis.

III. RESULTS

A. Respondents level of Knowledge

Findings presented in Table 1, on level of Knowledge on the improved pearl millet among farmers in the study area, revealed that knowledge among respondents was high with a frequency of 405 representing 91.6% ; with a mean value of 4.30. That means the majority of active pearl millet farmers in North-Eastern Nigeria had high level of knowledge towards the improved Pearl millet. This also implies that majority of respondents has good

understanding and comprehension of the context of the improved technology on pearl millet. The result further revealed that the second category of respondents fell into the moderate level with a frequency count of 33 representing 7.5% of respondents while, third category recorded low level of knowledge with a frequency count of 4 representing 0.91% among respondents. See Table 1.

Table 1: Respondents Level of knowledge on the Improved Pearl millet (n=442)

Level SD	Frequency	Percentage %	Mean
Low (1.00 -2.66)	4	0.91	4.30
Moderate (2.67 -3.99)	33	7.5	
High (4.00-5.00)	405	91.6	

Source: Computed from field survey, 2017

B. Respondents level of attitude

The findings on the level of attitudes towards the improved pearl millet is presented in Table 2. The result revealed that more than half of respondents recorded a moderate level of attitude with a frequency count of 362 representing 81.9% among respondents with a mean score of (3.44) by respondents. That means the majority of practicing pearl millet farmers in North-eastern Nigeria had a moderate level of attitude on the adoption of improved pearl millet. The result further revealed that the second category of respondents falls at a high level with a frequency count of 79 representing 17.9% among respondents. Whereas, the third and the least category fall into the low level of attitude with a frequency of 1 representing 0.2% by respondents, see Table 2.

Table 2: Farmers level of Attitude on improved pearl millet (n=442)

Level SD	Frequency	Percentage %	Mean
Low (1.00 -2.66)	1	0.2	3.44
Moderate (2.67 -3.99)	362	81.9	
High (4.00 -5.00)	79	17.9	

Source: Computed from field survey, 2017

C. Farmers Level of Adoption

From Table 3, farmers' level of adoption on the improved pearl millet as popularised by stakeholders in the study area were presented. The findings revealed that the adoption level of respondents on the improved pearl millet recorded high with a frequency count of 285 representing 64.5% among respondents. Followed by respondents that fall into the moderate level of adoption, with a frequency of 129 representing 29.2 % by respondents. while the least category falls into the low level of adoption with a frequency of 28 representing 6.3% of respondents. This implies that majority of practicing pearl millet farmers in North-eastern Nigeria have adopted improved pearl millet seed as captured in Table 3.

Table 3: Farmers level of adoption on improved pearl millet (n=442)

Level	Frequency	Percentage %	Mean	SD
Low (1.00 -2.66)	28	6.3	4.020	0.734
Moderate (2.67 -3.99)	129	29.2		
High (4.00-5.00)	285	64.5		

Source: Computed from field survey, 2017

D. Relationship between knowledge, and attitude towards the Adoption.

Based on the findings on the correlational analysis, the results on the relationship between knowledge, attitude towards Adoption is captured in Table 4, which revealed that a significant relationship existed between knowledge, attitude as independent factors towards adoption at (p<0.01) level of

probability. Thus, this result was confirmed that, there is a positive significant relationship between knowledge and adoption, which was supported by the correlation coefficient value of (r=0.469, p=0.000). It further revealed that, there is a positive relationship between attitude as towards adoption, which was equally supported by the correlation coefficient value obtained on attitude of farmers as indicated its coefficient (r =0.151, p=0.001), which showed positive relationship towards adoption.

Table 4: Relationship between knowledge, attitude towards Adoption

Variables	X1	X2	Y
X1 Knowledge	1		
X2 Attitude	.151	1	
Y Adoption	.469	.117	1
Significant	.000	0.14	
Mean	4.30	3.44	4.02
Standard Deviation	0.73	0.29	0.73

** Correlation is significant at p<0.01 Level (2 tailed)

E. Contribution of knowledge, and attitude towards adoption

To determine the most contribution of knowledge and attitude towards adoption among farmers in North-Eastern Nigeria, the regression model was used. Thus, the model in question consists of two independent variables which were analyzed namely; knowledge (X1) and attitude (X2) and so, the prediction equation is as follows:

$$Y = b_0 + b_1(X_1) + b_2(X_2) + e_i$$

Where:

Y = Adoption,

b₀ = Constant,

b₁₋₂= Estimates (regression coefficients),

X₁=Knowledge,

X₂ =Attitudes,

e = Error.

The proposed hypothesis to test, which examine the validity of the model was expressed below:

$$H_0: Y = \beta_0 + e_i$$

$$H_A: Y = b_0 + b_1X_1 + b_2X_2 + e_i$$

From Table 5, the regression results revealed that among the two independent variables; knowledge contributed significantly towards the adoption of improved Pearl millet technology among respondents where, coefficients for knowledge (β=0.283, p=000). While, attitude was not significant with a value of (β=0.047, p=0.623) since the t-value was 0.623 which is more than 0.05 but it has a relationship with adoption. Thus, knowledge was

considered the strongest independent factor that contribute most towards adoption of improved pearl millet due to its higher (β= 0.283). Hence, adjusted R² value was 0.366 which indicates that Knowledge contributes 36.6 % of the variance towards adoption of the improved pearl millet among respondents in North-Eastern Nigeria. Hence, the estimate coefficient could be presented as follows and see data in Table 5.



Role of Knowledge, Attitude, on the Adoption of Improved Pearl Millet by Farmers in North-east, Nigeria

$Y = .812 + 0.283 (\text{Knowledge}) + 0.047(\text{Attitudes}) + e^*$
 Increase in 1 unit of Knowledge, will therefore increase the DV by 0.283.

value was 0.366 which indicates that knowledge contributes 36.6 % of the variance on adoption.

Table 5: Regression of Knowledge, and Attitude towards Adoption

Predictors		Unstandardized Coefficients		Standardized Coefficients		Sig
		B	Std. Error	Beta	T	
Y	Constant	.812	.375		2.162	.031
X1	Knowledge	.283	.068	.193	.4.145	.000
X2	Attitude	.047	.095	.019	.492	.623

$R = 0.609$, $R^2 = 0.371$, $\text{Adj. } R^2 = 0.366$, $\text{Std. Error} = 0.584$
*significant; *p<.05; **p<.01; ***p<.001*

IV. DISCUSSION

From the data presented above, this section attempt to discuss the overall findings as presented. Thus, from the findings, the outcome on farmers level of knowledge, attitude and as well adoption have clearly shown that, farmers level of knowledge towards the improved pearl millet had confirmed that, the greater proportion of respondents recorded high level of knowledge on the improved pearl millet. These results were in line with previous findings of [30,32;33,34,35&36]. Furthermore, results revealed that, the majority of the pearl millet farmers in North-eastern Nigeria recorded a moderate level of attitude towards the adoption of the improved pearl millet. These findings were in line with the previous results obtained by [32&37] who found that respondents had a moderate level of attitudes. More so, the outcome further revealed that, more than half of the respondents recorded high level of adoption on the improved pearl millet. These findings were in agreement with the findings of [38,27,39,40,41&42] who established that, respondents recorded a high level of adoption.

From the results, findings on the relationship between independent factors 'knowledge and attitude towards adoption were investigated. The findings revealed that, positive relationship existed between knowledge and adoption, which was supported by the earlier findings of [35,43&44]. Hence, the correlation coefficient value of ($r=0.469$, $p=0.000$) on knowledge also supported this findings. Furthermore, findings also revealed that, positive relationship existed between attitude and adoption, this was also supported by correlation coefficient value obtained on the attitude of farmers as revealed in the outcome of this research ($r=0.151$, $p=0.001$), which showed positive relationship towards adoption. These findings were equally supported by the previous studies conducted by [45,46,30,44&47] that, there was a positive relationship between attitude and adoption.

In addition, from the outcome, findings on regression analysis of this study revealed that Knowledge level of farmers contributed significantly towards the adoption of improved Pearl millet technology. While, attitude was not significant towards adoption, with a value of ($\text{Beta}=0.047$, $p=0.623$). Thus, Knowledge was considered the most contributing independent factor influencing adoption due to its higher Beta value of (0.283). More so, Adjusted R2

V. CONCLUSION

From the findings of this study, it concludes that, Thus, the overall that farmers level of knowledge was at high level. While, attitude is at a moderate level and the results on farmers level of adoption was also notice high. The finding further revealed that significant relationship ($p<0.01$) existed between knowledge, attitude towards adoption and finding of the regression revealed that, knowledge contributes towards adoption. while the attitude did not contribute. Hence, knowledge is considered the most contributing independent factor towards adoption. Thus, the study suggests that farmers should be encouraged towards developing positive attitude towards the adoption of improved pearl millet. More extension agents should be deployed to intensify awareness creation on the use and acceptance of the technology, which could further boost adoption among farmers, thereby increasing the production output. More so, stakeholders in collaboration with change agents are required to strictly focus on programmes, via sensitization, educational campaign, on-farm trials, with the emphasis of developing positive attitude among, which could influence the adoption of the improved pearl millet and other relevant areas of improvement in North-east and other pearl millet producing region in Nigeria.

ACKNOWLEDGMENTS

The authors are extremely thankful to the Department of Agricultural Technology, Faculty of Agriculture, Universiti Putra, Malaysia for providing enabling environment for successful completion of this research work. The stakeholders in the study area, particularly programme managers of Agricultural Development Programmes (ADPs) in all the selected states in North East, Nigeria as well as relevant agencies such as; research institutes for providing both material and human resources support particularly the skilled extension personnel that were incorporated into the surveys in order to facilitate the research work. Last but not the least, we owe all the 45 respondent farmers in North eastern Nigeria, for their cooperation during the surveys, their warm kindness and for sparing their valuable time, throughout the research period.

REFERENCES

1. Fess TL, Kotcon JB, Benedito VA. Crop breeding for low input agriculture: a sustainable response to feed a growing world population. Sustainability. 2011 Oct;3(10):1742-72.
2. Bantilan MC, Gowda CL, Reddy BV, Obilana AB, Evenson RE. Sorghum genetic enhancement: research process, dissemination and impacts. International Crops Research Institute for the Semi-Arid Tropics; 2004.
3. BenYishay A, Mobarak AM. Social learning and incentives for experimentation and communication. The Review of Economic Studies. 2018 Jul 30;86(3):976-1009.
4. Dupas P. Short-run subsidies and long-run adoption of new health products: Evidence from a field experiment. Econometrica. 2014 Jan;82(1):197-228.

5. Miller G, Mobarak AM. Learning about new technologies through opinion leaders and social networks: experimental evidence on non-traditional stoves in rural Bangladesh. *Poverty Action*. 2013 Jan.
6. Adhvaryu A. Learning, misallocation, and technology adoption: evidence from new malaria therapy in Tanzania. *The Review of economic studies*. 2014 Jun 30;81(4):1331-65.
7. Conley TG, Udry CR. Learning about a new technology: Pineapple in Ghana. *American economic review*. 2010 Mar;100(1):35-69.
8. Anaeto FC, Asiabaka CC, Nnadi FN, Ajaero JO, Aja OO, Ugwoke FO, Ukpongson MU, Onweagba AE. The role of extension officers and extension services in the development of agriculture in Nigeria. *Journal of agricultural Research*. 2012 Jul;1(6):180-5.
9. Rogers EM, *Diffusion of Innovations 3rd Edition 2003* (pp.1-375) The Free Press, New York.
10. Rogers EM. Diffusion of Innovations: modifications of a model for telecommunications. In *Die diffusion von innovationen in der telekommunikation 1995* (pp. 25-38). Springer, Berlin, Heidelberg.
11. World Bank. *Understanding Poverty*, The World Bank, Washington D.C, 2018.
12. UNSDG. *The United Nations, Sustainable Development Goals, The United Nations*, New York, 2018. Retrieved March 5, 2018, from <https://www.un.org/sustainabledevelopment>
13. Duflo E, Kremer M, Robinson J. Nudging farmers to use fertilizer: Theory and experimental evidence from Kenya. *American economic review*. 2011 Oct;101(6):2350-90.
14. Ndjeunga, J., & Ajeigbe, H. Proceedings of the Stakeholder Workshop of Actors along the Sorghum, Pearl millet and Groundnut Value Chains in Nigeria 23-25 November 2011 Kano, Nigeria.
15. Mitaru BN, Mgonja MA, Rwomushana I, Opio F. Integrated sorghum and millet sector for increased economic growth and improved livelihoods in Eastern and Central Africa. In *Proceedings of the ECARSAM stakeholders' conference 20-21 November 2006*, Dar es Salaam, Tanzania 2012.
16. Gibbon D. *Save and Grow: A Policymaker's Guide to the Sustainable Intensification of Smallholder Crop Production*. Rome, Italy: Food and Agriculture Organization of the United Nations (2011), pp. 112, US \$45.00. ISBN 978-92-5-106871-7. *Experimental Agriculture*. 2012 Jan;48(1):154-.
17. Ajeigbe HA, Mohammed SG, Adeosun JO, Ihedioha D. Farmers' guide to increased productivity of improved legume-cereal cropping systems in the Savannas of Nigeria. IITA, Ibadan, Nigeria. 2010;104.
18. Lubadde G, Tongoona P, Derera J, Sibiya J. Pearl Millet Socioeconomic and Production Characteristics in Uganda. Kampala, Uganda: National Semi Arid Resources Research Institute of the National Agricultural Research Organisation-Uganda. 2015.
19. Okeke-Agulu KI, Onogwu GO. Determinants of farmers adoption decisions for improved pearl millet variety in Sahel savanna zone of northern Nigeria. *Journal of Development and Agricultural Economics*. 2014 Oct 1;6(10):437-42.
20. Baba BA, Maina YB. Marketing margin and transaction cost in pearl millet market supply in Borno State, Nigeria. *Greener Journal of Business and Management Studies*. 2013;3(5):201-6.
21. Izge AU, Song IM. Pearl millet breeding and production in Nigeria: problems and prospects. *Journal of Environmental Issues and Agriculture in Developing Countries*. 2013 Aug;5(2):25.
22. Rai KN, Murty DS, Andrews DJ, Bramel-Cox PJ. Genetic enhancement of pearl millet and sorghum for the semi-arid tropics of Asia and Africa. *Genome*. 1999 Aug 1;42(4):617-28.
23. Olanrewaju FO, Olanrewaju A, Omotoso F, Alabi JO, Amoo E, Loromeke E, Ajayi LA. Insurgency and the Invisible Displaced Population in Nigeria: A Situational Analysis. *SAGE Open*. 2019 Apr;9(2):2158244019846207.
24. Bibi-Farouk I. Boko Haram and the Geopolitics of Forced Migration in Nigeria. *Journal of International Studies* Vol. 2018;14:51-63.
25. Leshie, N.E. & Henry, B. 2016. Boko Haram Insurgency .. Internally Displaced Persons and Humanitarian Response in Northeast Nigeria Insurgency *International Journal of Humanities and Social Sciences*. 2016 August 4 141-150.
26. Obikaeze VC, Onuoha CB. The Nigerian-state and management of internally displaced persons (IDPs) from 2012-2016. *African Journal of Politics and Society*. 2016;2.
27. Yadav BC, Choudhary R, Saran PL. Adoption of improved production technology of Mandarin in Rajasthan, India: A review. *African Journal of Agricultural Research*. 2013 Dec 19;8(49):6590-633.
28. Gwary, M.M., Bawa, D.B., Shettima, A.G., Mohammed S.T., Nuhu, S.H and Zangoma, B. *Voices from flood Plains: A Quantitative Baseline Study of Fadama III States in North Eastern Nigeria, Bauchi and Yobe State Fadama Coordination Office Monograph 2011* Retrieved from isbn: 978-978-49580-1-1.
29. National Population Commission and National Bureau of Statistics Estimates NPC & NBS. (2016). *National Population Estimates*.
30. Hassan CE. *Knowledge, attitude and practices [KAP] of healthcare workers in the Free State, South Africa regarding type 2 diabetes mellitus* (Doctoral dissertation, University of the Free State).
31. Yamane T. *Designing and Conducting Survey Research—A Comprehensive Guide*. 1967.
32. Gupta RK, Raina SK, Shora TN, Jan R, Sharma R, Hussain S. A household survey to assess community knowledge, attitude and practices on malaria in a rural population of Northern India. *Journal of family medicine and primary care*. 2016 Jan;5(1):101.
33. Wang R, Yang Y, Chen R, Kan H, Wu J, Wang K, Maddock J, Lu Y. Knowledge, attitudes, and practices (KAP) of the relationship between air pollution and children's respiratory health in Shanghai, China. *International journal of environmental research and public health*. 2015 Feb;12(2):1834-48.
34. Evangelista RJ, Cruz AC, Lasco RD. Knowledge, Attitude and Practice of Smallholder Farmers Regarding Climate Change and Agroforestry: A Case Study of Farmers in Pena Blanca, Cagayan. *Journal of Environmental Science and Management (Special Issue 1)*. 2016 Nov 11:42-55
35. Quina CR, Almazan JU, Tagarino JB. Knowledge, attitudes, and practices of leptospirosis in Catbalogan City, Samar, Philippines. *Am. J. Public Health Res*. 2014;2:91-8.
36. Parveen, S. Rice Farmers' Knowledge About The Effects of Pesticides on Environmental Pollution in Bangladesh. 2010, 1214-1227.
37. Mondal S, Haitook T, Simaraks S. Farmers' knowledge, attitude and practice toward organic vegetables cultivation in Northeast Thailand. *Kasetsart J. Soc. Sci*. 2014;35:158-66.
38. Issa FO, Kagbu JH, Abdulkadir SA. Analysis of socio-economic factors influencing farmers' adoption of improved maize production practices in Ikara Local Government Area of Kaduna State, Nigeria. *Agrosearch*. 2016;16(2):15-24.
39. Awotide BA, Karimov A, Diagne A, Nakelse T. The impact of seed vouchers on poverty reduction among smallholder rice farmers in Nigeria. *Agricultural Economics*. 2013 Nov;44(6):647-58
40. Abebaw D, Haile MG. The impact of cooperatives on agricultural technology adoption: Empirical evidence from Ethiopia. *Food policy*. 2013 Feb 1;38:82-91.
41. Amare M, Asfaw S, Shiferaw B. Welfare impacts of maize-pigeonpea intensification in Tanzania. *Agricultural Economics*. 2012 Jan;43(1):27-43.
42. Kafle B, Shah P. Adoption of improved potato varieties in Nepal: A case of Bara district. *Journal of Agricultural Sciences—Sri Lanka*. 2012 Jan 31;7(1).
43. Askarian M, Danaei M, Vakili V. Knowledge, attitudes, and practices regarding pandemic H1N1 influenza among medical and dental residents and fellowships in Shiraz, Iran. *International journal of preventive medicine*. 2013 Apr;4(4):396
44. Azman A, D'Silva JL, Samah BA, Man N, Shaffril HA. Relationship between attitude, knowledge, and support towards the acceptance of sustainable agriculture among contract farmers in Malaysia. *Asian Social Science*. 2013 Jan 1;9(2):99-105.
45. Arbiol J, Orecio P, Nomura H, Takahashi Y, Yabe M. Knowledge, attitude and practices towards leptospirosis among lakeshore communities of Calamba and Los Baños, Laguna, Philippines. *Agriculture*. 2016 Jun;6(2):18.
46. Hu Y, Luo S, Lou L, Zhang B, Li Q. Knowledge, Attitude and Practice on Immunization among Migrant Mothers: A Questionnaire Development and Field Application. *Int J Vaccine Immunization*. 2015;2(1).
47. Neda T, Azimi H, Bahaman AS, Jegak U. Attitudes of Malaysian extension workers towards Sustainable Agricultural Practices. *American Journal of Environmental Sciences*. 2013;9(1):33-7.

Role of Knowledge, Attitude, on the Adoption of Improved Pearl Millet by Farmers in North-east, Nigeria

AUTHORS PROFILE



Mohammed Galadima, is a PhD. student in the field of Agricultural Extension, Department of Agriculture Technology, Universiti Putra, Malaysia and a Lecturer with Federal University Gashua, Yobe State, Nigeria. He received his MSc. in Agricultural Extension & Rural Sociology at Ahmadu Bello University Zaria and Bachelor Degree in Sociology and Anthropology from University of Maiduguri,

Nigeria. His research Interest is on Specialised Agricultural extension, improved Technology adoption, community development and rural livelihood researches. The Author is happily married with children.



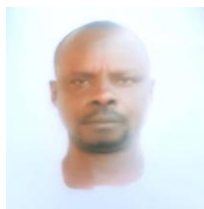
Dr Salim Hassan, is currently a Senior Lecturer in the Department of Agriculture Technology, Agriculture, University Putra, Selangor, Malaysia. He received his PhD. in the field of Rural Advancement and Agricultural Extension, Universiti Putra, Malaysia; MSc. in the field of Agriculture Research, Technology and Extension, University of Readings, United Kingdom and

Bachelor Degree in Agriculture Universiti Putra, Malaysia. His research interest is on Technology Transfer for paddy, cocoa and adoption of improved technologies on pearl millet, groundnut etc.



Assoc. Prof. Norsida Man, is currently the Head of Department Agriculture Technology, Faculty of Agriculture, Universiti Putra, Malaysia. She received her Bachelor Degree in Agricultural System Engineering; MSc. and PhD. in Agricultural Economics and Management at Kagoshima University, Japan. Her research

interest in on Adaptation towards Climate change Impact, off-farm employment, Rural Development, custom farming and Agriculture Development.



Professor Ibrahim Abdul Abu, is currently a Professor in the field of Agricultural Extension, in the Department of Agricultural Extension Services, Faculty of Agriculture, University of Maiduguri, Borno State, Nigeria. He received his Bachelor Degree B. Tech (Hons) Agricultural Education in the Federal University of Technology Yola, MSc. in Agricultural Extension University of Ibadan Nigeria and PhD in

Agricultural Extension University of Maiduguri with expertise in Agricultural Communication and Technology Adoption. His research interest is on Farmers Guide to production of drought-tolerant Maize, Adoption decision on Rice Production Technology by farming household and how to produce certified seed of drought-tolerant Maize