International Journal of Agriculture and Environmental Sciences
ISSN: 3108-088X | Volume 2 Issue 1, 07-13, January-March 2026
DOI: https://doi.org/10.64137/3108088X/IJAES-V2I1P102

Received: 18/01/2026 Revised: 21/01/2026 Accepted: 29/01/2026 Published: 04/02/2026

Original Article

Enhancing Yam Production Using Participatory Action Research In Federal College Of Education (Technical), Omoku, Rivers State, Nigeria

ODINWA, A. B[1], UKPONG, G. U[2], AKUGBO, M[3]. IDIBIA, F. A[4]
[1,2,3,4]Department of Agricultural Education, Federal College of Education (Technical) PMB 11, Omoku, Rivers State, Nigeria.

ABSTRACT: *The study investigated avenues for enhancing yam production using participatory action research in Federal College of Education (Technical), Omoku, Rivers State, Nigeria. It was geared to: examine the production practices that will be suitable to yam farmers using participatory action research; ascertain the causes of low yam production, and determine the factors that could enhance yam production in the area of study. Quasi-experimental design was adopted in this study to obtain the required data. Simple random sampling was adopted to select 10 degree year one students to demonstrate the yam cultivation using different planting methods in the College farm. Also, a well structured questionnaire was administered to the same students before the commencement, and after the field work to provide answers to the research questions. Both descriptive and inferential statistics were employed to analyze the data. Weighted mean score was the descriptive statistics used. The inferential statistics used were the student's T-test and Pearson correlation coefficient to test the hypotheses and the quality of the research questionnaire at 5% significant level. The results showed that student's view on the production practices that will be suitable to yam farmers; the causes of low yam production; and the factors that can enhance yam production in Rivers State, before participation were greatly improved after their participation in yam production exercise. The results clearly demonstrate that participation had a statistically significant effect on students' perception of suitable yam production practices, causes of low yam production and the factors that can enhance yam production in the area. The study recommended that: Suitable yam production practices should be used by farmers in the study area; and the participatory action research should be used in investigations that require people's involvement and contributions.*

KEYWORDS: *Farmer participation, Sustainable agriculture, Agricultural extension, Root and tuber crops, Food security, Rural development, Indigenous farming practices, Capacity building, Technology adoption.*

1. INTRODUCTION

Yam (Dioscorea species) is a vital food security crop and one of the major sources of income for millions of smallholder farmers in West Africa and other tropical regions of the world. Beyond its dietary importance as a major source of carbohydrate, yam holds deep cultural and ritualistic significance [1]. According to recent FAO data and agricultural reports, global yam production has seen a stable increase in land area under cultivation; however, this growth is largely driven by land expansion rather than gains in yield per hectare, which has stayed stagnant compared to other root and tuber crops [2].

In spite of its significance, yam production is plagued by innumerable biotic and abiotic limitations. Soil fertility depletion, the high cost and scarcity of clean "seed" tubers, and the incidence of pests and diseases, such as anthracnose and nematodes which has persist to weaken productivity [3]. In addition, climate change has introduced erratic rainfall patterns that interrupt traditional planting calendars, making the crop increasingly susceptible [4]. Historically, research efforts to solve these problems have relied on a "top-down" approach, where technologies are developed in research stations and handed down to farmers. These interventions often fail because they do not account for the socio-economic realities, local knowledge, or precise ecological positions of the end-users.

The constant gap between research station yields and actual farm yields has led to a paradigm shift toward Participatory Action Research (PAR). Unlike traditional "Transfer of Technology" (ToT) models, PAR is an iterative procedure that involves farmers, researchers, and extension agents as co-creators of knowledge [5]. This methodology lays emphasis on "learning by doing" and incorporates indigenous technical knowledge with scientific improvement. Recent studies advise that when farmers are involved in the selection of varieties or the design of agronomic practices, the adoption rates of new innovations increase drastically [6].

Existing literature highlights the effectiveness of PAR in addressing difficult agricultural problems like seed system development and climate-smart agriculture. For instance, the transition to aeroponics and minisett technologies for seed yam production has seen greater success when executed through Farmer Research Groups (FRGs) rather than isolated demonstrations [7]. PAR fosters a sense of ownership among participants, which is crucial for the long-term sustainability of agricultural interventions. Furthermore, PAR frameworks now increasingly incorporate gender-responsive dimensions, ensuring that innovations benefit both male and female farmers, who often have different roles in yam cultivation and marketing [8].

While the benefits of PAR are conceptually recognized, there is need for localized observed evidence on how this approach expressly enhances yam productivity in Federal College of Education (Technical) Omoku. By engaging Students farmers in the systematic evaluation of planting techniques, soil management, and variety selection, this study seeks to bridge the gap between scientific potential and field reality.

2. MATERIALS AND METHODS

The study was carried out in Federal College of Education (Technical), Omoku, Rivers State. Participatory Action Research (PAR) brings the researcher and the researched to jointly work together throughout the study. This is both practical (quantitative) and survey research (qualitative); therefore quasi-experimental design was adopted in this study because it involved both the use of structured questionnaire and field experiment to obtain the required data. Quasi-experimental design provides practical solutions to community problems [9].It was designed to make 10 participating degree students selected from the Department of Agricultural Education, Federal College of Education (Technical), Omoku demonstrate the yam cultivation using different methods in the College land laboratory. Also, questionnaire was administered to the same students before the commencement and after the field work to provide answers to the research questions based on their practical experience from the same study. The population of this study was drawn from year one degree students of the Department of Agricultural Education, Federal College of Education (Technical), Omoku in Rivers State (2024/2025 academic session). A simple random sampling technique which gave the students equal chances of participation as noted by [10] was used to select ten (10) students and use for the study.

The space was cleared, stumped, marked and pegged. Seedbeds and filled sack bags with approved soil were set up, using cutlass, spade, measuring tape and pegs. The space was divided into five (5) units and each unit housed six white yam varieties replicated five (5 times) to give a total number of 30 yam stands per unit in the set up. Each experimental unit was allocated to two students to handle throughout the research period and each unit measured $2m^2$ and with 50cm furrow apart between (inter) and within (intra) units respectively. Each unit contained 10 sack/cement bags, 10 heaps/mound and 10 flat/ soil and were planted with white yam (*Dioscorea spp.*) in a Completely Randomized Design (C.R.D). Planting was carried out after the bags of soil, seedbeds and the seed yams were set and were treated with the appropriate insecticide against pests.
Primary data was collected through the administration of a structured questionnaire to the student before the cultivation practices and after the harvest. Both descriptive and inferential statistics were employed to analyze the data. Descriptive statistics such as percentage and weighted mean scores derived from Likert rating scales were used. The inferential statistics used was the Analysis of Variance (ANOVA), the student's T-test and Pearson correlation coefficient to test the hypotheses at 5% significant level.

3. RESULTS AND DISCUSSION

Students' views on the production practices that will be suitable to yam farmers, causes of low yam production and the factors that can enhance yam production in ONELGA, Rivers State were presented as follow: **STUDENTS' VIEW ON THE PRODUCTION PRACTICES THAT WILL BE SUITABLE TO YAM FARMERS IN ONELGA, RIVERS STATE, 'BEFORE AND AFTER' PARTICIPATION**

The results in Table 1 presents the student's view on the production practices that will be suitable to yam farmers in ONELGA, Rivers State, 'Before and After' their participation in yam production exercise. It indicated that all the tested yam production practices before (GM = 3.38) and after participation (GM = 3.65) were approved by the participated students, as production practices that will be appropriate to yam farmers in the area. It means that with the increase in grand mean from 3.38 to 3.65 after the field experience that participation is crucial for improved or enhanced decisions. Therefore, all the tested yam production practices from proper land preparation, flat/deep planting, ridging or mounding, sack/bag planting to participatory farming practices will improve yam production in the area of study.

TABLE 1 Mean Distribution Of The Students' View On The Production Practices That Will Be Suitable To Yam Farmers In Onelga, Rivers State, 'Before And After' Participation

	Before		After			
Production Practices of yam	Wted Score n = 10	Mean	Wted Score n = 10	Mean	Grand Mean	Remark

Proper land preparation improves yam production.	40	4.00	40	4.0	4.00	Agreed
Flat/deep planting is suitable for yam cultivation in the area.	36	3.60	38	3.80	3.70	Agreed
Ridging or mounding is suitable for yam cultivation in the area.	38	3.80	40	4.00	3.90	Agreed
Sack/bag planting is suitable for yam cultivation in the area	28	2.80	30	3.00	2.90	Agreed
Early planting enhances yam yield.	32	3.20	34	3.40	3.40	Agreed
Use of improved yam varieties is suitable for farmers.	36	3.60	40	4.00	3.80	Agreed
Proper spacing during planting improves yam production.	32	3.20	34	3.40	3.30	Agreed
Staking of yam vines enhances tuber development.	34	3.40	38	3.800	3.60	Agreed
Application of organic manure improves yam yield.	40	4.00	40	4.00	4.00	Agreed
Use of inorganic fertilizer increases yam production.	34	3.40	36	3.60	3.50	Agreed
Mulching helps conserve soil moisture for yam growth.	32	3.20	36	3.60	3.40	Agreed
Timely weeding improves yam productivity.	40	4.00	40	4.00	4.00	Agreed
Crop rotation improves soil fertility for yam farming.	32	3.20	34	3.40	3.30	Agreed
Intercropping yam with other crops is beneficial.	26	2.60	30	3.00	2.80	Agreed
Use of healthy seed yam improves yield.	36	3.60	40	4.00	3.80	Agreed
Use of modern farm tools improves yam production.	28	2.80	30	3.00	2.90	Agreed
Participatory farming practices help identify suitable yam practices.	30	3.00	40	4.00	3.50	Agreed
Grand mean		**3.38**		**3.65**		

Source: Field Survey, 2025. **Decision Mean = 2.50**

Table 2 presents the paired samples t-test comparing students' mean responses before and after participation in yam production activities. The mean score increased from 3.38 before participation to 3.65 after participation, indicating a noticeable improvement in students' understanding of appropriate yam production practices. The reduction in variance from 0.19 (before) to 0.15 (after) further suggests that students' responses became more consistent after participation, implying better clarity and shared understanding of the matter under investigation. The high Pearson correlation coefficient (r = 0.97) indicates a strong positive relationship between pre- and post-test responses, showing that the same students were reliably measured at both time points. Despite this strong correlation, the paired t-test produced a t-value of –9.87, which is far greater than the critical value of 2.12. The associated two-tailed p-value (0.000) is significantly lower than the 0.05 threshold, confirming that the observed difference in mean scores was not due to chance. This result clearly demonstrates that participation had a statistically significant and substantial effect on students' perception of suitable yam production practices. The improvement can be attributed to experiential learning, where direct involvement in agricultural activities enhances understanding, retention, and practical knowledge. This finding is consistent with experiential learning theory of [11], which emphasized learning through direct experience and reflection, and with agricultural education studies showing that hands-on participation strengthens knowledge of farming practices.

TABLE 2 T-Test Result On The Students' View Concerning The Production Practices That Will Be Suitable To Yam Farmers In Onelga, Rivers State, 'Before And After' Their Participation

Source	N	Mean	df	Variance/Sd	t-cal	t- tab	Pearson Correlation	P-value	Remark
Before	17	3.38	16	0.19/0.43	-9.87	2.12	0.97	0.00	S
After	17	3.65		0.15/0.39					
Total	34								

Source: Field Survey, 2025 **S - means significant at P < 0.05%**

STUDENTS' VIEW ON THE CAUSES OF LOW YAM PRODUCTION IN ONELGA, RIVERS STATE, 'BEFORE AND AFTER' PARTICIPATION

The results in Table 3 present the student's view on the causes of low yam production in ONELGA, Rivers State, 'Before and After' participation in yam production exercise. It showed that all the tested variables could cause low yam production, except labour shortage (GM = 2.20). It showed that students' grand mean score increased from 3.09 before participation to 3.29 after participation, reflecting an improvement in their understanding of the factors responsible for low yam production in ONELGA, Rivers State. It implies that the increase in the grand mean after participation was as a result of the students' field experience and a conviction from on-the-farm practice that those variables from poor soil fertility to low level of farmer education in adopting of improved practices could cause low yam production in the area.

TABLE 3 Mean Distribution Of The Students' View On The Causes Of Low Yam Production In Onelga, Rivers State, 'Before And After' Participation

	Before		After			
Causes of low yam Production	**Wted Score n = 10**	**Mean**	**Wted Score n = 10**	**Mean**	**Grand Mean**	**Remark**
Poor soil fertility causes low yam production.	40	4.00	40	4.00	4.00	Agreed
Pest infestation reduces yam yield.	28	2.80	34	3.40	3.10	Agreed
Diseases contribute to low yam production.	26	2.60	26	2.60	2.60	Agreed
Lack of improved planting materials affects yam yield.	30	3.00	36	3.60	3.30	Agreed
Inadequate rainfall leads to low yam production.	32	3.20	34	3.40	3.30	Agreed
High cost of farm inputs discourages yam farming.	30	3.00	26	2.60	2.80	Agreed
Lack of agricultural extension services reduces productivity.	29	2.90	31	3.10	3.00	Agreed
Limited access to farmland affects yam production.	40	4.00	40	4.00	4.00	Agreed
Labour shortage contributes to low yam yield.	22	2.20	22	2.20	2.20	Disagreed
Poor weed control reduces yam productivity.	32	3.20	36	3.60	3.40	Agreed
Lack of fertilizer availability affects yam production.	28	2.80	32	3.20	3.00	Agreed
Poor storage facilities increase post-harvest losses.	34	3.40	38	3.80	3.60	Agreed
Inadequate access to credit affects yam farming.	36	3.60	38	3.80	3.70	Agreed
Poor transportation affects yam production and marketing.	34	3.40	36	3.60	3.50	Agreed
Low level of farmer education affects adoption of improved practices.	30	3.00	32	3.20	3.10	Agreed
Grand Mean		**3.14**		**3.34**		

Source: Field Survey, 2025. **Decision Mean = 2.50**

Table 4 presents a paired t-test result on the Students' view concerning the causes of low yam production in ONELGA, Rivers State, 'Before and After' Participation. The paired t-test yielded a t-value of –5.03, which exceeded the critical value of 2.14, while the p-value (0.00) was well below the 0.05 level of significance. This provides strong evidence that participation significantly improved students' awareness of the causes of low yam productivity, such as poor soil fertility, pest and disease pressure, inadequate planting materials, and limited access to improved technologies. This finding supports [12] which indicates that participatory learning and agricultural training enhance learners' ability to identify production constraints and develop problem-solving skills. It also confirms that exposing students to real agricultural environments strengthens their analytical understanding of farming systems and challenges [13].

TABLE 4 T-Test Result On The Students' View Concerning The Causes Of Low Yam Production In Onelga, Rivers State, 'Before And After' Participation

Source	N	Mean	df	Variance/Sd	t-cal	t- tab	Pearson Correlation	P-value	Remark
Before	15	3.09	14	0.30/0.54	-5.03	2.14	0.89	0.00	S
After	15	3.29		0.34/0.58					
Total	30								

Source: Field Survey, 2025 **S - means significant at P < 0.05%**

STUDENTS' VIEW ON THE FACTORS THAT CAN ENHANCE YAM PRODUCTION IN ONELGA, RIVERS STATE, 'BEFORE AND AFTER' PARTICIPATION

Table 5 presents the students' view on the factors that can enhance yam production in ONELGA, Rivers State, 'Before and After' Participation. The result shows that: Provision of improved yam varieties, adequate fertilizer supply, effective pest and disease control, access to agricultural extension services, mechanized farming, and formation of farmers' cooperatives all with the grand means of 4.00 among other factors, can enhance yam production and productivity in the area of study. It showed that students' grand mean score increased from 3.68 before participation to 3.79 after participation, indicating improved knowledge of strategies that can enhance yam production, meaning that participation is relevant and should be encouraged in research and development programmes.

TABLE 5 Mean Distribution Of The Students' View On The Factors That Can Enhance Yam Production In Onelga, Rivers State, 'Before And After' Participation

	Before		After			
Enhancement Factors for yam Production	**Wted Score n = 10**	**Mean**	**Wted Score n = 10**	**Mean**	**Grand Mean**	**Remark**
Provision of improved yam varieties can increase production.	40	4.00	40	4.00	4.00	Agreed
Adequate fertilizer supply can enhance yam yield.	40	4.00	40	4.00	4.00	Agreed
Effective pest and disease control can improve production.	40	4.00	40	4.00	4.00	Agreed
Access to agricultural extension services can enhance yam farming.	40	4.00	40	4.00	4.00	Agreed
Regular farmer training can increase yam productivity.	32	3.20	36	3.60	3.40	Agreed
Access to credit facilities can improve yam production.	38	3.80	40	4.00	3.90	Agreed
Government subsidy on farm inputs can enhance yam farming.	38	3.80	38	3.80	3.80	Agreed
Mechanized farming can increase yam production.	40	4.00	40	4.00	4.00	Agreed
Availability of irrigation facilities can improve yam yield.	38	3.80	40	4.00	3.90	Agreed
Formation of farmers' cooperatives can enhance productivity.	40	4.00	40	4.00	4.00	Agreed
Improved storage facilities can reduce yam losses.	36	3.60	36	3.60	3.60	Agreed
Stable market prices can encourage increased yam production.	28	2.80	32	3.20	3.00	Agreed
Improved road networks can enhance yam marketing.	28	2.80	28	2.80	2.80	Agreed

Youth involvement in yam farming can enhance production.	38	3.80	40	4.00	3.90	Agreed
Collaboration with agricultural agencies can improve yam yield.	36	3.60	38	3.80	3.70	Agreed
Grand Mean		**3.68**		**3.79**	**3.73**	

Source: Field Survey, 2025. **Decision Mean = 2.50**

Table 6 shows the paired t-test result on the Students' view concerning the factors that can enhance yam production in ONELGA, Rivers State, 'Before and After' Participation. The result indicated a t-value of –6.43, which is higher than the critical t-value of 2.14, and a very small p-value (0.00). This confirms that participation had a statistically significant effect on students' perception of the factors that can enhance yam production, such as improved seed yam use, better staking systems, soil fertility management, pest control, and adoption of modern agronomic techniques. This finding is in line with [14] and [15] which reported that participatory agricultural education improves awareness and acceptance of yield-enhancing innovations and sustainable practices.

TABLE 6 T-Test Result On The Students' View Concerning The Factors That Can Enhance Yam Production In Onelga, Rivers State, 'Before And After' Participation

Source	N	Mean	df	Variance/Sd	t-cal	t- tab	Pearson Correlation	P-value	Remark
Before	15	3.68	14	0.18/0.42	-6.43	2.14	0.94	0.00	S
After	15	3.79		0.13/0.36					
Total	30								

Source: Field Survey, 2025 **S - means significant at P < 0.05%**

4. CONCLUSION

From the study flat/hole planting appears to provide a more favourable environment for yam growth within the first six weeks, particularly in terms of vine elongation and leaf production. However, since statistical tests indicate no significant differences among variables/treatments, all the three methods can support yam growth effectively. In terms of yield performance at various planting techniques, the result showed that heap/mound planting consistently outperformed flat/hole and bag in tuber length and tuber size/gilt, number of tubers and tuber fresh weight, indicating its superiority for vigorous tuber development. Though, the choice of planting method may depend on resource availability, land conditions, and management objectives. The results clearly demonstrate that participation had a statistically significant and substantial effect on students' perception of suitable yam production practices, the causes of low yam production and the factors that can enhance yam production in ONELGA, Rivers State.

RECOMMENDATIONS

Based on the findings, the study recommended the following:

1. Suitable yam production practices should be adopted by farmers in the study area.
2. Causes of low yam production should be avoided in the area.
3. Various factors that can enhance yam production in the area should be encouraged and used.
4. Participatory action research should be used in investigations that require people's involvement, opinions and contributions.

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