

**ASSESSMENT OF AWARENESS LEVEL OF HYDROPONIC TECHNOLOGIES AMONG CROP FARMERS IN IBADAN NORTH LOCAL GOVERNMENT AREA OF OYO STATE NIGERIA**

\*OYETORO John Oyewole, \*ADETUNBI S.I, \*\*JOLAYEMI J.O and \*TIAMIYU A.O

\*Department of Agricultural Extension and Rural Development,  
Ladoke Akintola University of Technology, Ogbomosho, Nigeria

\*\*Department of Agricultural Science Education,  
College of Education, Oro, Kwara state, Nigeria.

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**ABSTRACT**

The study assessed awareness level of using hydroponic technologies among crop farmers in Ibadan North Local Government Area of Oyo state. The study employed the use of interview schedule in the collection of data from fifty (50) respondents. The mean age of the respondents is 40.22 years, majority (88.0%) of the respondents in the study were male, most of the respondents (66.0%) were married, most of the respondents are literate with mean year spent in schooling was 17.20 years, most (66.0%) of the respondent were aware of bucket as an hydroponic technology, most (58%) of the respondents in the study area believes utilizing hydroponic technologies require time and commitment. The major constraints in the study area to the utilization of hydroponic technologies was lack of technical know how of hydroponic technologies. Hypothesis tested revealed that socio-economic characteristics such as Gender ( $X^2= 28.880$ ,  $P= 0.000$ ), Marital status ( $X^2=74.400$ ,  $p= 0.000$ ), Religion ( $X^2=3.920$ ,  $p=0.048$ ), Education ( $X^2= 40.240$ ,  $p= 0.000$ ), Primary occupation ( $X^2= 64.800$ ,  $p= 0.000$ ), secondary occupation ( $X^2= 9.200$ ,  $p= 0.000$ ), Household ( $X^2= 14.440$ ,  $p= 0.071$ ), Social group membership ( $X^2=13.520$ ,  $p= 0.000$ ) were significantly associated with the awareness level of using hydroponic technologies. The study recommended that Government, private investors, companies manufacturing equipment for hydroponics farming and all stakeholders should not only encourage but assist in research and training of all interested on the technicalities involved in hydroponics technologies.

**Keywords:** Technology, Hydroponic Technology, Local Hydroponic Technologies, Crop Production

## **INTRODUCTION**

Hydroponics is a practice of raising plants by using water (Arshad, 2019). Vertical Roots (2020) viewed Hydroponics as a way to skip the soil, sub in a different material to support the roots of the plant, and grow crops directly in nutrient-rich water. Woodford (2020) observed that despite benefits of hydroponics have sometimes been questioned, there seem to be many advantages in growing without soil. Some hydroponic growers have found they get yields many times greater when they switch from conventional methods. Because hydroponically grown plants dip their roots directly into nutrient-rich solutions, they get what they need much more easily than plants growing in soil, so they need much smaller root systems and can divert more energy into leaf and stem growth. With smaller roots, you can grow more plants in the same area and get more yield from the same amount of ground (which is particularly good news if you're growing in a limited area like a greenhouse or on a balcony or window-ledge inside). Hydroponic plants also grow faster. Many pests are carried in soil, so doing without it generally gives you a more hygienic growing system with fewer problems of disease. Since hydroponics is ideal for indoor growing, you can use it to grow plants all year round.

In hydroponic farming, Kibiti (2017) stated that plants are grown without the use of soil. Plants receive all the essential nutrients from a nutrient-rich water-based solution. There is a variety of hydroponic methods in which plants can either grow in a non-soil medium or directly in the solution. Hydroponic intervention involve more capital than conventional production systems in infrastructure having positive impact on productivity and growth (Imran and Niazi, 2011).

The global food crisis is increasing with alarming speed and force, necessitating nations and international organizations all over the globe to respond with a strategic and long term approach. It has been observed that the current crisis is caused by a web of interconnected forces involving agriculture, energy, climate change, trade, and new market demands from emerging markets and therefore has grave implications for economic growth and development, international security, and social progress in developing countries (Centre for Strategic and International Studies (CSIS), 2008). Sustainable food production technologies could be used as an alternative for producing food all the year round. Hydroponics technology is one of such technologies. Despite the importance of the hydroponics technology on enhancing food security and environmental control, the adoption of the hydroponics technology by the small scale crop farmers in Nigeria has stagnated. On this note, the study generally assessed the awareness level of hydroponic technologies among crop farmers while specifically the study determined the awareness level of respondent on hydroponic farming technology; examined the perception of farmers towards hydroponic farming technologies and determined the constraints to the practice of hydroponic farming.

## **METHODOLOGY**

Multistage sampling procedure was used to select 50 out of the 185 registered crop farmers in Ibadan North Local Government Area. Well-structured questionnaire was used to elicit information from the respondents based on the stated objectives of this research work. Descriptive statistics such as frequency, percentage and mean was used to analyse the stated objectives while Chi-square was used to test the stated hypothesis.

## **RESULT AND DISCUSSION**

### **Socio-Economic Characteristics of Respondents**

Table 1 shows that most of the respondents (62.0%) fell between the age of  $\leq 40$  years. 32.0% of the respondents were in the range of 41-60 years while few (6.0%) were between the range of 61 years and above. The mean age of the respondents was 40.22 years. This implies respondent were youthful and in their middle ages.

Table 1 also revealed that the gender distribution of respondents in the study area and the table revealed that majority (88.0%) of respondents in the study area were male and few (12.0%) of the respondents were female. This deduces that male were perceived to be more energetic than females especially in provision of labour power in agricultural activities. This is in agreement with previous study made by Kimaro *et al*, (2015) which shows that majority of youths who participate in Agriculture were males. Also the result in Table 3 shows that few (24.0%) of the respondents were single, 2.0% were separated, 2.0% were divorced, 6.0% were widow/widower and most (66.0%) were married. This implies that respondents in the study area may be responsible to have a family. Table 3 also portrayed that few (36.0%) of the respondents were practicing Islam while most (64.0%) were Christians. This implies that all the respondents belong to one religion or the other.

The educational status was included in the table 1 and it indicates that 2.0% had no formal education, few (16%) of the respondents has 7-12 years of formal education while majority (82%) had 13 years and above level of formal education. The mean years of the formal education was 17.20 years. This implies that most of the respondents in the study area are literate. Table 3 also indicates that most (62.0%) of the respondents primary occupation is farming, 26.0% were civil servants, 2.0% were artisan, 8.0% were involved in Trading, and 2.0% in Transport service. This shows that the respondent main occupation is farming.

Table 1 also explained that half (50%) of the respondents secondary occupation was Farming, 10.0% were artisan, 30.0% were traders, 2.0% involved in transport services and 8.0% of the respondents secondary occupation was indicated as others like fashion designing, public

speakers, football Research (Compiler) and so on. This implies that few of the respondents who are businesspersons, employees in both public and private sectors had farming as their secondary occupation. Table 1 further explained the household size of the respondents and it indicate that 46.0% of the respondents had household of  $\leq 5$  persons, almost half (54.0%) of the respondents had household size of 6-10 persons. The mean household size was 6 persons and thus indicates that farmers in the study area had a moderate household size.

The annual income of respondents as stated in table 1 shows that most (56%) of the respondents annual income fell between  $\leq$  #300,000, 20% fell between #301,000 – #600,000 while few (2%) fell between #601,000 and above. The mean annual income from crop production was #1,017,660.00. This insinuates crop farmers live above poverty level. Table 1 also indicated social organization membership. Majority (76.0%) of the respondent were member of a social organization while few (24.0%) of the respondents belong to no social organization. This implies that membership of social organization may provide exposure to gather innovations in crop production such as the use of hydroponic technologies.

**Table 1: Distribution of respondents according to socio-economic characteristics**

Socio-economic characteristics	Frequency	Percentage	Mean
<b>Age (years)</b>			
$\leq 40$	31	62	
41-60	16	32.0	40.22
61 and above	3	6.0	
<b>Gender</b>			
Male	44	88.0	
Female	6	12.0	
<b>Marital status</b>			
Single	12	24.0	
Separated	1	2.0	
Divorced	1	2.0	
Widow	3	6.0	
Married	33	66.0	

***Religion***

Islam	18	36.0
Christianity	32	64.0

***Education***

No formal education	1	2.0
≤ 6 years	--	--
7-12 years	8	16.0
13 years and above	41	82.0

***Primary occupation***

Farming	31	62.0
Civil servant	13	26.0
Artisan	1	2.0
Trading	4	8.0
Transport service	1	2.0

***Secondary occupation***

Farming	25	50.0
Civil servant	--	--
Artisan	5	10.0
Trading	15	30.0
Transport services	1	2.0
Others	4	8.0

***Household size***

≤ 5	23	46.0	
6-10	27	54.0	6
11 and above	--	--	

**Annual income**

≤ 300,000	28	56.0	
301,000-600,000	10	20	1017660.00
601,000 and above	12	24	

**Society or group**

Yes	38	76.0
No	12	24.0

**Source: Field survey 2019**

**Level of awareness of hydroponic technologies**

Table 2 indicates that most of the respondent (66.0%) were aware of bucket hydroponic technology. 8.0% aware of rain boot, 40.0% aware of plate, 32.0% aware of net pot, 18.0% aware of banana stem, 18.0% aware of Trough, 54.0% aware of Ropes, 58.0% aware of plastic bottles and pipes, 2.0% aware of palm fronds and 32.0% aware of Tray. This implies that the awareness level of bucket as a hydroponic technology is high in the study area followed by plastic bottles, and pipes. Palm fronds had lowest awareness claim on hydroponic technologies, which implies that the utilization of palm fronds as an hydroponic technology is still very low in the study area.

**Table 2: Distribution of respondents according level of awareness of hydroponic technologies**

Local Hydroponics Technologies*	Aware	Unaware
Bucket	33 (66.0)	17 (34.0)
Rain boot	4 (8.0)	46 (92.0)
Plate	20 (40.0)	30 (60.0)
Net pot	16 (32.0)	34 (68.0)
Banana stem	9 (18.0)	41 (82.0)
Trough	9(18.0)	41 (82.0)
Rope	27 (54.0)	23 (46.0)
Plastic bottles	29 (58.0)	21 (42.0)
Pipes	29 (58.0)	21 (42.0)
Palm fronds	1 (2.0)	49 (98.0)
Tray	16 (32.0)	34 (68.0)

**Source: Field survey 2019.**

**\* Multiple Response**

**Perception of crop farmers towards hydroponic technologies**

Table 3 reveals the distribution of respondents according to their perception toward hydroponic technology and it portrays that respondents in the study area believed hydroponic technology requires time and commitment, this was ranked first with a Weighted Mean Score (WMS) of 4.24. This implies that to give satisfactory yield, hydroponic plants need proper care, followed by the interest of farmers towards hydroponic technology was ranked second with a weighted mean score (WMS) of 4.16 which implies that majority of the respondents in the study area are interested in utilization of hydroponic technology, followed by market for hydroponic product which was ranked third with a weighted mean score (WMS) of 4.12 this implies that respondents believed that the demand for hydroponic product would be high due to its quality while hydroponic technology does not require more land to start with was ranked last with weighted mean score (WMS) of 2.40. This implies that the utilization of hydroponic technology is perceived to be economical and the cost-benefit ratio is high.

Other perception of the farmers in the study area towards hydroponic technologies are: Hydroponics can be used to reduce food security (WMS=3.84), Hydroponics does not require a technical skill (WMS=3.54), Hydroponics products are nutritious (WMS=3.52), Hydroponics are meant for literate farmers (WMS=3.36), Disease and pest cannot be easily controlled in hydroponics (WMS=3.34), Hydroponics is cheap to start (WMS=3.16), Hydroponics does not require high cost of investment (WMS=3.12), Hydroponics is not stressful (WMS=3.06) was ranked eleventh, thirteenth and fourteenth respectively .

**Table 3: Perception of crop farmers towards hydroponic technologies**

Crop farmer's perception*	Strongly Agreed	Agreed	Undecided	Disagreed	Strongly disagreed	WMS	Rank
Hydroponics are meant for literate farmers	16 (32.0)	10 (20.0)	3 (6.0)	18 (36.0)	3 (6.0)	3.36	7 <sup>th</sup>
Disease and pest spread quickly in hydroponics	4 (8.0)	6 (12.0)	16 (32.0)	21 (42.0)	3 (6.0)	2.74	13 <sup>th</sup>
Hydroponics product are Nutritious	13 (26.0)	7 (14.0)	25 (50.0)	3 (6.0)	2 (4.0)	3.52	6 <sup>th</sup>
Hydroponics is cheap to Start	6 (12.0)	10 (20.0)	23 (46.0)	8 (16.0)	2 (4.0)	3.16	9 <sup>th</sup>
Hydroponics can be used							

to reduce food scarcity	21 (42.0)	9 (18.0)	15 (30.0)	1 (2.0)	4 (8.0)	3.84	4 <sup>th</sup>
Hydroponics farming is too complex to understand	8 (16.0)	9 (18.0)	13 (26.0)	17 (34.0)	3 (6.0)	3.04	12 <sup>th</sup>
Hydroponics require time and commitment	29 (58.0)	8 (16.0)	11 (22.0)	0	2 (4.0)	4.24	1 <sup>st</sup>
Hydroponics is not stressful	4 (8.0)	10 (20.0)	20 (40.0)	11 (22.0)	5 (10.0)	3.06	11 <sup>th</sup>
Hydroponics does not require high cost of investment	4 (8.0)	8 (16.0)	22 (44.0)	10 (20.0)	6 (12.0)	3.12	10 <sup>th</sup>
Hydroponics does not require more land to start with	15 (30.0)	11(22.0)	16 (32.0)	5 (10.0)	3 (6.0)	2.40	14 <sup>th</sup>
Hydroponics does not require a technical skill	5 (10.0)	4 (8.0)	12 (24.0)	17 (34.0)	12 (24.0)	3.54	5 <sup>th</sup>
There is no market for hydroponic product	1 (2.0)	0	11 (22.0)	18 (36.0)	20 (40.0)	4.12	3 <sup>rd</sup>
Disease and pest cannot be easily controlled in hydroponics	5 (10.0)	6 (12.0)	16 (32.0)	13 (26.0)	10 (20.0)	3.34	8 <sup>th</sup>
No interest to practice hydroponic farming	2 (4.0)	3 (6.0)	3 (6.0)	19 (38.0)	23 (46.0)	4.16	2 <sup>nd</sup>

**Source: Field survey 2019.**

**( ) represents percentage**

**\* multiple responses**

### **The constraints affecting the utilization of hydroponic technology**

Table 4 shows the distribution of respondents according to the constraints to the awareness level of hydroponic technologies on the study area and it indicates that Majority 76.0% of the respondents claimed government policy as serious constraints affecting the utilization of hydroponic technology, 46% of the respondents indicated that distance from farm is a minor problem to the practicing of hydroponic technology. Majority (96%) of the respondents claimed that lack of technical know how is one of the major problem facing utilization of hydroponic technologies, 76% of the respondents indicates that inadequate power supply is a serious constraint, 86.0% of the respondents claimed that literacy level also constituted serious constraints to the utilization of hydroponics technology while 70.0% of the respondents indicates that high cost of investment as a serious constraint. This deduces that major constraints to the utilization of hydroponics technologies among crop farmers is lack of technical know-how.



**Table 4: The constraints affecting the utilization of hydroponic technology.**

Constraints of hydroponics technologies utilization	*Serious	Mild	Not a constraint
Government policy	38(76.0)	18 (36.0)	4 (8.0)
Distance from farm	23 (46.0)	18 (36.0)	9 (18.0)
Technical know-how	48 (96.0)	2 (4.0)	-
Power supply	38 (76.0)	9 (18.0)	3 (6.0)
Literacy level	43 (86)	6 (12.0)	1 (2.0)
High cost of investment	35 (70)	15 (30.0)	-

**Source:Field survey, 2019**

**( ) represents percentage**

**\* multiple responses**

### **Hypothesis testing**

There is no significant association between socioeconomic characteristics of the respondents and the awareness level of using hydroponic technologies.

The result in the table 5 shows that selected socioeconomic characteristics such as Gender ( $X^2=28.880$ ,  $P=0.000$ ) this implies that the percentage of male practicing agriculture is higher than female because male were perceived to be more energetic than female especially in provision of labour power in agricultural activities which influence the rate at which they area were of hydroponic technologies. Marital status ( $X^2=74.400$ ,  $p=0.000$ ),this implies that married men have more responsibilities to cater for which influences their pursuit for increase in the level of agricultural practice thereby making them to seek for innovative technologies such as hydroponic technologies for meeting their responsibilities. Religion ( $X^2=3.920$ ,  $p=0.048$ ), some religion give room for training and educational program which open up their devotee to latest development and technologies while some religion does not. Those religions that give room for exposure to latest development and innovative technologies makes their devotees to be aware technologies like hydroponics. Education ( $X^2=40.240$ ,  $p=0.000$ ), this portrays that farmer with higher level of education tend to be more expose to hydroponic technologies compare to farmers with low level of education. Primary occupation ( $X^2=64.800$ ,  $p=0.000$ ), this implies that someone who practices farming as a primary occupation has interest in seeking for knowledge on innovative technologies related to farming thereby affecting the awareness level of hydroponic technologies. Secondary occupation ( $X^2=9.200$ ,  $p=0.000$ ), this implies that farmers who have their major source of income outside farming tend to have low or little interest in seeking for knowledge on

innovative technologies related to farming which result to low awareness of hydroponic technologies. Household ( $X^2= 14.440$ ,  $p= 0.071$ ), thus shows that farmers with large households seeks for ways by which food security will be attained all through the year in their family thereby making them to tend to be aware of hydroponic technologies compare to farmers with smaller household size who does not have much responsibility to cater for. Group ( $X^2=13.520$ ,  $p= 0.000$ ). This implies that farmers who belong to group that encourages innovation in agriculture are likely to be aware of hydroponic technologies.

**Table 5: Chi-square analysis showing the relationship between selected socio-economic characteristics of the respondents and the level of using hydroponic technologies**

Socio-economic characteristics	X <sup>2</sup>	Df	P-value	Remark
Age	17.000	24	0.849	Not significant
Gender	28.880	1	0.000	Significant
Marital status	74.400	4	0.000	Significant
Religion	3.920	1	0.048	Significant
Education	40.240	11	0.000	Significant
Primary Occupation	64.800	4	0.000	Significant
Secondary occupation	39.200	4	0.000	Significant
Household	14.440	8	0.071	Significant
Annual income	13.920	16	0.605	Not significant
Group	13.520	1	0.000	Significant

**Source: Field survey, 2019**

## CONCLUSION AND RECOMMENDATIONS

This study concluded that majority of the respondents are male, married, Christians, and literate. Most of the respondents are aware of bucket as a hydroponic technology. The majority of the respondents in the study area believes hydroponics technology require time and commitment. Constraints encountered by the respondents in the study area to the utilization of hydroponic technologies were lack of technical know-how, government policy, distance, inadequate power supply, literacy level and high cost of investment.

The following recommendations were made from the study:

- Government, private investors, companies manufacturing equipment for hydroponic farming and all stakeholders should not only encourage but assist in research and training of all interested on the technicalities involved in hydroponics technologies.
- The cost of the hydroponics system is determined by the type of materials used in the construction. Suitable locally available materials should be sourced for to construct

hydroponics systems and this will go a long way to reduce the cost of hydroponics technology.

- Limited access to agricultural loans affects agricultural production and investment. The government should provide grants, subsidy or low interest credit facilities to smallholder hydroponic farmers who are interested in hydroponics technologies. The promotion of hydroponic technologies can help to reduce food scarcity in Nigeria.

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