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COMPARATIVE ANALYSISN OF THE PRODUCTIVITY INDEX OF ADOPTERS AND NON ADOPTERS OF IMPROVED MAIZE VARIETY (BR9928DMRSR-Y) IN SURULERE LOCAL GOVERNMENT OF OYO STATE, NIGERIA.

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Abstract

The empirical study was conducted to compare the production of adopter and non adopter of improved maize variety (BR9928DMRSR-Y). The sampling technique employed was multi-stage stratified random sampling technique. The first stage involved purposive selection of small scale maize farmers from the rural. The second stage involved a systematic simple random sampling of 200 farmers of which 191 was valid for the analysis. Both descriptive and Ordinary Least Square analysis were used to achieve the objective of the study. The empirical study discovered that male adopters (2.80) had more productivity than female adopters (2.37). There was no significant difference in the level of productivity of male or female non adopters, while overall male farmers have higher productivity than female farmers. Among the adopters farmers aged above 60 years have higher productivity, hybrid maize adopters who have spent between 11-15 years schooling have the highest productivity, and adoptee farmers who have spent 41-50 years farming and those who have spent 51-60 years farming reported higher productivity than those with lower years of farming experience. The statistical test results revealed that there is a significant (P<0.1) positive relationship between seed input and maize yield (0.314) and Significant (P<0.1) positive relationship between labour input and maize output (0.266) among hybrid maize adoptees in the study area. It is therefore recommended that farmers should take full advantage of the benefits of cultivating improved hybrid maize varieties. This will be possible with an effective network of extension agents services to the farmers more frequently.

Keywords: Adopter, Non adopter, Hybrid, Maize, Farmers

Introduction: Maize (Zea mays L.) stands out as a highly nutritious staple cereal, distinguished by its rich composition of essential macronutrients including starch, fibre, protein and fat. Furthermore, it is an excellent source of vitamin B Complex starch, fibre, protein and crucial minerals like magnesium, zinc, phosphorus, and copper, underscoring its significant contribution to a balanced diet (FAO,2014). Maize can be eaten in boiled, roasted or fried forms and it can be used for the development of variety of food products, such as, oil, eternal, flour, flakes, popcorn and major feed for livestock and poultry. It is source of bio-fuel for energy use and ingredients in industries such as pharmaceutical companies. Globally, maize (with wheat and rice) is a source of 30% of food calories especially among low income countries of about 4.6 billion people (FAOSTAT 2020). About 75 of the 125 developing countries that produce maize consider the crop as staple and 70% of the maize is produced by smallholder farmers (FAO, 2021). This shows that maize is important among the majority of low income nations and therefore, deserves adequate and effective monitoring in its production chain. Maize is a staple food crop in Nigeria widely grown across agro-ecological zones as both subsistence crop and commercially, as raw materials for agro-based industries. Maize production in Nigeria was estimated at 10.5 million tonnes in 2016/2017 (FAO, 2017). According to NBS (2021), about 45.5% of locally produced maize in Nigeria is processed as animal feeds, 13% for manufacturing industrial flours and confectionaries, 10-15% for household consumption and 6.5% is used by brewing companies. Nigeria is the second largest maize producer in Africa, and largest producer in sub-Sahara Africa (Tegbaru, A., Menkir, A., Baco, M. N., Idrisou, L., Sissoko, D., Ayinde O. E., Abate T. and Abdoulaye, T., 2020), contributing 12.77% to Africa, about 43% to sub-Saharan Africa (SSA) and 0.98% to world maize production in 2021 (USDA, 2022)

However, despite the evidence of the sustained maize production in the last two decades, maize yields are still low compared to its potential outcomes. The production of the crop must be increased in order to ensure food and income security through the development of improved maize varieties and technologies. Against this backdrop, technology change, which involves introducing modern

agricultural technology and improved cultivation practices, becomes crucial for raising agricultural productivity (Baiyegunhi L.J.S · Akinbosoye F.· Bello L.O., 2022). In this regard, the Nigerian government collaborated with International Institute of Tropical Agriculture (IITA), the International Maize and Wheat Improvement Centre (CIMMYT), and the Stress Tolerant Maize for Africa (STMA) project to develop a variety of improved maize seeds. Thus, more than 120 improved maize varieties (IMVs) with different characteristics have been released (NACGRAB 2016). IMVs are defined as a scientifically bred population that adapts to the International Union for the Protection of New Plant Varieties (IUPV) standards of being distinct, uniform and stable. Some of the improved maize varieties in Nigeria include DMR-LSR-W, DMR-LSR-Y, DMR-LSR-W, DMR-ESR-Y, SUWAN-1-SR-Y, 8644-3, 8644-27 and 8644-32. These enhanced varieties are sourced from research institutes, seed companies, the National Seed Service, state agricultural supply companies, and other agro-allied retailers. Adoption of improved maize hybrids, availability of improved hybrid varieties and accessibility to quality hybrid maize seed, which are crucial to transformative agricultural development in Nigeria, have been major limitations in maize production (Quarshie P.T, Abdulai A.R, Fraser E.D.G., 2021)

Farmers in Nigeria have over time relied on open-pollinated varieties (OPVs), which have low yield potential and are vulnerable to pests, diseases and drought stress, a situation that led to low productivity and production (Oladimeji, Y. U., Tahirou Abdoulaye, Usman, H. A., Henry Egwuma., Kadjo Didier Kadjo., Anyebe, Y. O., Muhyideen Oyekunle., Saminu Zakariyau and Hamza Mani 2022). The slow adoption of maize hybrid seeds, due in part to the smallholder farmers' propensity to recycle their grains as seeds, limited knowledge on the benefits of hybrid seeds, misconception on the value proposition versus pricing, and limited availability of hybrid maize varieties in key maize-growing areas are major limitations to maize productivity varieties, fertilizers, pesticides, herbicides, planters and irrigational systems by the existing research institutes, these technologies in maize production seem to have not been disseminated and adopted by farmers to increase the maize productivity level in many areas of Nigeria. The objectives of this study were to compare the productivity index of adopters and non-adopters of improved maize varieties relative to the their socioeconomic characteristics and the factors influencing the adoption and non adoption.

Methodology: The study was carried out in Surulere Local Government area in Ogbomoso Agricultural zone of Oyo State; this LGA comprises of different villages, which are rural Ogbomoso is located approximately on the intersection of latitude 8'008' North and longitude 4015' East. It is about 105 km North East of Ibadan (State capital), 58 km North West of Osogbo, 53 km South West of Ilorin and 57 km North East of Oyo town. The population was approximately 166,034 as of 2006 census, an area of 3542.82 square kilometres with about 60% of the dwellers being civil servants and also engaged in farming (both crops and animal production), Ogbomosho is regarded as a derived Savannah vegetation zone and a low land rainforest area. Surulere Local Government Area (LGA) was considered as study area simply because, the LGA is one of the major maize producing LGAs in Ogbomosho Agricultural.

Sampling Procedure: Primary data were obtained with the interview schedule administered to the maize farmers and through observations. The sampling technique employed is a multi-stage stratified random sampling technique. The first stage involved purposive selection of small scale maize farmers from the rural areas such as, Ireesaadu, Iresapa, Surulere, Oko, Ilajue, Bayeoje, Igbon, Gambari, Arolu and Maayin because farmers were more concentrated in these area. The second stage involved a systematic simple random sampling to draw two hundred maize farmers from the constructed sample frame through random selection of twenty farmers per settlements.

Method of Data Analysis: Both descriptive and Ordinary Least Square analysis were used to achieve the objective of the study. Descriptive analysis was used to compare the productivity index of adopters and non adopters improved maize seed.

Model specification: The Cobb-Douglas production function in the form expressed above was linearised into an OLS function with a view to getting a form amenable to practical purposes as expressed below:

$y=a+blxl+b2x2 +b3x3 + b4x4 + e$

Where, Y = output/hectare

a = constant

e = error term

The general production function used in the study was implicitly of the form represented in

Equation: $Y = f (X1, X2, X3, X4, Ui)$.....(3)

Where; Y = Maize output (Kg) (output/hectare)

X_1 = Seeds (kg)

X_2 = Fertilizer (kg)

X_3 = Labour (Amount paid to labourers)

X_4= Farming Experience (in years)

Results and Discussion: The empirical study (Table 1.) discovered that the average index of productivity for adopters (2.7) is higher than that of the non- adopters (1.58) and the combination of adopters and non-adopters (2.30). Male adopters (2.80) reported more productivity than female adopters (2.37). There was no significant difference in the level of productivity of male or female non adopters, while overall male farmers have higher productivity than female farmers. The result is corroborated by Oladimeji et al, 2022 that male (51.3%) adopted than the female farmers (33.3%). This was against the finding of Chete, (2021) among maize farmer in Northern Nigeria, that female adopters (0, 85) were more than the male adopters (0.62) even in productivity

Among the adopters farmers aged above 60 years have higher productivity followed by those between 21 40 years. Farmers' age between 40 - 60 years were more productive compared to those below 40years and those above 60 years among non-adoptee farmers. But in contrary to Chete, 2021 study, the average age of adopters (44.84 years) was less than non-adopters (49.02 years). Danso-Abbeam G, Antwi B, Ehiakpo D, Mabe, F. (2017) agree that older farmers find it difficult to abandon traditional practices while Sánchez-Toledano I.B, Kallas Z, Rojas O, Gil J (2018) concur that younger farmers are more inclined to taking risks which predisposes them to adopting improved seeds. Married polygamous adopters have highest productivity based on marital status followed by married monogamous and never married singles. However, never married have highest productivity among non adopters followed by monogamous married and polygamous married adopters. This could imply that more married farmers with their spouse and children serve as labour hence increase productivity. Overall, married monogamous and single farmers were more productive than other marriage categories. Hybrid maize adopters who have spent between 11 - 15 years schooling have the highest productivity followed by those without education and those with 16-20 years of education. Among the non-adopters those with 6 - 10 year education produce more, followed by those with 1-5 years of education and those with 11 - 15 years of education. Overall, farmers with 16 - 20 years of schooling and those with 11 - 15 years of schooling have higher productivity than those with low years of schooling and those with education at all. However in Northern Nigeria adopters have greater average mean years of schooling (8.42 years) compared to non-adopters (7.67 years). Again, this mean difference is rather small as farming is experiencing influx of educated persons as a result of dearth of white collar jobs; still it signifies that the skills and learning obtained through education is a driving force for adopting new maize seed varieties (Chete, 2021) Adoptee farmers who have spent 41-50 years farming and those who have spent 51 - 60 years farming reported higher productivity than those with lower years of farming experience. Also, non-adoptee farmers who have spent 51 - 60 years farming reported more productivity than those with lower years of farming experience. Overall, farmers with more years of experience have the highest productivity. This is corroborated by Sedi M, Akinola AA and Obunyali C. O (2024) that farming experience was a key drivers for increased adoption of hybrid maize varieties (Table 1.)

Determinant of Productivity among Adopters and Non Adopters of Hybrid Maize: The factors influencing the productivity of the adopters and non adopters of hybrid maize variety was analysed using multiple regression. Data were fitted into four functional forms using ordinary least square techniques (OLS), for testing the effects of all the regressors on the regressand, the Cobb-Douglas production function was chosen as the lead equation, which is implicitly represented by equation. The adjusted R^2 value of 0.504, for adopters of hybrid of maize production implied that he 50.4 % of the independent variables explained the maize productivity among the adopters and 0.207, for non adopters maize production, was reported, implying that the inputs used in maize production explained 20.7% of the variation in the output of for non adopters maize production in the study area. The numbers of significant variables were two for adopters' hybrid of maize production namely seed and labour being significant at 10% levels of probability. Non adopters maize productions on the other hand have seed and fertilizer as significant factors at 10% (Table 2.)**.** Y = f(S,La, F, farmexp) .....The cobb Douglass production function was adopted in this study because of the higher number of significant variables which considers only the constant returns to scale. The parameters and related statistical test results as presented in Table 2 revealed that there is a significant ($P<0.1$) positive relationship between seed input and maize yield (0.314) and Significant ($P<0.1$) positive relationship between labour input and maize output (0.266) among hybrid maize adoptees in the study area. Seed adoption and labour input are significant factor associated with changes in output among adopters of hybrid maize in this local government area. However farming experience was negatively significant ($P<0.$), implying that farming experience did not influence adoption of new variety maize and productivity.

This implies that the farmers who adopt the hybrid seeds have higher maize yield compared to those with non-adoption and hired labour also increase the maize yield among the adopters of hybrid maize in the study area. The constant of the model revealed that, outside the factors of production the average yield among the adoptees of the hybrid maize was significant. For the non- **Conclusion and Recommendation:** Adopters, there is a marginal positive relationship between seed and maize output. Planting more seed and fertilizer input were significantly associated with higher yields among non-adopters of hybrid maize in this local government area. Suggesting that farmers who use more maize seeds and fertilizer produced more than those who did not use more seeds and fertilizers. The average productivity among the non-adoptee farmers was not significant. This study found that the average index of productivity for adopters is higher than that of the non-adopters and the combination of adopters and non-adopters. Male adopters reported more productivity than female adopters. Married polygamous adopters have highest productivity based on marital status followed by married monogamous and never married singles. There was a negative significant relationship between farm size and maize output adopters and positive relationship between labour input and maize output among hybrid maize in Area. Smaller farm size is significant factor associated with changes in output among adopters of hybrid maize in this local government area. Seed and labour input influence higher productivity among adopters while seed and fertilizer determine farmers output among planters of the local varieties. Most of maize farmers are small scale farmers; Majority of maize farmers had obtained low output per hectare from their farm, majority of maize farmers used local varieties of maize for their production. Based on the findings in the study area, it is recommended that farmers should take full advantage of the benefits of cultivating improved hybrid maize varieties which usually translates into increased income. This will only be possible with an effective network

of extension agents who deliver their services to these farmers more frequently. Learning centres should be set up in strategic locations like the ADPs (Agricultural Development Projects). These centers should be equipped with very recent technologies so that farmers can be aware, understand the technologies and apply them appropriate to their needs. In, the education of the farmers and their household members should be taken seriously

References

Babatunde RO, Fayode S. &Bardo A. A (2018).Fadama maize Production in Nigeria: Case study from Kwara State. Research Journal of Agriculture. 4(5): 340-345.

Baiyegunhi L.J.S · Akinbosoye F.· Bello L.O.(2022) Welfare impact of improved maize varieties adoption and crop diversification practices among smallholder maize farmers in Ogun State, NigeriaVolume 8, Issue 5e09338May 2022*Open access.*

Chete, O B. (2021). Factors influencing adoption of improved maize seed varieties among smallholder farmers in Kaduna State, Nigeria Vol.13(2), pp. 107-114 April-June 2021 DOI: 10.5897/JAERD2019.1032 Articles Number: D9E5EF666959 ISSN: 2141-2170 Copyright ©2021

Danso-Abbeam G, Antwi B, Ehiakpo D, Mabe, F. (2017) Adoption of improved maize variety among farm households in the northern region of Ghana. Cogent Economics and Finance 5:1416896. https://doi.org/10.1080/23322039.2017.1416896

FAO. (2014). FAOSTAT database: Food and Agriculture Organization of United, Rome.

FAO. (2017). GIEWS – Global Information and Early Warning System: Country briefs, Nigeria. http://www.fao.org/giews/countrybrief/country.jsp?cod e=NGA.

FAOSTAT, (2021). FAO Report. www.faostat.org

National Bureau of Statistics, NBS (2021). National Bureau of Statistics (2021). https://www.nigerianstat.gov.ng/download/1229

Oladimeji, Y. U., Tahirou Abdoulaye, Usman, H. A., Henry Egwuma., Kadjo Didier Kadjo., Anyebe, Y. O., Muhyideen Oyekunle., Saminu Zakariyau and Hamza Mani(2022). Differentials in Adoption of Maize Seed Varieties and Impact on Farmers' Livelihood in Northern Nigeria https://www.naj.asn.org.ng. Nigerian Agricultural Journal Vol. 53, No. 3 | pg. 22 N1* 2 1 1 3

Quarshie P.T, Abdulai A.R, Fraser E.D.G. (2021). Africa's "seed" revolution and value chain constraints to early generation seeds commercialization and adoption in Ghana. Front Sustain Food Syst. 5: 665297.

Sánchez-Toledano IB, Kallas Z, Rojas O, Gil J (2018). Determinant factors of the adoption of improved maize seeds in Southern Mexico: A analysis doi:10.3390/su10103543.

Sedi M, Akinola AA, Obunyali C.O, (2024). Hybrid Maize Adoption Determinants in Northern Nigeria: A Gendered Perspective. Int J Agriculture Technology. 2024; 4(1): 1-9

Tegbaru, A., Menkir, A., Baco, M. N., Idrisou, L., Sissoko, D., Ayinde O. E., Abate T. and Abdoulaye, T. (2020). Addressing Gendered Varietal and Trait Preferences in West African maize. World Development Perspectives, 20(100268): 1-20.

USDA (2022). United States Department of Agriculture, (2022). National Agricultural th Statistics Service Report. Retrieved 27 August 2022 from http://www.usda.download

Table 1. Productivity index based on general characteristics of adopters and non- adopters of hybrid maize.

		ADOPTER		**NON-ADOPTER**		**COMBINED**	
	Levels	**Index**	N	**Index**	N	**Index**	N
Sex	Male	2.8078	100	1,5800	38	2.4697	138
	Female	2.3794	19	1. 5956	34	1.8766	53
Age	21-40	2.4800	25	1.2500	10	2.1343	35
	41-60	2.7200	71	1.9641	43	2.4388	114
	Above 60	3.0500	23	0.9123	19	2.0845	42
Maritalstatus	Marriedmonog	2.7451	76	1.6725	36	2.4003	112
	Marriedpolyg	2.8086	36	1.5340	27	2.2623	63
	Separated	0.000	0	1.1250	4	1.1250	4
	Never Married	2.5417	6	2.2500	2	2.4688	8
	Widow	1.000	1	2.222	3	1.1667	4
Year Spent In School	None	2.9999	37	1.3306	30	2.2524	67

	1-5	2.2506	30	1.8062	23	2.0577	53
	6-10	2.0185	9	2.1389	6	2.0667	15
	11-15	3.0647	36	1.5385	13	2.6598	49
	16-30	2.7107	7	0.000	0	2.7107	7
Years Spent In Farming.	0-10	2.6353	47	1.9063	16	2.4501	63
	11-20	2.6803	22	1.6270	21	2.1659	43
	21-30	2.6798	19	1.6296	18	2.1689	37
	31-40	2.4798	21	1.1250	9	2.0733	30
	41-50	3.9630	9	1.1667	5	2.9643	14
	51-60	4.500	1	2.1667	2	2.9444	3
	Above 60yrears			0.000	1	0.000	1

Source Field Survey, 2024.

Table 2. Productivity of the Adopters and Non Adopters of hybrid maize using OLS as an estimator

Variables	**ADOPTERS**			**NON ADOPTERS**		
	Coef.	**Std. Err.**	**t-value**	**Coef**	**Std,Err.**	**t-value**
Constant	3.673	0.520	7.06	0.593	0.602	0.814
Seedkg	0.314	0.082*	3.447	0.187	0.112	0.1,67
Labour	0.266	0.109*	2.436	-0.009	0.096	0.035
Fertilizer	0.31	0.186	0.166	0.944	0.381	2.474
Farming Experienc.	-0.126	0.144*	0.876	-0.-14	0.134	0.814
R	0.481			0.432		
R2	0.531			0.487		
R2 Adjusted	0.504			0.207		
F	8.56			7.39		
Durbin Watson	2.06			1.92		
Error Of Estimate	1.71			1.48		

Source Field Survey, 2024. *** Significant at 1% probability level,** Significant at 5%, *Significant at 10% probability level