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Effect of Adoption of Technologies for African Agricultural Transformation (TAAT) Production Technologies on Yield of Cassava Farmers in South-West Nigeria

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Abstract

*The study assessed the effect of adoption of Technologies for African Agricultural Transformation (TAAT) production technologies on yield of cassava farmers in South-West Nigeria. The specific objectives were to: determine farmers' levels of adoption of TAAT cassava production technologies and estimate the cassava yield of TAAT participants and non-participants. The study adopted a descriptive survey research design. A multistage sampling procedure was used in selecting a sample size of 240 respondents (120 TAAT participants and 120 non-participants) for the study. Data were collected using structured questionnaire and were analyzed using descriptive statistics such as frequency counts, percentages, mean and standard deviation while Z-test was employed in testing the null hypothesis at 5% level of significance. The result showed that farmers adopted improved cassava varieties ($\bar{x}$ = 3.38) and six-step weed management ($\bar{x}$ = 3.24) in South-west Nigeria. The result also revealed that the mean cassava yield of TAAT participants and non-participants were 19133.40kg/ha and 12758.26kg/ha respectively. The Z–test result revealed a significant difference (12.174***) in the mean cassava yield of TAAT participants and non-participants at 5% level of significance. The study concluded that adoption of TAAT production technologies influenced the yield of cassava farmers in South-west Nigeria. Therefore, it recommended among others that efforts should be directed towards scaling up the dissemination of improved production technologies to rural farmers for increased cassava production in the study area.*

Keywords: Effect, Adoption, Production Technologies, Cassava Yield.

Introduction: Over the years, several agencies and international organizations like the International Fund for Agricultural Development (IFAD), United States Agency for International Development (USAID), International Institute of Tropical Agriculture (IITA), African Development Bank (AfDB) among others, in collaboration with research institutes in various African countries have played remarkable roles in developing agricultural technologies and implementing agricultural empowerment programmes with the overall aim of improving the socioeconomic status and welfare of rural farmers (Nwaobiala, Uzochukwu and Chukwu, 2023). The African Development Bank embarked on a mission to address several challenges of poverty, low food production, climate change, unemployment etc bewildering the African Continent holistically, through the implementation of the Technologies for African Agricultural Transformation programme (TAAT). The programme, established in 2017, is an integral part of the Bank's Feed Africa Strategy, 2016–2025 (TAAT Clearinghouse, 2022). The programme was funded by the African Development Bank (AfDB) and led by the International Institute of Tropical Agriculture (IITA) to contribute to job creation, food and nutrition security, income generation and improved livelihoods of the African population Nyong, *et al*.,2023) ;(Adeyanju, Mburu, Gituro,

Chumo, Mignouna, Mulinganya and Ashagidigbi, 2023).

The development objective of TAAT is to rapidly expand access of smallholder farmers to high yielding agricultural technologies that improve their food production, assure food security, and raise rural incomes. TAAT has delivered improved cassava, rice and wheat varieties to about 3.2 million households across Africa (TAAT Clearinghouse, 2021). Nigeria is the world's largest cassava producer; annual cassava production in Nigeria is estimated at over 60 million metric tonnes from a cultivated area of about 10 million hectares (Food and Agriculture Organization Statistics (FAOSTAT), 2022). About two-third of the total production is from the Southern part of the country, about 30% is produced in the North-central, while only about 4% is produced in the other parts of the North (Uzochukwu, Nwaobiala and Mbagwu, 2021). Despite being the world's top cassava producer, Nigeria's current output of the crop cannot still satisfy domestic demand for food and industrial usage (Akomolafe, Sennuga, Bamidele, Alabuja and Bankole, 2023). Cassava production in Nigeria, South-west inclusive is also dominated by small-scale farmers cultivating an average of 0.5 hectares Nyong, *et al*.,2023; (Okonkwo, Amaefula and Igwe, 2023) . Majority of the cassava produced in South-west Nigeria are also produced by farmers who are poor in resources and lack adequate access to production inputs and improved credit facilities (Ayodele 2023; Owoseni, Okunlola and Akinwalere, 2021). Cassava producers should thus be encouraged to increase production in order to bridge the supply-demand gap.

The TAAT Cassava Compact, led by the IITA in its attempt to boost cassava production in Nigeria established demonstrations farms where training activities were conducted across two agro-ecologies covering North-central and South-west Nigeria based on technology toolkits that combined improved varieties, correct tillage, optimum plant density and integrated weed control measures that guarantee high cassava yields. Specifically, the technologies developed for cassava production and disseminated to farmers in South-west Nigeria include; improved cassava varieties (Golden-fleshed cassava, TMS-961632), cassava seed-bulking, semi-autotrophic hydroponics, six-step weed management, fertilizer application among others (TAAT Clearinghouse, 2021). These technologies were disseminated to rural farmers with the overall aim of boosting their cassava yields and income. As a result, TAAT is estimated to have boosted the cassava yields of farmers in various parts of West Africa, by more than 10 metric tonnes per hectare and raised beneficiary incomes by an average of 38% through the dissemination and adoption of improved cassava production technologies (TAAT Clearinghouse, 2022). This implies that the TAAT programme had significant effect on the yield of cassava farmers in various parts of West Africa. However, giving the participation of cassava farmers in the TAAT programme in South-west Nigeria, the extent to which the adoption of TAAT production technologies has influenced their cassava yield is still apparently unknown, hence the need to fill this research gap by empirically investigating the effect of adoption of TAAT production technologies on the yield of cassava farmers in South-west Nigeria.

Objectives of the Study: The broad objective of this study was to assess the effect of adoption of Technologies for African Agricultural Transformation (TAAT) production technologies on yield of cassava farmers in South-West Nigeria. The specific objectives include the following: determine farmers' levels of adoption of TAAT cassava production technologies and estimate the cassava yield of TAAT participants and non-participants in the study area.

Hypothesis: There is no significant difference in the estimated cassava yield of TAAT participants and non-participants in South-west Nigeria.

Methodology: The study was carried out in South-west Nigeria. The South-west zone of Nigeria is made up of six (6) States namely; Ekiti, Lagos, Ogun, Ondo, Osun and Oyo States with one hundred and thirty seven (137) local government areas (Olawale, Tayo, David, Mathew and Adamu, 2022). The Zone also has an

estimated population of about forty-five million persons (National Bureau of Statistics, 2021). The zone also lies between latitude 4°and 9°N and longitude 30°and 7°E of the Greenwich Meridian, and has a total land area of about 191,843 square kilometres. Agriculture thrives very well in the area because the zone is endowed with fertile land. The main food crops grown in the zone include, yam, cassava, cocoyam, rice, millet and maize while the cash crops include, rubber, cocoa, banana and various types of fruits (Akintonde, Ajayi, Dlamini and Dlamini, 2022).

The population of the study comprised all TAAT and non-TAAT cassava farmers in South-west Nigeria. In the first stage, three (3) States (Ogun, Ondo and Oyo) were purposively selected from the six (6) States that make up South-west Nigeria. The purposive selection of these three (3) States was due to the fact that the States were among those in the South-west zone where TAAT Cassava Compact activities were carried out and also because of the intensity of cassava production in the States. In the second stage, two (2) agricultural zones were purposively selected from each State to a give a total of six (6) zones. In the third stage, one (1) block was purposively selected from each of the zones to give a total of six (6) blocks. In the fourth stage, 2 (two) circles were randomly selected from each of the blocks to give a total of 12 (twelve) circles. In the final stage, purposive sampling technique was used to select ten (10) TAAT participants and ten (10) non-participants respectively from each of the 12 (twelve) circles, which gave a grand total of one hundred and twenty (120) TAAT participants and one hundred and twenty (120) TAAT non-participants for the study.

Data collection and analysis: Primary data were obtained with the aid of structured questionnaire, and analyzed using descriptive and inferential statistics such as percentages, means, standard deviation and Z-test. To determine farmers' levels of adoption of TAAT cassava production technologies was realized using mean scores. The adoption stages were allocated weights as follows: aware = 1; interest = 2; evaluation = 3; trial = 4 and adoption = 5. In using the adoption scale, a mid-point was obtained by adding 5, 4, 3, 2 and 1 which gave 15 and when divided by 5 gave a mean score of 3.0. For the purpose of decision making and to identify the different stages of adoption of technologies by participants, the categorization followed in accordance with Onwusiribe, Nmerengwa and Amadi (2022); awareness stage = 1.0 – 1.49; interest stage = 1.50 – 1.99; evaluation stage = 2.0 – 2.49; trial stage = 2.50 – 2.99; and adoption stage = ≥ 3.0. For the purpose of decision making, any mean score ≥ 3.0 was adjudged an adopted technology while any mean score < 3.0 was adjudged otherwise.

Results and Discussion

Objective 1: Determine farmers' levels of adoption of TAAT cassava production technologies in South-west Nigeria.

Table 1: Farmers' Levels of Adoption of TAAT Cassava Production Technologies in South-west Nigeria

TAAT cassava production technologies	Ogun			Ondo			Oyo			South-west	
	$\sum F\bar{x}$	$\bar{x}$	SD	$\sum F\bar{x}$	$\bar{x}$	SD	$\sum F\bar{x}$	$\bar{x}$	SD	$\bar{x}$	SD
Improved cassava varieties											
TMS- 961632 (Farmers' Pride)	128	3.46	0.930	88	3.38	0.941	207	3.63	0.723	3.49	0.865
Golden-fleshed cassava	126	3.40	1.066	94	3.62	0.752	204	3.58	0.755	3.53	0.858
TME 419	120	3.24	0.862	82	3.15	0.833	190	3.33	0.913	3.24	0.869
CR36-5 (Ayaya)	125	3.38	0.681	81	3.12	0.653	188	3.30	0.533	3.27	0.622
Grand mean		**3.37**	**0.885**		**3.32**	**0.794**		**3.46**	**0.731**	**3.38**	**0.804**
Planting											
Land preparation	123	3.32	1.001	87	3.35	1.018	194	3.40	0.961	3.36	0.993
Appropriate plant spacing	124	3.35	0.889	85	3.27	0.919	209	3.67	0.636	3.43	0.815
Mechanized planting	92	2.49	1.346	60	2.31	1.320	138	2.42	1.322	2.41	1.329
Cassava seed-bulking	101	2.73	1.326	70	2.69	1.379	150	2.63	1.345	2.68	1.350
Semi autotrophic hydroponics	83	2.24	1.321	61	2.35	1.384	137	2.40	1.361	2.33	1.355
Fertilizer application	118	3.19	1.151	82	3.15	1.255	207	3.63	0.837	3.32	1.081
Grand mean		**2.89**	**1.172**		**2.85**	**1.213**		**3.03**	**1.077**	**2.92**	**1.154**
Six-step weed management											
Site selection	118	3.18	0.845	86	3.30	0.891	196	3.44	0.865	3.31	0.867
Slashing of vegetation	107	2.88	0.821	74	2.86	0.952	177	3.11	0.923	2.95	0.899
Land clearing with herbicides	125	3.39	1.336	72	2.78	1.262	191	3.35	1.192	3.17	1.263
Ploughing and ridging of fields	118	3.20	1.326	76	2.93	1.183	184	3.22	1.141	3.12	1.217
Planting and pre-emergence herbicide application	127	3.42	1.071	90	3.48	1.116	185	3.25	1.191	3.38	1.126
Post-emergence manual and chemical weed control	128	3.46	1.038	89	3.41	1.177	210	3.68	0.711	3.52	0.975
Grand mean		**3.26**	**1.073**		**3.13**	**1.097**		**3.34**	**1.004**	**3.24**	**1.058**
Mechanized harvesting	93	2.52	1.222	64	2.47	1.185	150	2.63	1.146	2.54	1.184
Grand adoption mean score		**3.01**	**1.088**		**2.94**	**1.072**		**3.12**	**0.910**	**3.02**	**1.023**

Source: Computed from field survey data, 2024

Note: $\sum F\bar{x}$ indicates sum total for nominal Likert values multiplied by frequencies; $\bar{x}$ = Mean responses; SD = Standard deviation
$\bar{x} \geq 3.00$ = adopted; $\bar{x} < 3.00$ = not adopted.

Table 1 revealed that TAAT cassava farmers adopted improved cassava varieties ($\bar{x}$ = 3.38) and six-step weed management ($\bar{x}$ = 3.24) in South-west Nigeria. This implies that farmers highly adopted TAAT cassava production technologies in the study area. This also suggests that cassava farmers are predisposed to adopting improved technologies that would enhance their yield and income in South-west Nigeria. This is also encouraging considering the fact that rural smallholder farmers find it very difficult to abandon their already established ways of doing things no matter how primitive, for a better technology except if the new technologies being introduced have been tried and found to be more advantageous and conform to their local differences and peculiarities (Adzenga and Dalap, 2023).

This finding further implies that TAAT is fulfilling its mandate of rapidly expanding access of smallholder farmers to high yielding agricultural technologies that improve their crop output and assure food security in the study area. However, efforts should still be directed by the government, ministries of agriculture, extension agencies, non-governmental organizations and rural development experts towards scaling up the dissemination of improved production technologies to cassava farmers in order to increase their adoption levels of improved technologies and cassava yields in the study area. Farmers adopted improved cassava varieties ($\bar{x}$ = 3.37) and six-step weed management ($\bar{x}$ = 3.26) in Ogun State. The result also shows that improved cassava varieties ($\bar{x}$ = 3.32) and six-step weed management ($\bar{x}$ = 3.13) were adopted by TAAT cassava farmers in Ondo State. Farmers also adopted improved cassava varieties ($\bar{x}$ = 3.46) and six-step weed management ($\bar{x}$ = 3.34) in Oyo State. This finding is in agreement with Ogunjobi (2024) who reported that optimal spacing ($\bar{x}$ = 4.69), intercropping ($\bar{x}$ = 4.57) and training on timely use of NPK, pesticide and herbicide ($\bar{x}$ = 4.28) were cassava technologies adopted by USAID MARKETS-II project participants in South-west Nigeria. Nyong, and Nweze,, 2012)

Objective 2: Estimate the cassava yield of TAAT participants and non-participants in the study area.

Table 2: Estimated cassava yield of TAAT participants and non-participants in the study area.

Yield (Kg/ha)	TAAT participants		Non-TAAT participants	
	Frequency (n= 120)	Percentage (%)	Frequency (n= 120)	Percentage (%)
3,000 – 8,000	38	31.7	46	38.3
9,000 – 14,000	61	50.8	67	55.9
15,000 – 20,000	17	14.2	7	5.8
21,000 – 26,000	4	3.3	-	
Mean ± standard deviation	**19133.40 ± 3951.24**		**12758.26 ± 3976.81**	

Source: Computed from field survey data, 2024

The result in Table 2 shows that the mean estimated cassava yield of the TAAT participants in Southwest Nigeria was 19133.40kg/ha while that of the non-TAAT participants was 12758.26kg/ha. This finding that implies the mean estimated cassava yield of TAAT participants was higher than that of the non-TAAT participants. This further implies that farmers' participation in the TAAT programme enhanced cassava yield in South-west Nigeria. This could be further attributed to farmers' adoption of TAAT cassava production technologies in the study area. This finding is similar to Nyong, and Nweze,, 2012); Nwaobiala *et al.* (2023) who reported that USAID farmers realized mean cassava output of 58,405.56

kg/ha while non-USAID farmers realized mean cassava output of 34,038.89kg/ha.

Hypothesis: Test for significant difference in the estimated cassava yield of TAAT participants and non-participants in South-west Nigeria.

Table 3: Z-test result of significant difference in the estimated cassava yield of TAAT participants and non-participants in South-west Nigeria

Mean difference in cassava yield (kg)	No. of respondents	Mean	Standard deviation	Df	Z-statistic	Z-tab
Mean estimated cassava yield of participants [a]	120	19133.40	3976.814			
Mean estimated cassava yield of non-participants [b]	120	12758.26	3951.243			
Difference (a-b)		6375.14	5736.602	239	12.174***	1.96

Source: Computed from field survey data, 2024
NB: *** = significant at P≤0.05; Df = Degree of freedom
Ho rejected at 0.05 level.

The Z-test result of significant difference in the mean estimated cassava yields of TAAT participants and non-participants in South-west Nigeria is presented in Table 3. The result shows that the mean estimated cassava yields of TAAT participants and non-TAAT participants were 19133.40kg/ha and 12758.26kg/ha respectively. This result implies that the cassava yield of TAAT participants was higher than that of the non-TAAT participants. This is encouraging as this suggests that TAAT is fulfilling its mandate of raising the output and income of farmers through their adoption of high yielding agricultural technologies. Ekweanya and Igbokwe (2023) posited that agricultural extension interventions, whether in the form of technology adoption, training, or resource provision, can positively influence the agricultural practices of the beneficiaries, resulting in a significant boost in farm output. This further suggests the need for more research and extension efforts to be directed towards the development and dissemination of high yielding technologies to resource poor farmers in order to bring about high farm yields. This finding is in consonance with Nyong, and Nweze,, 2012); Uzochukwu *et al.* (2021) who reported a significant difference in the mean cassava output of USAID/MARKETS II farmers and non-USAID farmers at 5% level of significance in Akwa Ibom State.

Conclusion and Recommendation: The study concluded that adoption of TAAT cassava production technologies had positive effect on the yield of cassava farmers in South-west Nigeria as the cassava yield of participants was higher than that of non-participants. Majority of the participants also adopted TAAT cassava production technologies in the study area. Therefore, it recommended that extension agencies, ministries of agriculture, non-governmental organizations and other stakeholders in the agricultural sector should vigorously promote farmers' adoption of TAAT production technologies in South-west Nigeria through the organization of workshops, seminars aimed at creating more awareness and demonstrating the use of these improved cassava technologies.

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