Research Article

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Assessment of Existing Gaps among Genders in Maize Value-Chain in Northern Nigeria

George Marechera[1], Millicent Sedi[1], Moses Adeolu Adebayo[2*], Adebayo A. Akinola[3], Itai Mazambani[4], Dean Muungani[5], Caleb O. Obunyali[1] and Sylvester O. Oikeh[1]

[1]*AATF, ILRI Campus, PO Box 30709- 00100, Nairobi, Kenya.*

[2]*Department of Crop and Animal Sciences, Ajayi Crowther University, Oyo, Nigeria.*

[3]*Department of Agricultural Economics, Obafemi Awolowo University, Ile-Ife, Nigeria.*

[4]*Lynchburg Development Consultancy, 46 Edmonds Drive, Belvedere, Harare, Zimbabwe.*

[5]*International Institute of Tropical Agriculture (IITA), PMB 5320, Ibadan, Nigeria.*

***Correspondence:**
Moses Adeolu Adebayo, Department of Crop and Animal Sciences, Ajayi Crowther University, P.M.B. 1066, Oyo, Nigeria; Tel: +2348167820656.

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ABSTRACT

Equitable access to production resources, inputs, and technologies by men, women, and youth is a critical success factor for improved livelihoods of maize farmers in sub-Saharan Africa (SSA). This study was conducted to assess the existing gaps among different genders in the maize production value chain in selected northern States of Nigeria. A field survey was conducted in five major maize-producing States of Kaduna, Nasarawa, Niger, Taraba, and Adamawa. Structured questionnaires were administered to 450 maize farming households across the five selected States using a simple random sampling technique. Focus group discussions (FGDs) and Key Informant Interviews (KII) were in the study area. The Integrating Gender into Agricultural Value Chains (INGIA-VC) Analytical Framework was employed to develop the tools for the study. Data were analyzed using descriptive statistics. Results showed that over 82% of the sampled farm households in each State were male-headed households, whilst only 18% were female-headed households. Male farmers cultivated an average 4.2 ha of farmland compared to 1.8 ha cultivated by female farmers for maize production. Male farmers have more access to other production inputs like fertilizers than female farmers. More female farmers (22%) than male farmers (7.6%) purchase improved seeds directly from seed companies. Maize productivity by male farmers was consistently higher (2–2.5 t ha^{-1}) than female farmers that recorded an average of 0.24 t ha^{-1} across the States. The lower participation of female farmers in maize production compared to male farmers was attributed to the socio-cultural and religious restrictions placed on females that exclude them from public engagements in northern Nigeria. Awareness creation through the traditional rulers and mechanization of some practices will engender more women and youth participation in maize cultivation.

Keywords
Gender, Maize, INGIA-VC, Northern Nigeria.

Introduction

The potential of maize (*Zea mays* L.) for food and nutritional security in sub-Saharan Africa (SSA) is huge as more than 300 million people depend on it as a source of food, nutrition and livelihood [1]. In SSA, maize is regarded as "life" because of its significance for food security and the economic well-being of its producers and consumers [2]. Maize accounts for almost half of the calories and protein consumed in eastern and southern Africa (ESA), and one-fifth of the calories and protein consumed in West

Africa. Despite its significant economic importance, average maize yields are below 1.7 t ha^{-1} in SSA [1], although some countries such as Ethiopia with a national average yield >3 t ha^{-1} have made significant gains in productivity. Such gains are still far below the global average yield of ~5 t ha^{-1}, and significantly lower than the on-farm trial results of 4.4–5.4 t ha^{-1} for improved varieties under optimal inputs and good agronomic practices (GAPs) adopted by AATF/CIMMYT/IITA within SSA [3-5]. The potential of maize to revolutionize the food landscape in SSA remains enormous. Cultivating the crop in a 1–2 ha farm can overcome hunger in a household, and the cumulative result could double food production in Africa [6].

Nigeria occupies a landmass of 923,768 km^2 with over 34 million hectares of arable land. Maize has become an important major staple crop in the country, taking over farming space from traditional cereals such as millet and sorghum [7-9]. It is a widely adapted, grown, and distributed cereal crop in Nigeria, spreading from the moist evergreen forest zone to the dry ecology of the Sudan Savanna [9,10], and altitudes that range from as low as sea level to as high as 1,200 metres above sea level (masl) in the Jos Plateau. Maize is grown across all the six agro-ecological zones (Humid Rainforest, Derived Savanna, Southern Guinea Savanna, Northern Guinea Savanna, Sudan Savanna, and Sahel Savanna) in Nigeria. The highest producing States in the country are Kaduna, Niger, Nasarawa, Adamawa, Plateau, Taraba, and the Federal Capital Territory, mostly in the Southern and Northern Guinea Savannas. In Nigeria, smallholder farmers, with each farmer cultivating an average of 0.65 ha, mainly produce maize [11]. Smallholder farmers are regarded as people with landholdings of less than 10 ha. This group makes up about 80% of Nigeria's farming population and is responsible for 80–90% of food production in Nigeria, yet it is the poorest group in the country [12].

Creating and sustaining competitive and equitably oriented value chains that help smallholder farmers, especially women, youth, and the vulnerable, require examining gender issues explicitly and integrating gender components proactively into value chain analysis and development strategies [13]. The African Development Bank (AfDB) observed that the agricultural sector remains the largest employer of women in Africa with 62% of economically active women working in farm-related activities [14]. It is, therefore, appropriate to say that women feed the dwellers of Africa, a continent where 70% of the youth constitute 65% of the labor force in agricultural sector and live in rural areas [15]. Women have been credited with the production of over 50% of the food that the world consumes [16].

Notwithstanding that woman form the critical mass of the agricultural workforce, they are constantly confronted with limited access to the required resources and opportunities for agricultural production to realize their full economic potential, and to guarantee sustainable food security in the continent. Gender inequality in the distribution and ownership of productive means has been the bane of agricultural development in Africa [17]. The inequalities between men and women in accessing productive resources, services, and opportunities have been identified as major causes of underdevelopment in the agricultural sector, and as contributory factors to deficiencies in food and nutrition security, and poor economic and overall prosperity of a nation [13]. Equitable distribution of resources among genders at project, institutional, and network levels is almost non-existent in most countries in Africa. Access to agricultural technologies and innovations, resources, services and products for women and youth continues to be low, jeopardizing the continent's development agenda [17]. Yet, giving women more access and control over assets has proven to have significant and desirable impacts on vital human development outcomes including household food security, child nutrition and education, and women's own well-being and status within the home and community [13,18].

Sex-disaggregated data and gender indicators are an integral element for a gender-based study. Quality sex-disaggregated data will significantly bolster agricultural development in developing countries in SSA. Such data are required to effectively monitor gender differences and their effects on agricultural productivity, and to ultimately promote gender equality. Although gender roles in agriculture have gone through several evolutions over time in Nigeria [19,20], male farmers have always had an edge over their female counterparts when it comes to access to benefits and productive means because of the social-cultural and religious factors that place certain restrictions on women, especially in northern Nigeria. Even agricultural innovations have favored males more than females. More than women, men have access to formal education and technical assistance, and have benefited from laws that granted them access to land, which is the most crucial factor of production. Conversely, women have been left to practice agriculture with crude means of land preparation, planting, field maintenance, harvesting and post-harvest activities that are tedious [13,21].

Women participation is almost zero in agricultural reforms training programs because of the universal misconception that men are the main drivers of agricultural production. Yet, the responsibility for provision of food for the household, especially in the rural areas, rests squarely on women [22-24].

Though the men derive more benefits from farming maize as an economic crop, the women and youth produce up to 80% of foodstuffs for household consumption and sale in local markets, thereby contributing substantially to agricultural production, food and nutrition security, land and other natural resources management, and building climate resilience [25]. It is, therefore, pertinent to carry the women and youth alongside the men as strategic partners and stakeholders as Nigeria progresses in her agricultural development agenda. With the avalanche of policies and programs that are aimed at empowering women and creating gender equality at both global and national levels in the last three decades, there is still a paucity of data on the impact that such Nigerian agricultural policies and programs have made in turning around the productivity of women for the better. This data, though almost non-existent, has constituted a major clog in the wheel of

progress in the empowerment of rural women farmers in Nigeria [26,27].

This study, therefore, examines the gender perspective to maize production in five maize-producing northern States of Nigeria. The specific objectives were to: (i.) determine the socio-economic characteristics of sampled farmers; (ii.) assess the existing gaps in the roles that different genders carry out in maize production value chain; (iii.) assess the control of maize production resources by the genders; and (iv.) make recommendations on interventions.

Methodology

The study was conducted in five northern States in Nigeria (Kaduna, Niger, Nasarawa, Taraba, and Adamawa) because large volumes of maize are produced in the Northern region, particularly Niger, Kaduna, Taraba, Plateau, Nasarawa, and Adamawa States (Figure 1). More information about the States is presented in Table 1. The study was carried out between September and November 2021. The population of the study comprised the maize farmers in the five States. A mixed-methods approach combining quantitative and qualitative data collection and analyses were employed in this study. The sample size was determined using Yamane [28] formula, i.e.

$$n = \frac{N}{1 + N(e)^2}$$

Where: n is the sample size; N is the population size; and e is the desired level of precision. A precision level of ±5% and a confidence level of 95% were assumed. With a target population of more than 100,000 maize farmers (N), application of the above formula gave a sample size of 400 respondents as being representative of the target population. With >10% margin error, 450 farmers (consisting males, females, and youths aged between 18 and 35 years) were interviewed in the selected five States for primary data collection. Purposive sampling technique was employed at the first stage of sampling to select five States that are active in maize production out of the 36 States in the country. At the second stage, five (5) high maize producing Local Government Areas (LGAs) were randomly selected in each State. At the third stage, 18 farm families were randomly selected from each of the villages based on the list collected from the Agricultural Development Programme (ADP) office, giving 90 farm families from each State. The Integrating Gender into Agricultural Value Chains (INGIA-VC) Analytical Framework was used to develop the tools for the study.

Four different data collection tools, namely Farmer Households Interview Schedule, Focus Group Discussion (FGD) Tool, Key Informant Interview (KII) for Research and Government Institutions, and KII for Seed Companies, were developed for assembling and collecting primary and secondary data from the study area. For primary data collection, open structured

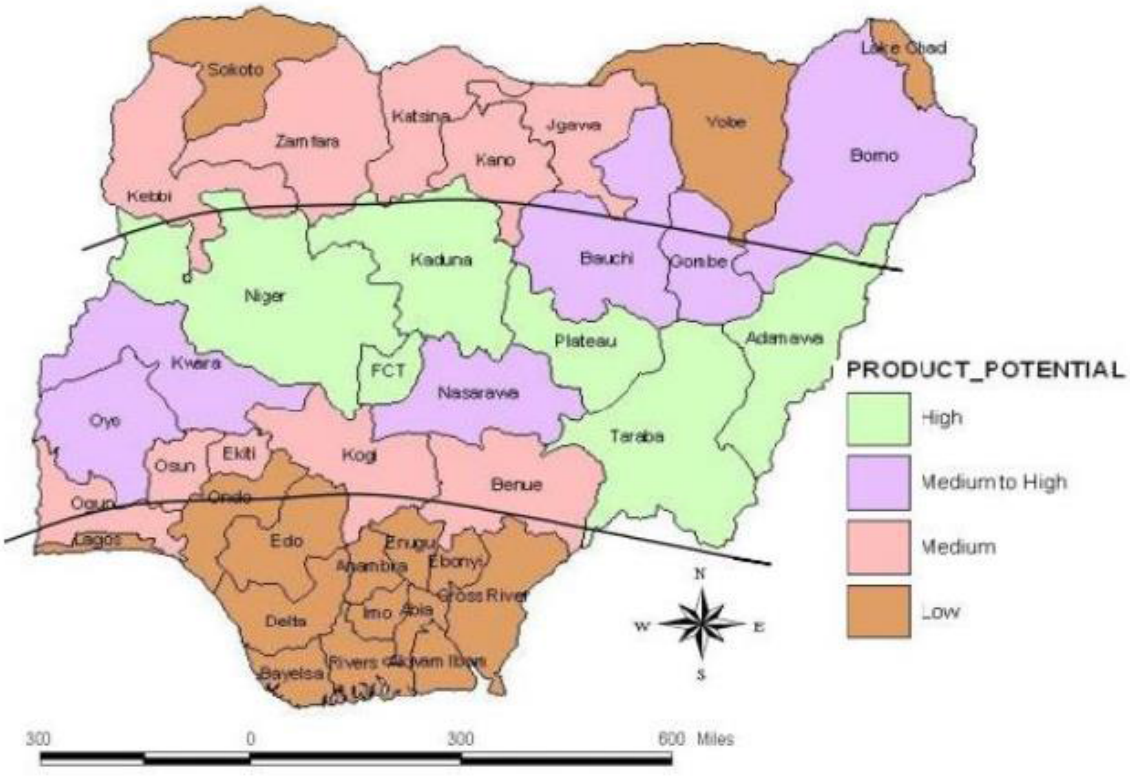

Figure 1: Maize growing regions in Nigeria.

Source: ATA 2017

Table 1: Agro-ecological zones, geographical coordinates, altitudes and mean annual precipitation of five northern States comprising the study area in Nigeria.

State	Agro-ecological zone	Geographical coordinates	Altitude (m asl)	Annual rainfall (mm)
Kaduna	Northern Guinea Savanna	9°10' and 11°30 N, 6°20' and 9° E	704	1,524
Niger	Southern Guinea Savanna	8°20′ and 11°30′ N, 3°30′E and 7°20′ E	650	1,210
Adamawa	Southern Guinea Savanna	7°00′ and 11°00′ N, 11°00′ and 14°00′ E	158	1,300
Nasarawa	Derived Savanna	6°45' and 9°45' N, 7°45' and 9°35' E	400	1,100
Taraba	Derived Savanna	7°00' and 9° 58' N, 9° 52' and 12° 39' E	173	1,000

questionnaires were designed to solicit gendered farmer data on the socio-economics that guide decision making on maize production, distribution, marketing, and consumption. The roles and responsibilities within farm households were captured with the aim of identifying the structural gaps that might need intervention at strengthening the gender parities and ensuring equity. For the secondary data collection, FGDs and KIIs were conducted to solicit collective ideas of production, processing and marketing, including the challenges being encountered along the value chain.

Data Analysis

The gender disaggregated data were analyzed with the aid of INGIA-VC and Statistical Package for Social Sciences (SSPS, Version 23), and summarized using descriptive statistics such as percentages, mean scores, and standard deviations.

Results and Discussion

Socio-economic characteristics of sampled maize farmers

The demographic characteristics of 450 sampled farmers in selected five northern States of Nigeria showing the percentage distribution are presented in Table 2. The results indicate that males head over 82% of household farms while female-headed farms ranged between 6 and 18% (Table 2). The males were 90% in Kaduna, 82% in Niger, 83% in Adamawa, 84% in Nasarawa and 86% in Taraba. This suggests that more males are active in maize farming than females, corroborating earlier studies that agricultural activities are male dominated [29,30]. These results also agree with the prevailing social cultural practices in which males are the ones that represent the households in interacting with outsiders and are more empowered in the northern part of Nigeria [31,32]. Consequently, female farmers in northern Nigeria have been reported to be 28% less productive than their male counterparts [33]. Culture and predominantly Islamic religion also dictate that men are the ones involved in most agricultural activities while women stay indoors to look after the children. The proportion of youth in maize farming across the States ranged between 11 and 16% (Table 2). The highest was in Adamawa (16%) followed by Niger (13%). Kaduna and Nasarawa each had 11% of their farm households as youth. The low proportion of youth in maize production may have implications and opportunities for future development of maize value chain (MVC) in the country. A significant proportion of the farmers may be able to read or write because a minimum of 87% of the interviewed farmers in each State had at least primary school education (Table 2). This result is similar to that of Amah et al. [31] who reported that > 76% of interviewed farmers in Plateau State had formal education, and Okoye et al. [34] have opined that formal education contributes significantly to agricultural development. The respondents were predominantly involved in crop and livestock farming (Table 2). Across the States, the average family or household size ranged between 10 and 14 persons (Table 2). Family or household size refers to the number of people living under one roof, under the care of one head and eating from the same pot. Since the size and structure of the households and the age distribution of farming households often give an indication of labour productivity and availability in the household, the size and structure of households in all the States indicate great prospects for maize farming in northern Nigeria.

The sex disaggregated demographic characteristics of the 450 respondents in the five States are presented in Table 3. Results show that relatively high proportions of interviewed male and female farmers, averaging 25 and 31%, respectively, were within the age brackets of 36 and 45 years across the five States. This shows that more female than male farmers are within the active age bracket for agricultural practices. Kaduna State has the highest percentages of male (49%) and female (45%) farmers within this active age bracket. Taraba has the least proportions of male (11%) and female (13%) farmers between the ages of 36 and 45 years. Aguillar et al. [35] and Amah et al. [31] earlier reported that this age range is characterized with the potential that is required for maize production. However, the low percentages of male (~15%) and female (~14%) farmers that are youth (< 35 years of age) underscore the need to have more incentives for this group to be involved in agriculture, especially maize production. AATF regards farmers between the ages of 18 and 35 years as youth (AATF personal communication). Youthfulness has been identified as an asset for innovativeness and tenaciousness, which are required for enduring the drudgery inherent in maize production [31]. More female (34%) than male (22%) farmers had primary education. It is noteworthy that no interviewed female farmer had tertiary education in Adamawa State (Table 3). Girl child education beyond the primary school level would enhance the output of female farmers in maize production. The state of education in general, and female education in particular, is low in most of the northern States in Nigeria because, very often, male children who are exchanged among States to enrol in Arabic schools end up on the streets to fend for themselves in an *Almajiri* system (a semi-formal education system relying solely on Quranic education), and the female children are given out in child marriages. Results of this study also indicate that 85% of the interviewed male and female respondents are involved in agrarian practices. More interviewed females (14%) than males (9 %) were in formal employment across the five States: Adamawa (26 vs 5%), Kaduna (16 vs 6%), and Niger (22 vs 2%) (Table 2).

Table 2: Distribution of the demographic characteristics of respondents in the study area.

Variables	Kaduna (n=90)	Niger (n=90)	Adamawa (n=90)	Nasarawa (n=90)	Taraba (n=90)
Gender					
Male (%)	90	82	83	84	86
Female (%)	10	18	17	6	14
Youth < 35 years (%)	11	13	16	11	12
Education					
None (%)	9	3	9	12	13
Primary (%)	32	27	19	13	34
Secondary (%)	32	25	19	26	37
College (%)	11	43	29	23	10
University (%)	16	22	24	26	6
Occupational background					
Never had a Job (%)	0	0	0	0	0
Agrarian (%)	75	77	75	83	85
Worker (%)	15	21	12	8	9
Professional (%)	10	10	12	6	4
Others (%)	0	1	1	3	2
Household size (number)	13	11	10	13	14

Table 3: Gendered distribution of demographic characteristics of sampled farmers in five sampled States in Nigeria.

Gender/	Age (%)						Education (%)					Occupational (%)					HN
State	≤ 35	36-45	46-55	56-65	66-75	> 75	None	Pri.	Sec.	Coll.	Tert.	Never	Agra	Worker	Prof	Others	
MALE																	
Adamawa	34	16	21	12	13	4	28	24	38	10	0	0	91	5	4	0	8
Kaduna	8	49	29	5	5	4	2	20	37	34	7	0	77	6	5	12	12
Nasarawa	7	35	16	34	6	2	28	21	43	4	4	0	71	29	0	0	8
Niger	8	13	30	30	19	0	7	15	39	39	0	1	88	2	0	0	13
Taraba	16	11	44	20	3	6	28	28	8	16	20	0	98	2	0	0	11
MEAN	*14.6*	*24.8*	*28.0*	*20.2*	*9.2*	*3.2*	*18.6*	*21.6*	*33.0*	*20.6*	*6.2*	*0.2*	*85.0*	*8.8*	*1.8*	*2.4*	*10.4*
STDEV	*11.44*	*16.56*	*10.65*	*12.09*	*6.65*	*2.28*	*12.99*	*4.83*	*14.16*	*15.22*	*8.26*	*0.45*	*10.89*	*11.43*	*2.49*	*5.37*	*2.30*
FEMALE																	
Adamawa	25	31	32	9	3	0	20	27	32	21	0	0	74	26	0	0	2
Kaduna	2	45	43	4	4	2	29	48	10	0	13	0	84	16	0	0	1
Nasarawa	17	24	36	19	4	0	5	25	30	22	18	2	95	2	0	1	3
Niger	14	41	5	25	9	6	20	40	32	3	5	0	78	22	0	0	0
Taraba	11	13	28	24	23	3	25	28	0	40	7	0	92	4	4	0	3
MEAN	*13.8*	*30.8*	*28.8*	*16.2*	*8.6*	*2.2*	*19.8*	*33.6*	*20.8*	*17.2*	*8.6*	*0.4*	*84.6*	*14*	*0.8*	*0.2*	*1.8*
STDEV	*8.4*	*12.9*	*14.4*	*9.3*	*8.4*	*2.5*	*9.1*	*10.0*	*14.9*	*16.2*	*7.0*	*0.9*	*8.9*	*10.7*	*1.8*	*0.4*	*1.3*

Pri=Primary, Sec.=Secondary, Coll.=College, Tert.=Tertiary, Agra=Agrarian, Prof=Professional, HN=Number of people in a household

Source: Field Survey, 2021

Table 4: Gendered distribution of crops grown by sampled farmers in selected five States of Nigeria.

Gender/	Crop							
State	Maize (%)	Rice (%)	Cassava (%)	Cowpea (%)	Soybean (%)	Yam (%)	Plantain (%)	Others (%)
MALE								
Adamawa	100	74	21	59	14	7	4	21
Kaduna	100	44	38	9	6	26	13	4
Nasarawa	92	73	54	40	39	27	0	0
Niger	100	93	61	44	19	6	0	17
Taraba	100	14	30	24	41	46	0	12
MEAN	*98.4*	*59.6*	*40.8*	*35.2*	*23.8*	*22.4*	*3.4*	*10.8*
STDEV	*3.58*	*30.92*	*16.57*	*19.23*	*15.51*	*16.56*	*5.64*	*8.76*
FEMALE								
Adamawa	100	29	29	12	35	47	0	41
Kaduna	100	30	50	40	0	30	40	50
Nasarawa	100	100	33	83	33	0	33	100
Niger	100	72	17	22	0	0	0	11
Taraba	100	57	7	29	29	14	0	14
MEAN	*100*	*57.6*	*27.2*	*37.2*	*19.4*	*18.2*	*14.6*	*43.2*
STDEV	*0.00*	*29.94*	*16.35*	*27.56*	*17.84*	*20.30*	*20.14*	*35.94*

Source: Field survey, 2021

Gendered distribution for cropping of maize and other important crops in the study area

Results in Table 4 show that 98% of interviewed male farmers and all the interviewed female farmers grow maize whereas half the population of interviewed male and female farmers grow rice across the five States. Lesser proportions of males and females grow other crops. These results corroborated the claim that maize, because of its manifold uses, such as food, feed, and industrial raw material, has risen to become one of the most important crops in Nigeria having steadily displaced the traditional cereal crops like sorghum and millet [7-9]. Though the results add to the discourse on gendered cropping in northern States of Nigeria where crops are stereotyped across different genders, majority of the crops in Nigeria are cultivated by both male and female [33]. This finding was corroborated by FGDs and KIIs that female gender in the selected States grow crops such as maize, soybean, rice, groundnut, vegetables, and cowpea. In general, all the respondents opined that maize cultivation is beneficial to every member of the family.

Gendered analysis of landholdings and maize productivities of sampled farmers in the selected States

Results in Table 5 show that sampled men cultivated an average of 4 ha of land and allocated 2.3 ha to maize cropping compared to the women who cultivated an average of 1.8 ha and allotted less than 1 ha for maize cultivation across the five States. Male farmers cultivated the highest land area of 5–6 ha and allocated a minimum of 40% for maize cropping in Nasarawa and Niger States that are reputed to be largest States in terms of landmass in Nigeria. The preference of male farmers for maize production as evidenced by land allocation was particularly more pronounced in Adamawa and Kaduna States with 67-83% land areas allocated to maize cropping. The difference in pattern of land allocation between male and female farmers may not be unconnected to the land tenure system operational in the sampled States. The results might have also reflected the patriarchal land holding system that confers ownership to the man and not his wives or grown daughters as attested to by earlier studies [17,36,37]. The patrilineal landholding system has been reported as one of the causes of gender inequality in African agriculture [17,37,38]. This land ownership system and its practices contradict the Nigerian land use Act of 1978 that gives men and women equal right to access and own land [37]. KIIs conducted with researchers at the Institute of Agricultural Research (IAR), Samaru revealed that the males: female's ratio of landholdings is 9:1, suggesting that female farmers own only 10% of farmlands. The FGDs and KIIs indicated that the rights to own land are mostly bequeathed on men because the proportion of female farmers owning land was less than 20% in all the selected States. The practice, therefore, is for these males to cede limited portions of the land to their female counterparts to farm. This is a major limitation for actualizing the potential of female farmers to contribute maximally to maize production as also opined by Amah et al. [31]. Our finding could also be a response to the strenuous and capital-intensive nature of maize farming, which requires inputs such as fertilizers, chemicals (herbicides and pesticides), and quality seeds of improved varieties that women often find too expensive to procure.

Male respondents obtained more yields in terms of maize grain from a hectare of land compared to the female respondents (Table 5). Mean maize yields of male farmers was about 2.0 t ha^{-1}, ranging between 2.0 and 2.5 t ha^{-1} in all the surveyed States except Niger with the lowest average yield of 1.0 t ha^{-1}. Maize productivities recorded by female farmers were generally poor, 0.24 t ha^{-1} across the States studied (Table 5). Across the five States, the interviewed male farmers had an average of eight years maize farming experience compared to female farmers with about four years (Table 5). Male respondents have more experience that varied from seven years in Adamawa and Kaduna States to 10 years in Nasarawa State compared with female farmers whose experience varied from two years in Kaduna to five years in Nasarawa State. The fact that male farmers have double the years of the female farmers across the States showed that the men possess better understanding of the times and seasons, ease of access to input

Table 5: Gendered distribution of land holdings and maize yield of sampled farmers in selected States.

Gender/State	Av. area of land (ha)	Area of maize farm (ha)	Maize yield (kg ha^{-1})	Number of years in maize farming
MALE				
Adamawa	2.7	1.8	2,487	7.0
Kaduna	3.2	3.0	1,995	7.0
Nasarawa	6.0	2.8	2,396	10.0
Niger	5.0	2.0	1,008	9.0
Taraba	4.0	2.0	1,950	8.0
MEAN	*4.2*	*2.3*	*1967.2*	*8.2*
STDEV	*1.34*	*0.54*	*586.34*	*1.30*
FEMALE				
Adamawa	1.1	0.9	462	4.0
Kaduna	2.0	0.3	350	2.0
Nasarawa	1.8	0.6	142	5.0
Niger	2.0	0.8	118	4.0
Taraba	2.0	2.0	120	3.0
MEAN	*1.8*	*0.9*	*238.4*	*3.6*
STDEV	*0.39*	*0.65*	*158.32*	*1.14*

Source: Field survey, 2021

Table 6: Gendered analysis of maize farming practices by sampled farmers in selected States.

Gender/ State	Land preparation method			Level of maize production			Source of seed					
	Man. (%)	Mech. (%)	Both (%)	Subs. (%)	Comm. (%)	Both (%)	Farmer-saved (%)	Agro-dealer (%)	Seed company (%)	Farmers' cooperative (%)	Farmers producer org. (%)	Gov. (%)
MALE												
Adamawa	2	2	96	13	26	82	29	53	2	16	0	0
Kaduna	56	29	5	16	28	67	40	38	9	2	0	11
Nasarawa	41	5	15	7	29	64	41	49	4	0	6	0
Niger	28	3	69	17	32	70	45	32	9	1	3	10
Taraba	26	44	30	20	21	73	38	41	14	6	0	1
MEAN	*30.6*	*16.6*	*43.0*	*14.6*	*27.2*	*71.2*	*38.6*	*42.6*	*7.6*	*5.0*	*1.8*	*4.4*
STDEV	*19.99*	*18.96*	*38.35*	*4.93*	*4.09*	*6.91*	*5.94*	*8.44*	*4.72*	*6.56*	*2.68*	*5.59*
FEMALE												
Adamawa	3	0	97	25	5	49	44	14	32	6	3	1
Kaduna	14	38	52	45	7	27	41	25	35	12	3	4
Nasarawa	40	10	50	51	29	20	40	24	31	5	0	0
Niger	10	41	49	38	13	30	51	31	11	7	0	0
Taraba	40	60	0	19	7	60	61	35	1	3	0	0
MEAN	*21.4*	*29.8*	*49.6*	*35.6*	*12.2*	*37.2*	*47.4*	*25.8*	*22.0*	*6.6*	*1.2*	*1.0*
STDEV	*17.43*	*24.42*	*34.33*	*13.41*	*9.86*	*16.66*	*8.73*	*7.98*	*15.10*	*3.36*	*1.64*	*1.73*

Man.= Manual, Mech.=Mechanical, Subs.=Subsistence, Comm.=Commercial, Gov.=Government

Source: Field survey, 2021

Table 7: Gendered analysis of adherence by sampled farmers to fertilization of maize crop in the selected States.

Gender/ State	Use of fert.		Type of fertilizer						Qty applied	
	Yes (%)	No (%)	NPK (%)	Urea (%)	DAP (%)	Ammo (%)	Poultry manure (%)	Liquid fert. (%)	NPK (kg/ha)	Urea (kg/ha)
MALE										
Adamawa	99	1	99	99	0	0	0	0	187	155
Kaduna	96	4	100	98	0	0	0	0	209	87
Nasarawa	99	1	98	100	0	0	0	0	112	38
Niger	100	0	98	100	0	0	0	0	199	41
Taraba	99	1	100	100	0	0	0	0	169	77
MEAN	*98.6*	*1.4*	*99.0*	*99.4*	*0.0*	*0.0*	*0.0*	*0.0*	*175.2*	*79.6*
STDEV	*1.52*	*1.52*	*1.00*	*0.89*	*0.00*	*0.00*	*0.00*	*0.00*	*38.34*	*47.35*
FEMALE										
Adamawa	100	0	100	100	0	0	0	0	184	40
Kaduna	100	0	100	99	0	0	0	0	287	81
Nasarawa	98	2	100	86	0	0	0	0	83	31
Niger	98	2	100	98	0	0	0	0	0	0
Taraba	97	3	98	99	0	0	0	0	200	56
MEAN	*98.6*	*1.4*	*99.6*	*96.4*	*0.0*	*0.0*	*0.0*	*0.0*	*150.8*	*41.6*
STDEV	*1.34*	*1.34*	*0.89*	*5.86*	*0.00*	*0.00*	*0.00*	*0.00*	*111.14*	*30.02*

Fert=Fertilizer, Qty=Quantity

Source: Field survey, 2021

procurement, risk management, ease of processing strategies and skilfulness in maize cultivation than their female counterparts [31,39]. These results may also be attributed to the fact that male farmers benefit more than female farmers from various maize intervention programmes provided by different development agencies because of the cultural, religious and traditional barriers that exclude women from participating in such programs as reported by earlier workers [31]. Therefore, designing capacity enhancing female-only programs to reverse this trend for female farmers in order to contribute to maize production in northern Nigeria might be necessary. Amah et al. [31] also suggested that women-based maize farmer organizations ought to lobby the appropriate organs of government for policies that directly address the interests of women in agriculture.

Gendered analysis of maize farming practices in the selected five States

The mean maize farming practices as shown in Table 6 revealed that about 37% of male respondents and 21% of female respondents prepared their land manually across the five States. More female (~ 30%) than male (17%) respondents used mechanical means of land preparation. Larger percentages of both male (43%) and

female (50%) used both manual and mechanical means for land preparation. More female (35.6%) than male (14.6%) respondents produced maize at subsistence level while more males (27.2%) than females (12.2%) produced for commercial purposes. In addition, a larger percentage of male (71%) than female (37%) respondents produced maize at both subsistence and commercial levels. Our finding suggests that both women and men consider maize as an important crop for food and economic security, and corroborates earlier reports that both genders support maize production as both subsistence and cash crop in northern Nigeria [31,40]. The two prominent sources of seed are farmer-saved and agro-dealers (Table 6). An average of 39% of male respondents and 47% of interviewed female farmers use farmer-saved seed for planting while 43% of male and 26% of female farmers patronize agro-dealers for seeds. More female farmers (11–35%) than male farmers purchase improved seeds directly from seed companies in all the States except Taraba State where more male farmers (14%) bought seed directly from seed companies (Table 6).

Gendered analysis of adherence to fertilization of maize crop in the selected five States

Results of the FGDs held in all sampled communities in the five States revealed that compound NPK and urea were the two most common fertilizers used for maize production by almost all the farmers, irrespective of gender. NPK fertilizer was used for basal application while urea was used for top-dressing. The use of DAP, ammonia, poultry manure and liquid fertilizer was not common among the farmers in all the five States. Details from FGDs also revealed that there are recommended rates for fertilizer application for maize. Farmers have the knowledge of the recommended fertilizer application rates for NPK as 300–400 kg ha^{-1} (6–8 bags) for basal application and 125 kg ha^{-1} (2.5 bags) of urea for top-dressing for a hectare of maize farmland. These recommendations are based on field experiments conducted by researchers over the years and adopted by the relevant authorities intertwined with economic considerations [9]. However, due to many reasons such as limited finance, differences in the fertility levels of farms, different levels of farming experience and knowledge of agronomic practices, the quantities being applied are below the recommended rates (Table 7). In all the five States, male and female farmers applied between 112 and 287 kg ha^{-1} of NPK with an average of 175 kg ha^{-1} for males and 150 kg ha^{-1} for female farmers. Likewise, urea application ranged between 31 and 155 kg ha^{-1} with an average of as low as about 80 kg ha^{-1} for male respondents and 42 kg ha^{-1} for female respondents. In fact, the female farmers in Niger State reported that they apply no fertilizers for maize production. In general, both female and male farmers (86–100%) in all the States top-dressed their maize crop. However, more male farmers (100%) apply more basal NPK fertilizers (112–209 kg ha^{-1}) than their female counterparts, except in Kaduna and Taraba States where females applied 18–37% more NPK than the male counterparts (Table 7). This finding gives credence to the assertion that male farmers have more access to productive inputs than female farmers for maize cultivation [7,31].

Conclusions and Recommendations

The results of this study show that more male than female and youth maize farmers benefit from the superior production inputs, education and technologies that are available for profitable maize production thereby achieving higher yields compared to women and youth. Yet, the yields being recorded at farm levels from both genders in selected States are still low. The mean yields of 2–2.5 t ha^{-1} reported by male farmers and 0.5 t ha^{-1} by female farmers in most States are lower than the global mean yield of ~ 5 t ha^{-1} reported by earlier researchers [3-5]. The lower participation of women compared to men at every stage of the maize production value chain might be due to the restrictions that the socio-cultural and religious orientations of the people in northern Nigeria place on women that exclude them from showing up for public engagements. These restrictions also exclude them from benefiting sufficiently from various programs and interventions that were designed to empower them and guarantee equitable access to productive resources together with their men counterparts. The burden of feeding the households rests more on the womenfolk, and this enormous burden puts their health and well-being at risk very often. Amah et al. [31] captured the situation that women face more succinctly by reporting that “men are known to work hard; women work longer but yet face different forms of discrimination.”

When intervention programs from development organizations including AATF are designed to address the food, health and wealth needs of the women farmers in maize farming, chances are that more women will be willing to participate in maize production for national food security and better livelihood for farm families if socio-economic and cultural barriers are addressed.

From our findings, we recommend the following:

- Awareness be created through traditional rulers and religious leaders on the need to give women opportunities to participate actively in maize production value chain.
- Greater efforts are needed for maize cultivation/production, harvesting and processing to be mechanized to reduce the drudgery associated with maize production practices. This will encourage both women and youth to engage in profitable ventures in the maize seed and grain sectors.
- Girl child education be encouraged and giving girls out in early marriages should be discouraged through appropriate government policies in the northern States of Nigeria so that the girls can grow into adults who are confident in public engagements including maize production.
- Male, female, and youth farmers should be trained in good agronomic practices (GAPs) for profitable maize cropping.

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