



Use of Social Media among Male and Female Agricultural Extension Agents in the north central Nigeria

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Abstract: The study examined the use of social media among male and female agricultural extension agents (AEAs) in the north central Nigeria. Specifically, we tried to find out if social media use depends on gender, state (location) of the AEAs and media type. The study randomly sampled AEAs from Benue, Plateau, Nassarawa, Kogi, Kwara, and Niger States. The social media studied include Facebook, WhatsApp, ResearchGate, Twitter, Instagram and LinkedIn. Analysis was done using three-way analysis of variance. First, pooled data result, $F(1, 455) = 8.08, p = .00$, showed that the male AEAs significantly used all the social media more than their female colleagues. This implies that social media use depends on gender. Second, the result, $F(5, 2275) = 98.91, p = .00$, indicated that regardless of gender of the AEAs, some social media were significantly used more than others across the states. For example, Facebook and WhatsApp were significantly used by the AEAs more than other social media while the least used were Instagram and LinkedIn implying that social media use depends on media type. Third, the result, $F(25, 2275) = 2.39, p = .00$, showed that there were significant variations in gender use of some of the social media in some states. In other words, there were significant locational differences in the male and female AEAs use of social media for extension work. This also indicates that the location (state) where the extension agents work influences media use in extension. Generally, the grand mean response (1.80) indicated that the use of social media was low in the study area. Based on the findings, it was concluded that the use of social media for extension services depends on gender, type of social media and location (state) of the AEAs in the north central Nigeria.

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1. Introduction

Agricultural extension is one of the important subsectors of agriculture. It is organised in different ways across the world thus lending itself to different definitions. For instance, Van den Ban and Hawkins (1996) defined it as a process involving the conscious use of communication of information to help people form sound opinions and make good decisions. In their own view, Anandajayasekeram, Puskur, Sindu, and Hoekstra (2008) see it as the delivery of relevant agricultural information and technologies to farmers. According to Moris (1991) it a mechanism for information and technology delivery to farmers. Israel, Harder and Brodeur (2011) stated that it is a comprehensive set of activities that are intended to bring about a sequence of outcomes among targeted clients. In line with these definitions, FAO (2010) defined it as: “systems that should facilitate the access of farmers, their organizations and other market actors to knowledge, information and technologies; facilitate their interaction with partners in research, education, agribusiness, and other relevant institutions; and assist them to develop their own technical, organizational and

management skills and practices”. The above definitions reflect the importance and the expectations of agricultural extension programmes to farmers who are the major beneficiaries in the society.

Globally, the role of agricultural extension workers in technology transfer has been widely acknowledged. Davis and Sulaiman (2014) revealed that extension service delivery performs a vital role in agricultural advancement including decreasing hunger and poverty. In Kenya, the Ministry of Agriculture (2010) indicated that agricultural extension service helped in sharing knowledge, technologies, information as well as linking farmers to other actors in the economy. Agricultural extension does not only provide innovations to end-users but also act as a catalyst to speed up adoption rate (Alemu, Maetens, Deckers, Bauer and Mathijs, 2016). This implies according to Davis (2016) that extension service remains a critical institution for supporting rural livelihoods and sustainable development goals. In developing countries (Nigeria inclusive), there is a

belief that investment in extension service has the potential to improve agriculture and increase farmers' income and productivity (Anderson and Feder, 2007). In terms of coverage and practicability, Adejo, Okwu and Ibrahim (2012) acknowledged that agricultural extension remains the most crucial and critical means of reaching farmers in the rural areas across the world.

While the organizational structure of agricultural extension programme varies from one country to another, there are strong evidence that its impact on technology transfer to farmers has drastically improved with the introduction of social media (Ajah and Atewamba, 2018; Maumbe and Okello, 2010). By definition, social media is a collection of online technologies that allow users to share insights, experiences and opinions with one another and it can take place through video, audio, text or multi-media (Safko and Brake, 2009). They refer to user-generated information, opinion, video, audio, and multimedia that are shared and discussed over digital media (Andres and Woodard, 2013). According to Kaplan and Heinlein, (2009), it is a group of internet-based applications that build on the ideological and technological formations of web 2.0 and that allow the creation and exchange of user-generated contents. Suchiradipta and Saravanan (2016) described social media as potential goldmine that can be used to engage all the actors in agricultural innovation system among other benefits. Its impact on technology transfer may be attributed to the fact that it creates an environment for individuals to interact with one another allowing for the creation and maintenance of mutual relationships (Rajagopalan and Subramani, 2003). Social media overcome geographical boundaries and create opportunities for beneficiaries to share information, ideas, e.t.c.

Some studies have been conducted on the use of social media in agricultural extension. For instance, Barau and Afrad (2017) studied social media use in agricultural extension service and showed that it was generally appreciated in agricultural extension service delivery but needed a gender sensitive approach. Similarly, Thakur and Chander (2018) researched on the use of social media in agricultural extension in India and revealed that the potential of social media channels like Facebook, WhatsApp and YouTube among others were not fully exploited by agricultural extension staff to reach out to farmers. Iwuchukwu, Eke and Nwobodo (2019) studied the perception of extension personnel on suitability and benefits of using social media in communicating agricultural information in Nigeria and revealed that majority (81.4%) of the agricultural extension agents (male and female) possessed facilities used in accessing social media. Ifejika, Asadu, Enibe, Ifejika and Sule (2019) studied social media mainstreaming in e-extension by

agricultural development programmes in North Central Zone, Nigeria and revealed that there was zero exclusion of social media such as WhatsApp, Facebook, YouTube, Chats and Mobile phone tools in communication strategies. Other scholars (Hassan, Shaffril, Samah, Ali and Ramli, 2010; Rhodes and Aue, 2010) have also carried out similar studies with appreciable results.

Really, a review of both online and off-line documents attests to the fact that there are abundant literature and empirical studies on the use of social media in agricultural extension services. However, hardly will you see studies addressing use of social media among male and female agricultural extension agents in the north central Nigeria. This has created a knowledge gap that needs to be filled with empirical evidence, hence the study. The study is vital because Lambrecht, Vanlauwe and Maertens (2016) argued that issues about gender are rarely considered in the literature on agricultural extension as well as technology adoption. This calls for attention because Ogbonah (2011) stated that it is only when the female agricultural extension agents are aware of, have access to, and can use modern ICTs that they can effectively discharge their functions. Again, Njuki, Parkins and Kaler (2016) stated that it is crucial to attend to gender in agricultural extension because gendered inequalities contribute to global hunger and food insecurity. Since gender is essential in understanding the context in which agricultural development is being implemented in a developing country like Nigeria, the questions are: 1) What is the overall utilization of social media by the male and female agricultural extension agents in the study area; 2) Do male agricultural extension agents use all the social media more than their female counterparts or vice versa? 3) Do male agricultural extension agents use each of the social media more than their female counterparts or vice versa? 4) Apart from gender, which of the social media is used more or less by the extension agents? 5) Does the use of social media depends on state (location) where the AEAs are working?

2. Objectives of the study

The main objective of the study is to analyse the use of social media among male and female AEAs in the north central Nigeria. The specific objectives are to:

1. assess the overall utilization of social media by AEAs in the study area;
2. determine if the male agricultural extension agents generally use all the social media more than their female counterparts or vice versa;
3. compare the use of each social medium between the male and female agricultural extension agents;

4. determine the most and least utilized social media by the extension agents;
5. determine if the use of social media depends on the state where the extension agents are working (i.e, locational differences in the use of social media).

3. Hypotheses

Ho: Irrespective of gender and location, there is no significant difference in social media use by the agricultural extension agents.

Ho: There is no significant difference in gender use of all the social media across the states.

Ho: There is no significant difference in gender use of each social medium in each state (That is, there is no significant interaction effect of gender, media-type and location).

4. Methodology

Nigeria has six geopolitical zones – North Central, North West, North East, South-South, South East and South West. The study was conducted in the North Central Zone consisting of Abuja, Benue, Kogi, Kwara, Nassarawa, Niger and Plateau States. Abuja, the Federal Capital Territory was not chosen for the study. Simple random sampling technique was used to select a total of 467 respondents from the States’ Agricultural Development Projects (ADPs). That is, Plateau State (56 males 28 females), Benue State (20

males and 16 females), Kwara State (72 male and 15 female), Nassarawa State (76 males and 24 females), Kogi State (49 males and 11 females) and Niger State (53 males and 47 females). Note that the skewness of the sample in favour of the male extension agents is a reflection of male dominance in agricultural extension services in the study area and it may be attributed to purdah (Chikwendu and Arokoyo (2008). This is also supported by Kiplangat and Ocholla (2005) who stated that agricultural extension is male dominated. Male dominance in extension service is not only visible in the study area because Ofuoku (2012) assessed gender representation in agricultural extension workforce in Delta State of Nigeria and found that majority (70%) of the village extension workers were males. In the questionnaires, the AEAs were asked to rate their level of usage of social media (Facebook, WhatsApp, ResearchGate, Twitter, Instagram, LinkedIn) for agricultural extension work in their various states using: *Very High (4), High (3), Moderate (2), Low (1) and Not used at All (0)*. The rating scores were used for analysis in line with methods applied by Ajah and Atewamba (2018), Ajah. (2016), Ajah and Okorie (2016), and Colin and Paul (2011). SPSS 21.0 was used to run the analysis and mean separation was done using Bonferroni model at 5 percent probability level. The three-way ANOVA model is mathematically expressed as:

$$Y_{ijkt} = \mu + L_i + M_j + G_t + LM_{ij} + LG_{it} + MG_{it} + LMG_{ijt} + e_{ijtk} \dots\dots\dots 1$$

Where:

- Y_{ijtk} = Individual extension agent’s response on his/her usage of each social medium
- i denotes the level of factor L
- j denotes the level of factor M
- t denotes the level of factor G
- k denotes the kth observation in cell or treatment (i,j,t)

μ = population mean

L_i = differences in gender use of social media due to location (Kwara, Kogi, Niger, Nasarawa, Benue, Plateau States). This measures the main effect of location (state) where the extension agent works.

M_j = Media-type - this measures the main effect of media-type. That is, differences in the usage of social media arising from the nature of the media as a devise (Facebook, WhatsApp, ResearchGate, Twitter, Instagram, LinkedIn).

G_t = Gender, this measures the main effect of gender. That is, differences in the usage of social media due to the gender of the extension agent (male, female)

LM_{ij} = interaction between location and media-type

LG_{it} = interaction between location and gender

MG_{it} = interaction between media-type and gender

LMG_{ijt} = interaction of location, media-type and gender

e_{ijtk} = error term

The model hypothesizes that the usage of social media among agricultural extension agents in the north central Nigeria depends on three factors – gender, location (state) and media-type. Gender as a factor has 2 levels (male and female) while location (state) has 6 levels (Kwara, Kogi, Niger, Nasarawa, Benue, Plateau States). Both gender and location are called “*between factor variables*”. On the other hand, media-type has 6 levels (Facebook, WhatsApp, ResearchGate, Twitter, Instagram, LinkedIn) and it is called “*within factor variable*”. By implication, the model states that the usage of social media among the male and female extension agents (Y_{ijtk}) depends on location (state) of the extension agent in the north central Nigeria (L_i), type of social media (M_i), the gender of the extension agent (G_t), both location and type of social media (LM_{ij}), both location and gender (LG_{it}), both media-type and gender (MG_{it}), and the joint effects of location, media-type and gender (LMG_{ijt}).

5. Results and discussion

Table 1 shows the results of the three-way mixed analysis of variance (ANOVA) carried out to assess the use of social media among the male and female agricultural extension agents in the north central Nigeria. The model provides us the opportunity to look at the data in different perspectives. That is, assessing the main effects of the factors and their interaction

effects. Each of the factors and their interaction effects are interpreted separately for easy understanding. The *p*-values indicated that most of the results are significant (*p* < .01) hence mean separation was done to determine those variables that significantly differed from each other. The results are presented in charts (Figures 1-8).

Table 1: ANOVA results of male and female extension agents’ use of social media

Sources of variation	Df	SS	MS	F-cal	P-value
Media-type	5	670.79	134.16	98.91	.00
Media-type*location	25	192.72	7.71	5.68	.00
Media-type*Gender	5	19.405	3.88	2.86	.01
Media-type*Location*Gender	25	81.02	3.24	2.39	.00
Error (within subjects)	2275	3085.65	1.36		
Location	5	379.19	75.84	77.59	.00
Gender	1	7.898	7.89	8.08	.00
Location*Gender	5	9.05	1.81	1.85	.11
Error (between subjects)	455	444.69	0.98		

Note: * = sign of interaction

6. Assessing the most and least utilized social media across north central Nigeria

The result of how the agricultural extension agents (AEAs) rated their use of social media is shown in the first row of Table 1. Here, we address the main effect of media-type as expressed in the ANOVA model. The question is: Regardless of gender and location (state), what are the most and least utilized social media by the AEAs in the study area? It tests the hypothesis, which states that there is no significant difference in social media use by the AEAs. The result, $F(5, 2275) = 98.91, p = .00$, indicated that there are significant differences (*p* < .05) in the use of social media by the AEAs hence the rejection of the null hypothesis. In other words, regardless of gender and the

location (state) of the AEAs, some social media were significantly used more than others in the study area. The mean separation (Fig.1) indicated that Facebook and WhatsApp were significantly (*p* < .05) used more than ResearchGate, Twitter, Instagram and LinkedIn. This agrees with the findings by Boyd and Ellision (2010); Suchiradipta and Saravanan (2016), and Thakur and Chander (2018) which indicated that Facebook and WhatsApp were the most utilized social media. The least utilized social media were Instagram and LinkedIn. This may be attributed to the observation of Suchiradipta and Saravanan (2016) which revealed that LinkedIn, Academia.edu and ResearchGate are utilized more by academicians, researchers and other professionals for the purpose of creating peer network.

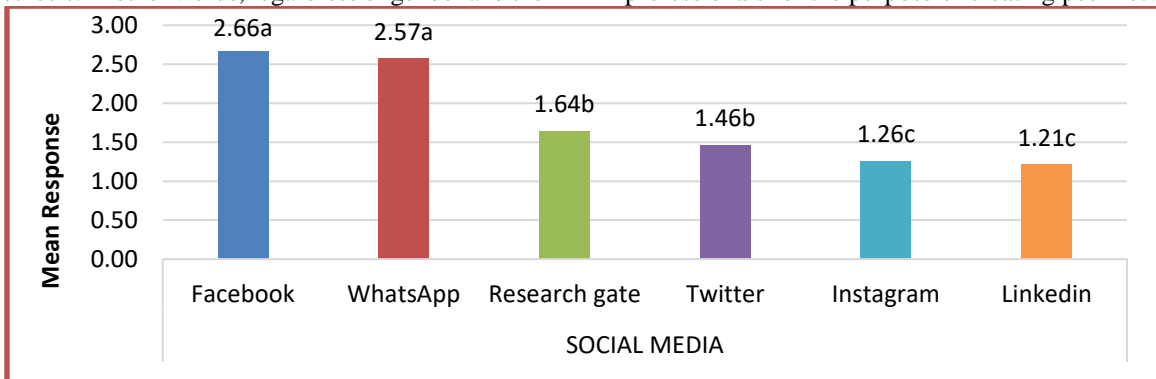


Fig. 1: Extension agents’ use of social media, irrespective of gender and location

Note: Mean with same alphabet didnot significantly differ

7. Comparing gender use of all the social media across north central Nigeria

Row seven in Table1 contains the result comparing the male and female extension agents’ use

of all the social media. The question is: Do male AEAs use all the social media more than their female counterparts or vice versa? This led to the test of hypothesis which states that, there is no significant

difference in gender use of all the social media across the states. The result, $F(1, 455) = 8.08, p = .00$, showed that there was significant difference ($p < .05$) in gender use of all the social media in extension services hence the null hypothesis was rejected. Mean separation (Fig. 2) shows that the male AEAs significantly ($p < .05$) used all the social media more than their female counterparts. This is contrary to a priori expectation because inequality in the use of social media by the male or female AEAs was not expected. However, this tallies with the finding by Ma *et al.*, (2018) which indicated that men far outnumbered women in the use of information technology. This may have also resulted in male farmers using social media more than their female counterparts as observed by Barau and Afrad (2017). This gender gap in the use of social media in extension services has to be addressed because Njuki, Parkins and Kaler (2016) stated that it is crucial to address gender issues in agricultural extension because inequalities between male and female AEAs will contribute to global hunger and food insecurity.

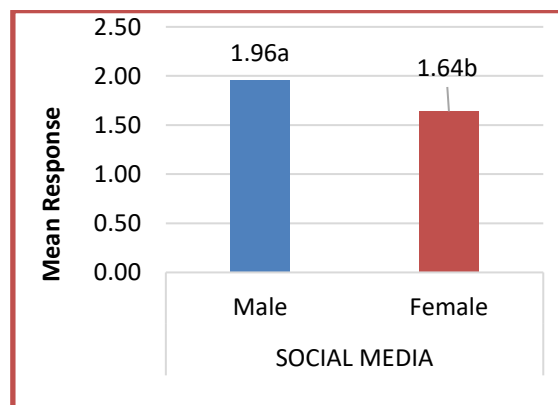


Fig. 2: Comparing gender use of all social media across the states

Note: Mean with same alphabet did not significantly differ

7. Assessing gender use of social media in each location (state)

Row four in Table 1 contains the result of gender use of each social medium in each location (state). It shows the result of interaction (*Media-type*Location*Gender*) of gender, media-type and location. The question is: In each of the states sampled, do male AEAs use each of the social media more than their female counterparts or vice versa? Here, we test the hypothesis which states that there is no significant difference in gender use of each social medium in each state. That is, there is no significant interaction effect of gender, media-type and location. The result, $F(25, 2275) = 2.39, p = .00$, indicates there was significant ($p < .05$) interaction effect of gender, media-type and location hence the rejection of the null hypothesis. This

implies that there was significant variations in gender use of each social medium in some of the states. For a better understanding of the results, the mean separation was done state-by-state and are shown in Figures 3-8. This is one of the advantages of using ANOVA because it breaks the data down to state level.

8. Use of WhatsApp by the extension agents

The results of how the agricultural extension agents (AEAs) rated their use of WhatsApp in all the states are presented in Figures 3-8. The mean responses showed that out of the six states studied, the male and female AEAs' use of WhatsApp significantly ($p < .05$) differed only in Kogi State (Fig. 4) in favour of the male gender. This agrees with the report by Hafkin and Huyer (2007) which showed that, on average, men in Africa (Nigeria inclusive) have greater chances than women in benefitting from information communication technologies. On the other hand, this is contrary to the observation of Pew Research Center (2012) which showed that women are more likely to use social media than men. Although there was no significant difference in the use of WhatsApp among the male and female AEAs in the other states, the mean responses clearly indicated that the male AEAs relatively used WhatsApp more than their female counterparts in Nasarawa (Fig.6), Benue (Fig.7) and Plateau (Fig. 8) States while the reverse is the case in Kwara (Fig. 3) and Niger (Fig. 5) States. However, in spite of the relative differences, Suchiradipta and Saravanan (2016) observed that the use of social media is picking up in rural areas of developing and least developed countries in the world.

9. Use of Facebook by the extension agents

Facebook is one of the social media that was utilized more by the agricultural extension agents (AEAs). The results of how the AEAs rated their use of Facebook are shown in Figures 3-8. The mean separation indicated that the male AEAs significantly used Facebook more than their female colleagues in Kogi (Fig. 4) and Plateau (Fig. 8) States. There was no significant difference in their use of Facebook in other states but the male AEAs relatively used Facebook more than their female counterparts in Niger (Fig. 5), Nasarawa (Fig.6) and Benue (Fig.7) States while the reverse is the case in Kwara State (Fig. 3). Overall, it can be seen that the male AEAs either significantly used or relatively used Facebook more than their female counterparts across the states. This agrees with finding of White, Meyers, Doerfert and Irlbeck (2014) which indicated that there were some differences in gender use of social media in agricultural marketing. This called for attention because according to Kingsley (2010), social media platforms such as Facebook offer

enormous potential to agricultural extensionists for reaching their audience.

10. Use of ResearchGate by the extension agents

The results showing how the extension agents rated their use of ResearchGate are shown in Figures 3-8. Apart from Kogi State (Fig. 4), there was no significant difference in the use of ResearchGate among the male and female AEAs in other States. In a similar study using farmers as respondents, Balkrishna and Deshmukh (2017) found that male farmers had more time to use social media compared to their female counterparts. However, the male AEAs relatively used ResearchGate in Nasarawa (Fig.6), Benue (Fig.7) and Plateau (Fig. 8) States while the reverse is the case in Kwara (Fig. 3) and Niger (Fig. 5) States. The magnitude of the mean responses showed that it was hardly used by the extension agents in Kwara (Fig. 3) and Benue (Fig.7) States.

11. Use of Twitter by the extension agents

The use of Twitter for information communication has proliferated with the increase in smartphones across the world. The mean separation on the use of Twitter among the male and female agricultural extension agents in the study area is shown in Figures 3-8. There was no significant difference ($p > .05$) in the use of Twitter among the male and female AEAs in all the States sampled. This is in line with the a priori expectation because education and exposure are reducing gender imbalance in the society. It corroborates the fact that extension services in many nations function with greater gender balance in reaching out to male and female decision makers (Quisumbing, *et al.* 2014; Rola-Rubzen *et al.* 2020). Nevertheless, the male AEAs relatively used Twitter in Kogi (Fig. 4), Niger (Fig. 5) and Nasarawa (Fig.6) States while the female AEAs relatively used Twitter in Kwara (Fig. 3), Benue (Fig.7) and Plateau (Fig. 8) States. The magnitude of the mean responses indicated that Twitter was hardly used by both male and female extension agents in Kwara (Fig. 3) and Kogi (Fig. 4) States. This has to be addressed because Mills, Reed, Skaalsveen, and Ingram (2019) showed that it was very useful for knowledge exchange on sustainable soil management under EU research project called SoilCare.

12. Use of Instagram by the extension agents

The results of mean separation on the use of Instagram among the male and female AEAs across the states are shown in Figures 3-8. Apart from Benue State (Fig.7) where the male farmers significantly used Instagram more than their female AEAs, mean separation indicated that there was no significant difference in the use of Instagram among the male and

female AEAs in other States sampled. However, the male AEAs relatively used Instagram in Niger (Fig. 5), Benue (Fig.7) and Plateau (Fig. 8) States while the reverse is the case in Kwara (Fig. 3) and Nasarawa (Fig.6) States. The magnitude of mean responses revealed that Instagram was hardly used in Kwara (Fig.3), Kogi (Fig. 4), Nasarawa (Fig.6) and Benue (Fig.7) States. The low usage may be due lack of skill and other issues because Suchiradiptra and Saravanan (2016) stated that many extensionists and experts have not started using social media due to lack of technical skills and other issues.

13. Use of LinkedIn by the extension agents

The results of mean separation on the use of LinkedIn among the male and female AEAs are shown in Figures 3-8. There was significant difference ($p < .05$) in the use of LinkedIn among the male and female AEAs in Kogi (Fig. 4) and Benue (Fig.7) States. While there was no significant difference in the use of LinkedIn in other States, it should be noted that the male AEAs relatively used LinkedIn more than their female counterparts in Plateau State (Fig. 8) while the reverse is the case in Kwara (Fig. 3) and Niger (Fig. 5) States. The magnitude of the mean responses indicated that LinkedIn was hardly used by both gender in Kwara (Fig. 3), Kogi (Fig. 4), Nasarawa (Fig.6) and Benue (Fig.7) States. This justifies the finding of Isiaka, Lawal-Adebowale and Oyekunle (2009) which indicated that many extension workers are not really conscious of the fact that information communication devices can be used efficiently to accomplish numerous functions in extension service delivery. This calls for further attention to find out why it is not used by the AEAs.

Generally, judging from the mean responses, the usage of all the social media among the male and female agricultural extension agents in Niger State is very encouraging. Notwithstanding, there is still room for improvement. While WhatsApp and Facebook maintained the lead in all the states as the most utilized social media, it can be seen that the usage of each social medium depends on state (location), gender and media type.

14. Conclusions

The importance of social media in agricultural extension services cannot be over emphasized and it has triggered-off research in different areas. Against this backdrop, the study assessed the use of social media among male and female agricultural extension agents in the north central Nigeria. The study covered six states making it possible to carry out analysis using pooled data as well as stepping it down to the state level. First, when the male and female AEAs were compared in their use of all the social media (pooled

data), finding showed that the male AEAs significantly used all the social media more than their female colleagues. In this regard, more research should be conducted to identify reasons for the gender gap in order to address it.

Second, finding indicated that some social media were significantly used by both male and female AEAs more than others across the states. This is expected because each of the social media has its own comparative advantage over the other especially with respect to technical skill and knowledge. Third, at the state level, there were significant variations in gender

use of some social media. This is also expected because the socio-political environment under which the extension agents work are not the same. Some extension agents may have more opportunities to access social media facilities in their respective states more than others. Generally, the grand mean response indicated that the use of social media for agricultural extension services was low in the study area. The paper, therefore, recommends capacity building for the extension agents in order to enhance their use of social media in agricultural technology transfer.

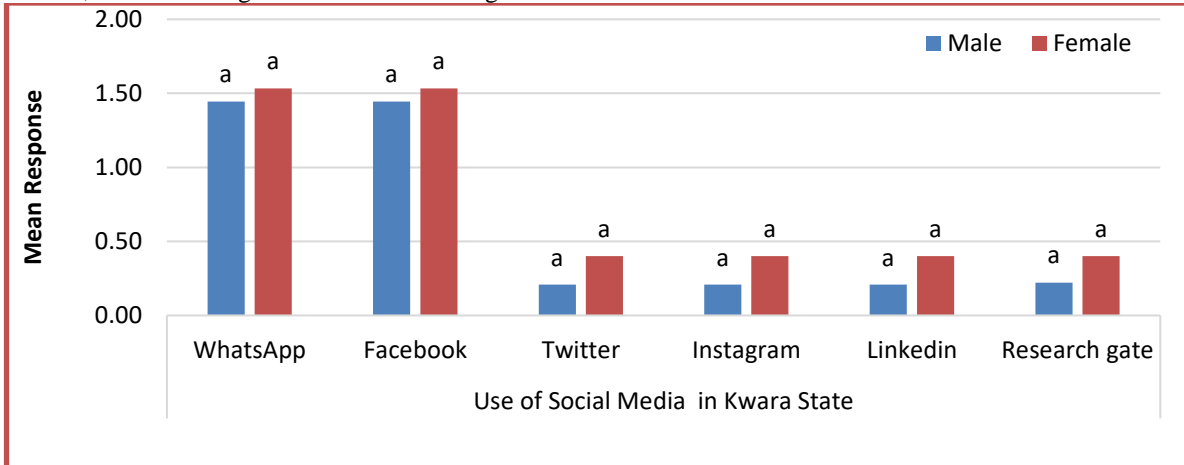


Fig 3: Gender use of Social media in Kwara State

Note: Mean with same alphabet (for each social medium) didnot significantly differ

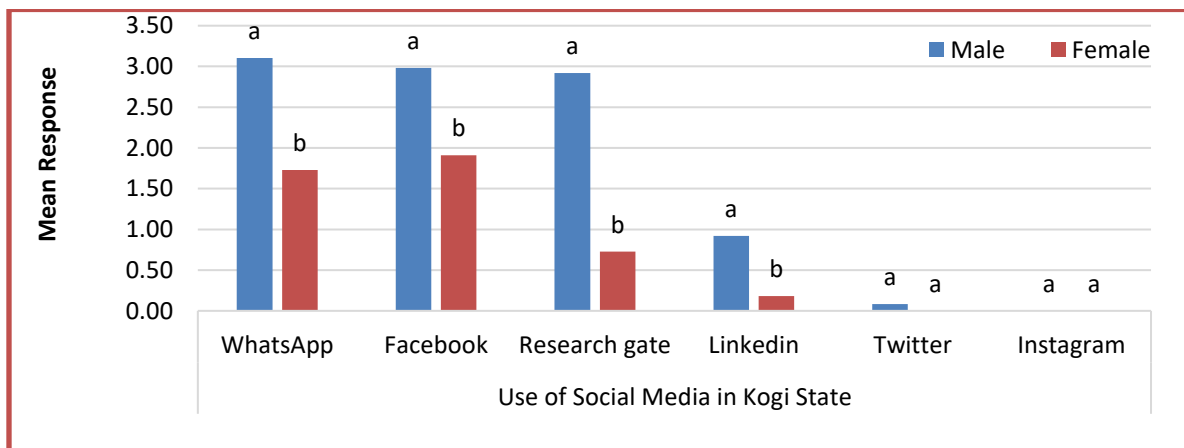


Fig 4: Gender use of Social media in Kogi State

Note: Mean with same alphabet (for each social medium) didnot significantly differ

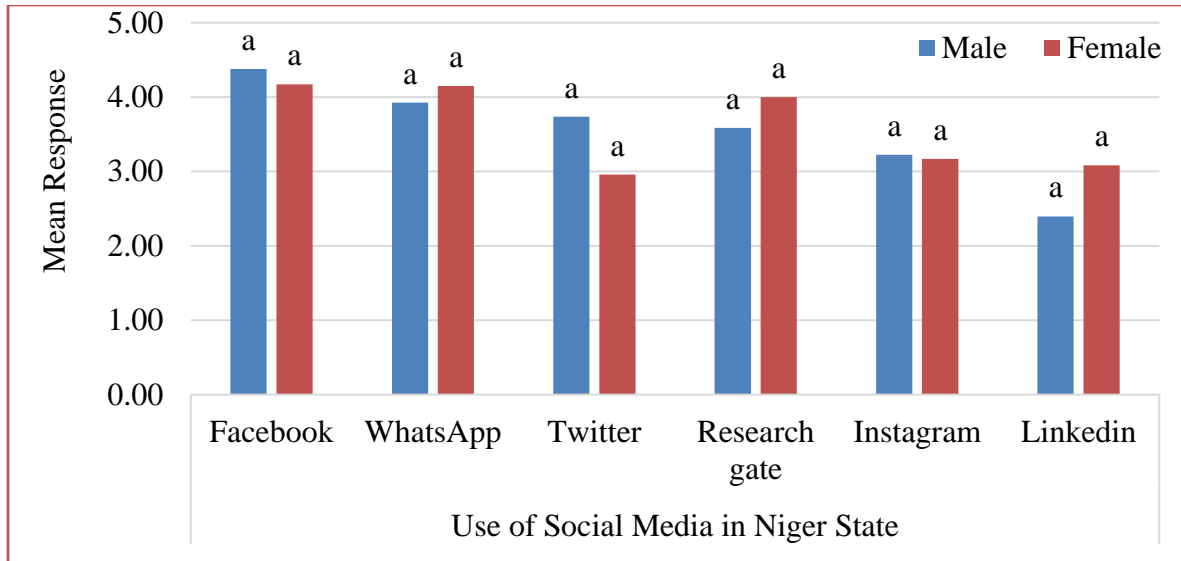


Fig 5: Gender use of Social media in Niger State

Note: Mean with same alphabet (for each social medium) didnot significantly differ

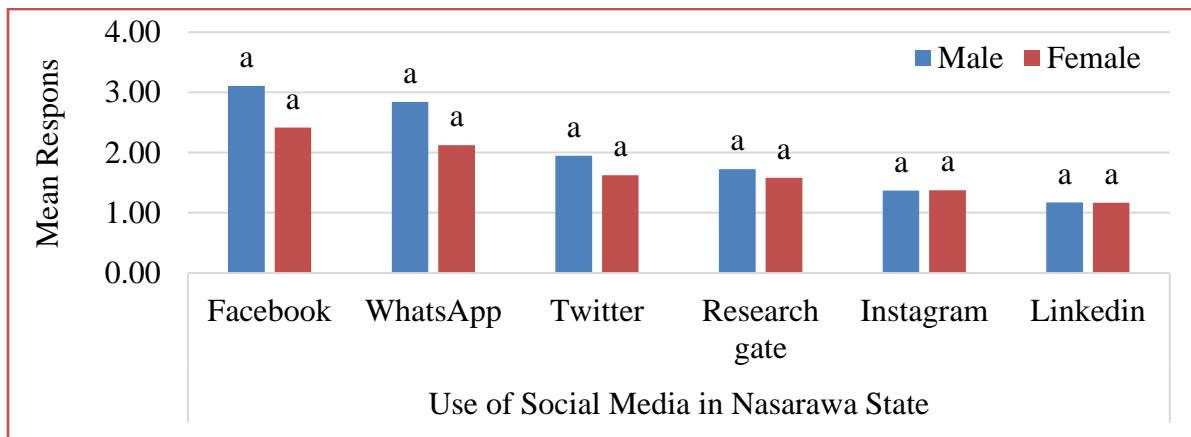


Fig 6: Gender use of Social media in Nasarawa State

Note: Mean with same alphabet (for each social medium) didnot significantly differ

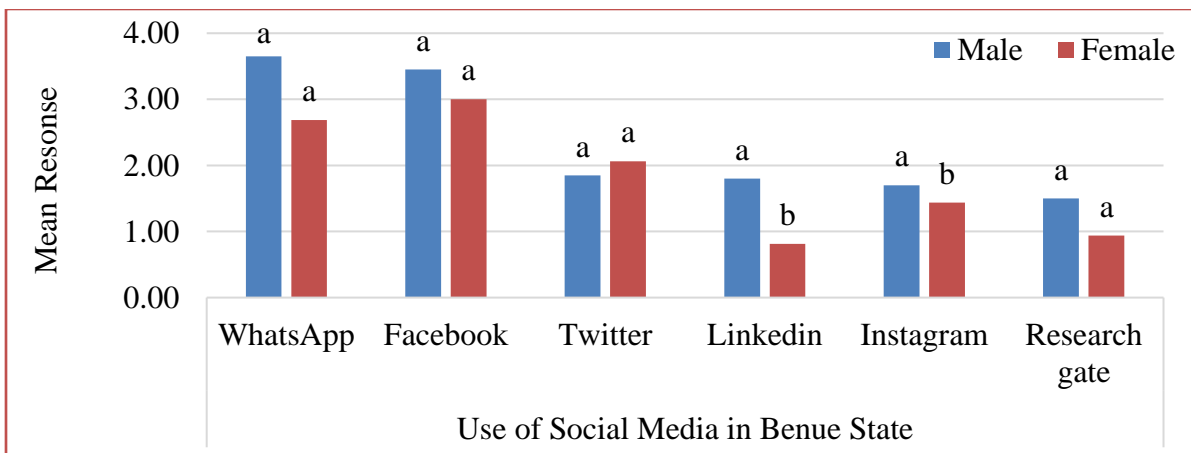


Fig 7: Gender use of Social media in Benue State

Note: Mean with same alphabet (for each social medium) didnot significantly differ

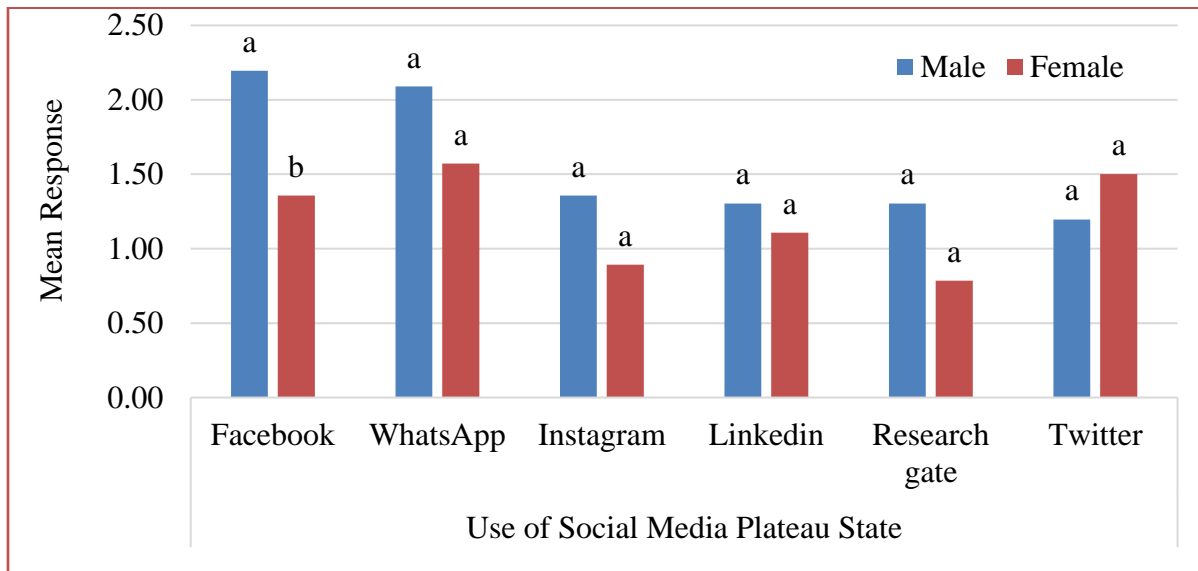


Fig 8: Gender use of Social media in Plateau State

Note: Mean with same alphabet (for each social medium) didnot significantly differ

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References

- Adejo PE, Okwu OJ, Ibrahim MK. Challenges and Prospects of Privatization of Agricultural Extension Service Delivery in Nigeria. *Journal of Agricultural Extension and Rural Development* 2012. 4(3): 63-68.
- Ajah J, Atewamba C. Impact of Gender and Cooperative Membership on Farmers' Use of Information Communication Technologies in Abuja, Nigeria, *Tropical Agriculture (Trinidad)*. 2018. 95(2): 194-210.
- Ajah J, Okorie NU. The Impact of Education on Small-scale Farmers' Use of ICT in Abuja, Nigeria. *Journal of Agricultural Economics, Extension and Rural Development*. 2016. 4(7): 476-487.
- Ajah J. Gender Use of Global System for Mobile Communication in Agriculture in Abuja Nigeria, *International Journal of Research in Social Sciences*. 2016. 6(10): 809 – 821.
- Alemu AE, Maertens M, Deckers J, Bauer H, Mathijs E. Impact of supply chain coordination on honey farmers' income in Tigray, Northern Ethiopia. *Agricultural and Food Economics*. 2016. 4(9):1-21.
- Anandajayasekeram P, Puskur R, Sindu W, Hoekstra D. Concepts and practices in agricultural extension in developing countries: A source book. Nairobi, Kenya: International Food Policy Research Institute (IFPRI), Washington, DC, U.S.A, and International Livestock Research Institute (ILRI). 2008.
- Anderson, JR, Feder, G. Agricultural Extension. In *Handbook of Agricultural Economics*, Vol 3, ed. R. Evenson and P. Pingali, 2343– 2378. Amsterdam, The Netherlands: North Holland Press. 2007.
- Balkrishna, BB, Deshmukh, AA. A study on role of social media in agriculture marketing and its scope. *Global Journal of Management and Business Research*. 2017. 17(1): 1-5.
- Barau, AA, Afrad, SI. An overview of social media use in agricultural extension service delivery. *Journal of Agricultural Informatics*. 2017. 8(3):50-61.
- Boyd, DM., Ellison, NB. Social network sites: Definition, history, and scholarship. *Journal of Computer-Mediated Communication*, 2007. 13(1): 210-230.
- Chikwendu, DO, Arokoyo, JO. Women and Sustainable Agricultural Development in Nigeria. *Journal of Sustainable and Agriculture*. 2008. 11(1):53-69.
- Colin DG. Paul R. KIBM SPSS Statistics 19 Made Simple, Psychology Press, 27, Church Road, Hove, East Sussex, UK. 2011.
- Davis K. How will extension contribute to the sustainable development goals? A global strategy and operational plan. *Journal of International*

- Agricultural and Extension Education. 2016. 23(1): 1-7.
14. Davis K, Sulaiman, RV. The “New Extensionist”: Roles and capacities to strengthen extension and advisory services. *Journal of International Agricultural and Extension Education*. 2014. 21(3): 6-18.
 15. FAO, Food and Agriculture Organization of the United Nations: Ethiopia Country Brief; 2010. Retrieved from www.fao.org/countries/55528/en/eth/.
 16. Government of Kenya, Kenya Agricultural Sector Development Strategy 2010–2020. 2010.
 17. Hassan, MS, Shaffril HA, Samah BA, Ali MS, Ramli NS. Agriculture Communication in Malaysia: The current situation. *American Journal of Agricultural and Biological Sciences*. 2010. 5(3): 389-396.
 18. Huyer S, Hafkin N, Engendering the knowledge society: Measuring women’s participation. Montreal: Orbicom, NRC Press. 2007.
 19. Ifejika PI, Asadu AN, Enibe DO, Ifejika LI, Sule AM. Analysis of social media mainstreaming in E-extension by agricultural development programmes in North Central Zone, Nigeria. *Journal of Agricultural Extension and Rural Development*. 2019. 11(4):78-84.
 20. Isiaka BT, Lawal-Adebawale OA, Oyekunle O. Agricultural Extension Agents’ Awareness of ICT Potentials and Training Needs on Usage for Improved Extension Service Delivery in Selected Southwest States, Nigeria. *Journal of Humanities, Social Science and Creative Arts*. 2009. 4(1):18-30.
 21. Israel GD, Harder A, Brodeur CW, What is an Extension Program? University of Florida: Gainesville. UF/IFAS. 2011.
 22. Iwuchukwu JC, Eke OG, Nwobodo CE. Perception of Extension Personnel on Suitability and Benefits of Using Social Media in Communicating Agricultural Information in Enugu State, Nigeria. *Journal of Agricultural Extension*. 2019. 23(3): 172-181.
 23. John A, Barclay F. Pict usage and effects among rural farming communities. *Journal of Media and Communication*. 2017. 1(1): 100-136.
 24. Kinsey J. Five social media tools for the Extension toolbox. *Journal of Extension*. 2010. 48(5): 1-3.
 25. Kiplang’at J, Ocholla DN. Diffusion of information and communication technologies in communication of agricultural information among agricultural researchers and extension workers in Kenya. *South African Journal of Libraries and Information Science*. 2005. 71(3): 234-246.
 26. Lambrecht I, Vanlauwe, B, Maertens M. Agriculture extension in Eastern Democratic Republic of Congo: Does Gender Matter? *European Review of Agricultural Economics*. 2016. 43(5): 841-874.
 27. Ma W, Renwick A, Nie P, Tang J, Cai R. Off-farm work, smartphone use and household income: Evidence from rural China. *China Economic Review*. 2018. 52: 80-94.
 28. Maumbe BM, Okello J. Uses of Information and Communication Technology (ICT) in Agriculture and Rural Development in Sub-Saharan Africa: Experiences from South Africa and Kenya. *International Journal of ICT Research and Development in Africa*. 2010. 1(1):1-22.
 29. Mills J, Reed M, Skaalsveen K, Ingram J. The use of Twitter for knowledge exchange on sustainable soil management. *Soil Use and Management*. 2019. 35(1): 195-203.
 30. Moris J, Extension Alternatives in Tropical Africa". London: ODI. Rivera, WM. and DJ. Gustafson (1991) (eds.) "Agricultural Extension: Worldwide Institutional Evolution and Forces for Change". Amsterdam: Elsevier. 1991.
 31. Njuki J, Parkins JR, Kaler A. (eds). *Transforming Gender and Food Security in the Global South*. New York, NY: Routledge. 2016.
 32. Ofuoku AU. Gender representation in agricultural extension workforce and its implications for agricultural advisory services. *Tropical Agricultural Research and Extension*. 2012. 14(2): 34-37.
 33. Ogbonah EE. Communication Technologies among Staff of Women in Agriculture Sub-Programme of Agricultural Development Programmes in North Central Zone of Nigeria” University of Nigeria, Virtual Library, 2011. Pp. 51.
 34. Pew Research Center. The demographics of social media users. 2012. Retrieved from <http://pewinternet.org/>
 35. Quisumbing AR, Meinzen-Dick R, Rainey TL, Croppenstedt A, Behrman JA, Peterman A. *Gender in Agriculture: Closing the Knowledge Gap*. Dordrecht, The Netherlands: Springer. 2014.
 36. Rajagopalan B., Subramani, M. Knowledge-sharing and influence in online social medias via viral marketing. *Communications of the ACM*. 2003. 46(12): 300-307.
 37. Rhoades E, Aue K. Social Agriculture: Adoption of Social Media by agricultural editors and broadcasters (Proc. 107th Annu. Mtg. of Southern Association of Agricultural Scientists, Orlando, Florida. 2010.Pp.7-9.
 38. Rola-Rubzen F, Paris TR Hawkins J, Sapkota B. Improving Gender Participation in Agricultural

- Technology Adoption in Asia: From Rhetoric to Practical Action. *Applied Economic Perspectives and Policy*. 2020. 42(1): 113–125.
39. Safko L, Brake DK. *The social media Bible: tactics, tools and strategies for business success*. Hoboken, NJ: John Wiley & Sons. 2009.
 40. Suchiradipta B, Saravanan R. *Social Media: Shaping the Future of Agricultural Extension and Advisory Services* GFRAS Interest Group on ICT4RAS Discussion Paper, GFRAS: Lindau, Switzerland. 2016.
 41. Thakur D, Chander M. Social media in agricultural extension: Benefits and challenges under Indian context. *Asian Journal of Agricultural Extension, Economics & Sociology*. 2018a. 27(2): 1-8.
 42. Thakur D, Chander M. Use of social media in agricultural extension: Some evidences from India. *International Journal of Science, Environment and Technology*. 2018b. 7(4): 1334-1346.
 43. Van den Ban AW, Hawkins HS. *Agricultural Extension (2nd Edition)*, Blackwell Science, Oxford. 1996.
 44. White D, Meyers C, Doerfert D, Irlbeck E. Exploring agriculturalists' use of social media for agricultural marketing. *Journal of Applied Communications*. 2014. 98(4): 72-86.

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